

**ARCHAEOLOGICAL INVESTIGATIONS
AT THE PROPOSED SITE OF
STEPHENSON QUARTER PUBLIC
SQUARE, NEWCASTLE UPON TYNE**

**Areas 1 & 2
Foundation Trench
Trenches 1, 4, 5 & 6**

MARCH 2018

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Archaeological Investigations at the Proposed Site of Stephenson Quarter Public Square, Newcastle upon Tyne

Central National Grid Reference: NZ 24667 63664

Site Code: SQN17, SSQ17, SFT17

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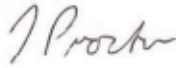

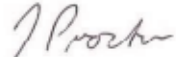
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DOCUMENT VERIFICATION

**ARCHAEOLOGICAL INVESTIGATIONS AT THE PROPOSED SITE OF STEPHENSON
QUARTER PUBLIC SQUARE,
NEWCASTLE UPON TYNE**

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1. NON-TECHNICAL SUMMARY

- 1.1 Pre-Construct Archaeology Ltd was commissioned by Galliford Try PLC on behalf of the Clouston Group Ltd to undertake a series of archaeological investigations within the Stephenson Quarter. The site is located in the area between the Crowne Plaza Hotel and the Stephenson Works Boiler Shop on South Street and is bounded to the north by Forth Street and to the south by a retaining wall beyond which the land drops steeply (Figure 1a&b). The majority of the archaeological work was undertaken in association with the construction of a walkway to be created between the hotel and Boiler Shop as part of the proposed development of a new public square (Stephenson Square). Ground reduction across the walkway is necessary to establish an appropriate gradient between the two areas due to the difference in ground level between the buildings. One element of the archaeological work was associated with the construction of a new technical college (the UTC) on land to the south of the site; a foundation trench for the north wall of this building extended into the south-western corner of Stephenson Square.
- 1.2 The Stephenson Quarter includes former structures of Robert Stephenson & Co. engineering works and Hawthorn Locomotive Works. Both were pioneering manufactories in the 19th century and the Stephenson Works is recognised as the first purpose built locomotive manufactory in the world, and as such is regionally significant.
- 1.3 A foundry was also located within the western side of the development area and is first observed on Oliver's map of 1849. The Ordnance Survey map of 1862 labels this foundry as 'White & Brown's'. An inscribed stone for the foundry dating to 1839 was present in building rubble found on the site prior to archaeological work commencing. However, the companies name is spelt *Wright & Brown* rather than *White*. *Ward's North of England Directory 1851* notes *Wright & Brown* as iron founders on Regent Street so the name on the Ordnance Survey is definitely an error. By the time of the Ordnance Survey of 1881, *Wright & Brown's* Foundry had been incorporated into the Stephenson Works.
- 1.4 The investigations detailed in this report were carried out in the south-eastern and south-western parts of the site. Historic map regression shows that the south-eastern part of the site was formerly occupied by Smith's Shops or Workshops associated with Stephenson's Engine Works (Ordnance Survey map of 1862), and subsequently by a High Smithy (Ordnance Survey map of 1896). *Wright and Brown's* Iron Foundry was located in the south-western part of the site (Oliver's 1849 map; 1862 and 1896 Ordnance Survey maps); by 1919 this had been replaced by the Forth Banks Engineering Works.
- 1.5 This report details three phases of archaeological work undertaken at Stephenson Quarter (SSQ17, SQN17, SFT17) which included a trial trenching evaluation and open area excavation. A specification for the archaeological evaluation was provided by Jennifer Morrison, Tyne and Wear Archaeology Officer (TWAS 2017; Ref. MON14841).

- 1.6 The first phase of work in January 2017 comprised the hand cleaning and recording in plan of structural remains situated in the south-eastern part of the site within the eastern half of the proposed walkway route. The structural remains were exposed following the removal of concrete hardstanding and some initial ground reduction which occurred in December 2016 prior to the commencement of archaeological investigations (SSQ17; Area 1). This was followed in June-July 2017 by the investigation of four evaluation trenches to better understand the scale and depth of the surviving archaeological remains at the site (SQN17). Trenches 4, 5, & 6 were located in the south-eastern part of the site within the walkway area where the Smith's Shops, Workshops and subsequently the High Smithy were situated. Trench 1 in the south-western part of the site was positioned to run centrally along Wright and Brown's Iron Foundry.
- 1.7 The third phase of work detailed in this report, undertaken between August/September 2017, involved a strip, map and record excavation across the western extent of the walkway which was located within the south-eastern end of Wright and Brown's foundry (Area 2). At the same time archaeological monitoring was undertaken during the excavation of the foundation trench for the UTC building located to the south-east of Wright and Brown's foundry, abutting the retaining wall.
- 1.8 Archaeological features and structures recorded during the investigations have been assigned to six phases of activity.
- 1.9 Phase 0 comprises geological glacial till (boulder clay), only encountered at depths of c. 3-3.75m below the existing surface within the UTC foundation trench; this drop in height reflecting the original sloping natural topography of the eastern valley side of the Skinner Burn.
- 1.10 Phase 1 comprises 19th-century ground raising dumps and levelling deposits which were encountered as the basal deposits within Trenches 1 & 6 and within Area 2. This material may have been deposited to level the ground with its sloping natural topography prior to the construction of industrial buildings in this area.
- 1.11 Phase 2 comprises 19th-century industrial activity at the site including structures within Area 1; Trenches 1, 4, 5 & 6 and Area 2. Within Area 1 and Trenches 4, 5 & 6 the structural remains comprised elements of the Smiths Shop and Workshops of the Stephenson Engine Works. Structural remains within Trench 1 and Area 2 comprised elements of Wright & Brown's Foundry. The south-western corner of the foundry was exposed; the external walls were of substantial sandstone construction and sandstone internal walls were also revealed. The recorded remains formed part of four rooms labelled *Mill Edge Runners*, *Drying Stoves* and *Under Construction Oct 1896* on the 1896 Goad Plan.
- 1.12 Phase 3 activity comprised late 19th-century modifications to the foundry within Area 2 and ground raising dumps and levelling deposits within all the investigated areas. A furnace was located within the south-west drying stove room and extended outwards beyond the outer

wall of the foundry. Elements of six drying stoves built into the earlier internal walls of the foundry building were recorded.

- 1.13 Phase 4 comprises further modifications to structures associated with an intensification of industrial activity at the site sometime in the latter part of the 19th century and into the 20th. Various elements of a complicated and multi-phase system of flue structures were recorded extending across Area 1 and were also recorded in Trenches 4, 5 & 6. These flues probably carried waste gases from ovens/furnaces to external vents. Although no datable material was recovered from any of these structures they probably represent part of a wider system of flue structures associated with the High Smithy of Robert Stephenson & Company Engineering Works as depicted on Goads Fire Insurance Map of 1896. The flues were likely in use until the early part of the 20th century.
- 1.14 Phase 5 comprised modern activity at the site including various services, surfaces demolition and backfill deposits.
- 1.15 At the time of writing a further phase of archaeological investigation was being undertaken comprising a strip, map and record excavation of the eastern end of the walkway. This includes the entirety of Area 1 as well as an additional area extending to the north. It is proposed that a combined publication should be prepared detailing all of the structural and archaeological remains recorded during all phases of archaeological work at the site.

2. INTRODUCTION

2.1 Project Background

- 2.1.1 This report details the results of three phases of archaeological investigations undertaken by Pre-Construct Archaeology Limited (PCA) in 2017 within the Stephenson Quarter of Newcastle upon Tyne (National Grid Reference NZ 24667 63664; Figures 1a&b). The work was commissioned by Galliford Try on behalf of the Clouston Group (the Client) prior to the development of a new public square (Stephenson's Square). The square is located in the area between the Crowne Plaza Hotel, the Stephenson Works Boiler Shop on South Street, Forth Street and to the south by a retaining wall beyond which the land drops steeply. The majority of the archaeological work was undertaken in association with the construction of a walkway to be created between the hotel and Boiler Shop. Ground reduction across the walkway is necessary to establish an appropriate gradient between the two areas due to the difference in ground level between the buildings. One element of the archaeological work was associated with the construction of a new technical college (the UTC) on land to the south of the site; a foundation trench for the north wall of this building extended into the south-western corner of Stephenson's Square.
- 2.1.2 The archaeological work that was undertaken at Stephenson Quarter was split into three phases (SSQ17, SQN17, SFT17) comprising a mixture of recording, trial trenching evaluation and open area excavation. A specification for the archaeological investigations was provided by Jennifer Morrison, Tyne and Wear Archaeology Officer (TWAS 2017; Ref. MON14841).
- 2.1.3 The first phase comprised the cleaning and recording of the eastern half of the walkway area after ground level had been reduced without supervision by an archaeologist (SSQ17; Area 1). This was followed by the investigation of four evaluation trenches to better understand the scale and depth of the surviving archaeological remains (SQN17; Trenches 1, 4, 5, & 6).
- 2.1.4 Trenches 4, 5 & 6 were located in the south-east part of the site to investigate archaeological remains relating to the Smith's Shops or Workshops associated with Stephenson's Engine Works. Trench 1 was located on the site of Wright and Brown's foundry in the south-west part of the site.
- 2.1.5 The third phase of archaeological work involved the archaeological monitoring of the excavation of a foundation trench to the south-east of Wright and Brown's foundry (abutting the retaining wall) and a strip, map and record area across the western extent of the proposed walkway within the area occupied by the foundry (Area 2). The archaeological project herein described was designed according to the guidelines set out in Management of Research Projects in the Historic Environment (MoRPHE; English Heritage 2006).

- 2.1.6 At the time of writing, the Site Archive, comprising written, drawn, and photographic records is housed at the Durham Office of PCA, Unit 19a, Tursdale Business Park, Durham, DH6 5PG. When complete, the Site Archive will be deposited at the Great North Museum, Newcastle upon Tyne, under the site codes SSQ17, SQN17 and SFT17. The Online Access to the Index of Archaeological Investigations (OASIS) reference number for the project is: preconst1-302740.
- 2.1.5 A range of appendices are included in this assessment which comprise the Figures (Appendix 1), the Context Index (Appendix 2), the Stratigraphic Matrix (Appendix 3), Photographic Plates (Appendix 4), Pottery Assessment (Appendix 5), Clay Tobacco Pipe Assessment (Appendix 6), Brick Assessment (Appendix 7) and a copy of the Specification (Appendix 8).

2.2 Site Location and Description

- 2.2.1 The Stephenson Quarter is located to the south of Central Station in Newcastle upon Tyne at central National Grid Reference NZ 24667 63664 (Figure 1a&b). The area is named after the Robert Stephenson & Co engineering works that previously occupied the site (and the majority of the surrounding area).
- 2.2.2 The proposed development area is currently occupied by a mixture of waste ground with areas of concrete and tarmac hard-standing. Until recently the area was occupied by Patterson's motor dealership.
- 2.2.3 The site is bounded to the north by Forth Street; to the east by Sussex Street and Stephenson Works Boilershop; to the south by the former site of J. T. Dove Building Merchants and to the east by the Crowne Plaza hotel.
- 2.2.4 No structures relating to the Stephenson Engineering Works were evident at the site prior to the investigation commencing however, nearby buildings such as the Boilershop and site offices are extant.

2.3 Geology and Topography

- 2.3.1 The bedrock geology of the site is comprised of Pennine Middle Coal Measures Formation – sandstone, that was formed in the Carboniferous Period (310 – 318 million years ago) when the local environment was previously dominated by swamps, estuaries and deltas (BGS 2017).
- 2.3.2 The superficial geology comprised Devensian – Diamicton Till that formed in the Quaternary Period (up to 2 million years ago) in an environment previously dominated by ice age conditions (*ibid.*).
- 2.3.3 Seventeenth-century maps of the area (Speed 1610 & Beckman 1684) show the landscape to be dominated by steep and undulating hills running along the course of the Skinner Burn to the bank of the River Tyne (c. 114m to the southwest of the site). The burn is one of

several post-glacial streams that cut deep, narrow gorges through the clay till and into the bedrock below.

- 2.3.4 Forth Banks broadly follows the former course of the Skinner Burn, a stream which once divided the counties of Northumberland and Newcastle, as well as Newcastle city with the township of Elswick. The burn was reportedly backfilled with domestic waste culverted sometime in the late 18th century and is noted as the western boundary of the corporation of Newcastle (Brand 1789, 412).

2.4 Planning Background

- 2.4.1 Stephenson Quarter Developments Limited has been granted planning permission for the conversion of Hawthorn Works to a College (the UTC) following the demolition of 20th-century additions, alteration to elevations, roof and a new 4.5 storey extension to the east. Moreover, the permission grants the erection of a six-storey office building; associated access, pick up and drop off, walkway, landscaping and public realm works (Ref. 2016/1978/01/DET).
- 2.4.2 This report only focusses on the archaeological mitigation undertaken during the construction of a walkway between the Crowne Plaza Hotel and the Stephenson Works Boilershop and the excavation of a foundation trench for the northern wall of the UTC.
- 2.4.3 The planning permission included conditions requiring archaeological investigation to evaluate the survival of the Stephenson Engineering Works shown on historic mapping. These comprised:

Condition 18

No groundworks or development shall commence until a programme of archaeological fieldwork (to include evaluation and where appropriate mitigation excavation) has been completed. This shall be carried out in accordance with a specification provided by the Local Planning Authority.

Condition 19

The building(s) shall not be occupied/brought into use until the final report of the results of the archaeological fieldwork undertaken in pursuance of condition 18 has been submitted to and approved in writing by the Local Planning Authority.

Condition 20

The buildings shall not be occupied/brought into use until a report detailing the results of the archaeological fieldwork undertaken has been produced in a form suitable for publication in a suitable and agreed journal and has been submitted to and approved in writing by the Local Planning Authority prior to submission to the editor of the journal.

Reason: *The site is located within an area identified as being of potential archaeological interest and the publication of the results would enhance understanding of and will allow*

public access to the work undertaken. The investigation is required to ensure that any archaeological remains on the site can be preserved wherever possible and recorded, in accordance with paragraph 141 of the NPPF, Core Strategy Policies CS15 and UC14 and saved UDP policies C4.2, C4.3

- 2.4.4 Justification for the planning conditions was to comply with paragraph 141 of the National Planning Policy Framework (NPPF 2012):

Local planning authorities should make information about the significance of the historic environment gathered as part of plan-making or development management publicly accessible. They should also require developers to record and advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and the impact, and to make this evidence (and any archive generated) publicly accessible. However, the ability to record evidence of our past should not be a factor in deciding whether such loss should be permitted.

- 2.4.5 A specification for the evaluation phase of works (SQN17) was issued by Jennifer Morrison, Archaeology Officer at Tyne & Wear Archaeology Section (Ref. MON14841).

2.5 Archaeological and Historical Background

Much of this background is taken from the Conservation Plan and Archaeological Assessment prepared by PLB Consulting Limited; the research and writing of those authors is acknowledged.

- 2.5.1 The development area to the north-east of Forth Banks was known as *the Forth* and was open land owned by the Hospital of St Mary the Virgin (established in the 12th century). In the 13th century the town began to expand with the incorporation of various outlying villages and the reclamation of the land on the north side of the river, where the Close, the Quayside and Sandhill now stand. By the 16th century the waterfront at Newcastle was lined with dwellings and warehouses belonging to the merchant classes and during the 17th-century the focus of the English glass trade had shifted from the Weald to Tyneside (although the proposed development site was still undeveloped at this stage).
- 2.5.2 At the beginning of the 19th century, the area was largely pastoral in appearance (Cole & Roper 1801; Kidd 1802) however structures are noted from the Postern gate along Forth Street and Forth Terrace in Wood's plan of 1827 and Oliver's plan of 1830 & 1838. Forth Street was originally laid out in 1811 as an extension of the medieval street called the Postern towards the Forth and Forth Banks. The present line of Forth Street is entirely a product of railway expansion before 1896 which widened the original Newcastle, York and Berwick Railway viaduct to the south. Several north-south streets are apparent on the south side of the new Forth Street; the earliest to be fully developed being Orchard Street and South Street.
- 2.5.3 The earliest evidence of industrial activity relating to the construction of railways and locomotives in this part of Newcastle dates from 1821 when George Stephenson entered

into a partnership with John and Isaac Burrell, iron founders of Orchard Street and South Street, Newcastle, and it is recorded that this firm constructed a metal girder bridge for the Stockton and Darlington Railway that was designed by Stephenson himself. There is no evidence to suggest that locomotives were built by Stephenson with the Burrells, but it is possible to consider their joint establishment as having given the idea from which the works of Robert Stephenson & Co. later developed (Warren 1923, 53).

- 2.5.4 Robert Stephenson & Co was established by June 23rd, 1823 as recorded in the first minute book of the new company (*ibid.*):

"MEMORANDUM for an agreement of Co-partnership between Robert Stephenson of Killingworth near Newcastle, George Stephenson of the same place, Edward Pease of Darlington, and Michael Longridge of Bedlington, for carrying on the business of Engine Builders, Mill Wrights, etc., at Newcastle-upon-Tyne, and for carrying on the same trade under the Firm of Robert Stephenson & Co...."

- 2.5.5 In the following weeks negotiations were entered into for the purchase of land on the south side of Burrell's foundry for the construction of an engine building manufactory. The completed contract was dated 1st August 1823. The original site of the works stood to the east of South Street in the angle formed by that street and Forth Street, after which the works were at first called and for many years known. The construction of additional premises quickly followed as in 1824 the company approved the erection of a Smith's Shop, and recorded that work was already in progress for a number of stationary and marine engines.
- 2.5.6 Describing South Street and Orchard Street in 1827, Mackenzie noted that both were 'filled with manufactories, and the houses of their proprietors, overseers, or workmen', but made no reference to the emerging railway works. The works later expanded westwards crossing South Street, which they eventually absorbed in 1829. Trade directories from 1847 list the principal businesses in South Street, dominated by ironworking and engineering firms - Robert Stephenson & Co (engineers – established 1823), John and Isaac Burrell (iron founders), William Henry Pearson (iron plate worker) and George Heron & Co. (engineers), and a small number of grocers and 'dealers in sundries'.
- 2.5.7 The company embarked upon a policy of steady development on the west side of South Street throughout the 1840s and 1850s. During 1850 the Stephenson Company works were extended northwards along the east side of Sussex Street and by 1859 the Stephenson works had almost reached its peak of development.
- 2.5.8 The expansion of the locomotive works can be traced through historic mapping of the site. The first phase of the works dating from the 1820s are likely shown on Oliver's plan of 1830 and 1849, however the works are not labelled on these editions. The first map to show the works in detail is the Ordnance Survey of 1862 which labels each of the individual structures as well as areas within those buildings such as Coppersmiths Shop, Boiler Department and

Erecting Shop. Within the limits of the proposed development area are Wright & Brown's Foundry (a separate enterprise detailed below) and three structures relating to the Stephenson Engine Works. These comprise: a Forge, a Workshop and the Smiths Shops, as well as an open yard between these structures.

- 2.5.9 The iron foundry in the western part of the development site is first noted on Oliver's map of 1849, although isn't labelled until the Ordnance Survey of 1862 where it is named *White & Brown's Foundry (iron)*. The First Edition Ordnance Survey depicts the various areas within the foundry and shows that the western part of the walkway area is within the stove section of the works. The stoves are where sand moulds were dried before casting in the foundry.
- 2.5.10 An inscribed stone for the foundry dating to 1839 was present in building rubble found on the site prior to archaeological work commencing. However, the companies name is spelt *Wright & Brown* rather than *White*. Ward's North of England Directory 1851 notes a Wright & Brown iron founders on Regent Street so the name on the Ordnance Survey is definitely a mistake. The inaccuracy in the First Edition Ordnance Survey is perhaps either an innocent mistake or an intentional error added to the map to combat plagiarism. By the Ordnance Survey of 1881, Wright & Brown's Foundry had been incorporated into the Stephenson Works.
- 2.5.11 Goad's Fire Insurance plan of 1896 depicts numerous changes to the works within the proposed development area. While the foundry remains unchanged, the Forge, Workshop and Smith's Shops have been demolished and a larger High Smithy built on the site.
- 2.5.12 Changes to the site occurred again when in 1899 Mr George Robert Stephenson (George Stephenson's nephew) retired and the private company was wound up to form a new public limited company (Warren 1923, 417). One of the most important decisions of the new company was to remove their locomotive works to a more convenient site. The old Forth Street, now known as the South Street works, which had opened in 1823; with less than an acre of ground the works had been extended to every possible limit. It was decided to dispose of these historic works and lay out a new establishment at Darlington, on a site which would offer ample area for future expansion (*ibid.*). The new works at Darlington were established in 1900 and were producing locomotives by 1902.
- 2.5.13 Following the move of Robert Stephenson & Co. to Darlington in 1900, the Hawthorn locomotive works to the south dominated the site. They took over a number of the previous buildings and continued operation until the merger with RS&Co in 1937. Between 1937 and 1944 the site was used primarily for the construction of smaller industrial engines, with the larger locomotives constructed at Darlington. In 1944 Robert Stephenson and Hawthorn Limited was taken over by the Vulcan Foundry, which was itself taken over by the English Electric Company in 1959. The Ordnance Survey of 1951 shows the Forth Banks Engineering Works, although the area within the proposed development was now operating as a Motor Engineering Works.

- 2.5.14 Other notable occupants of the former locomotive works that took over the site during the early 20th-century included George Jobling who leased 20 South Street and constructed bicycles, model T Fords, coaches and Sopwith Camel aeroplanes. J.T Doves building merchants began to operate on the site from 1908, leasing much of the former Stephenson workshops to the east of South Street and gradually expanding west through the century.
- 2.5.15 The engineering works are still on the 1970 Ordnance Survey but look to be scaled back by the time of the 1973-79 edition and on the 1993 edition a depot is depicted on the site. By the time of the archaeological investigations there were no standing buildings on the development site.

3. PROJECT AIMS AND RESEARCH OBJECTIVES

3.1 Project Aims

- 3.1.1 From the outset, the aim of the work was set out in the Specification for Preliminary Archaeological Evaluation on the proposed site of Stephenson Quarter public square (NCC 2017; Ref. MON14841). In general, the purpose of the archaeological evaluation was to determine and understand the nature, function, and character of the site in its cultural setting. Moreover, the works were undertaken to ensure that all archaeological remains were identified, and, if required, a suitable strategy set in place to mitigate the impact of the development on the historic environment.
- 3.1.2 The results are to be used to inform decisions regarding further mitigation measures that may be required at the site prior to the proposed development.

3.2 Research Objectives

- 3.2.1 The project was undertaken with reference to the research framework set out in *Shared Visions: The North-East Regional Research Framework for the Historic Environment* (NERRF) (Petts and Gerrard 2006), which highlights the importance of research as a vital element of development-led archaeological work. By setting out key research priorities for all periods of the past, NERRF allows archaeological projects to be related to wider regional and national priorities for the study of archaeology and the historic environment.
- 3.2.2 Preservation *in situ* of important archaeological remains is almost always the preferred option in any development scheme. In most cases, however, this is not possible with the result that appropriate and satisfactory provision for the recording of archaeological remains is usually implemented, followed by post-excavation analysis and publication of results. Therefore, the principal research objective of the archaeological investigations of Area 2 and the foundation trench was to further expose, record and excavate any remains relating to the iron foundry and to gather information on construction techniques, phases of development and refurbishment associated with the historically important buildings.
- 3.2.3 The archaeological investigation had the potential to make a significant contribution to archaeological knowledge of the post-medieval era. This period in the North East was one of radical and deep-rooted change and saw a transition from an agricultural to an industrial economy; a shift from a primarily rural population to an urban one and a move from horse power to, first, water power, then steam power. As such, the period saw a massive increase in industry, reflecting and causing technological changes, new patterns in social organisation and an increased demand for consumer goods.
- 3.2.4 Within the North East, one of the most significant manufacturing industries was iron and steel working. Wright and Brown's iron foundry was established by 1849. The NERRF notes that by the 19th century foundries were common in urban areas; however, the archaeology

of the foundry trade has received little attention nationally and virtually none within the region (Petts and Gerrard 2006, 97).

- 3.2.5 The later development of engineering works, often incorporating both forging and foundry elements, have received little archaeological study either regionally or nationally, though it was of prime importance to 19th century Tyneside (*ibid.* 97).
- 3.2.6 Key research questions to be addressed from the NERRF in regard to the foundry and Stephenson Engineering Works are detailed below:

Post-Medieval Research Agenda

PMii. Industrialisation

PMiii. The North-East in its national and international context

PMviii. Industrial intensification 1790-1830

Twentieth Century Research Agenda

Moi. Industry

Industry and Transport: Archaeometallurgy

ID9. The recovery of archaeological material indicative of metal working;

ID11. A type series of slag and other metallurgical residues should be developed.

- 3.2.7 Before any fieldwork is undertaken the archaeometallurgical potential of a particular site can be anticipated to some extent from a consideration of the general nature of the site. The Historical Metallurgy Society's *Metals and Metalworking: A research framework for archaeometallurgy* (HMS 2008, 69) notes that a particular priority area is the study of 19th century ironworks, especially the foundry and forge sectors.

4. ARCHAEOLOGICAL METHODOLOGY

4.1 Fieldwork

- 4.1.1 A public square is to be constructed at the Stephenson Quarter including a walkway linking the Crowne Plaza Hotel with the Boiler Shop; ground reduction across the walkway is necessary to establish an appropriate gradient between the two areas due to the difference in ground level between the buildings. A new college is being constructed at the site of the former Hawthorn Works to the south of the square, and the northern wall of the UTC building encroaches into the square.
- 4.1.2 Extensive remains of the smith's shop and workshops relating to the Stephenson Engineering Works were uncovered in late 2016 when the route of a temporary footpath was opened up. Works ceased when the historic remains were found which instigated the first phase of archaeological works at the site within Area 1 (SSQ17). During this phase the remains were hand cleaned, photographed and planned; however, no excavation was undertaken. This phase of works was undertaken between 3rd to 13th January 2017 with Area 1 measuring approximately 27m x 10m.
- 4.1.3 An archaeological trial trenching evaluation of the site was subsequently undertaken between 23rd June to 3rd July 2017 (SQN17). The trenches were required to inform Tyne and Wear Archaeology Service of the character, nature, date, depth, and degree of survival of archaeological deposits on the site in the area where ground reduction was to be undertaken for the construction of the walkway.
- 4.1.4 The specification required three trenches to be excavated across the site (NCC 2017; Ref. MON14841). These comprised: Trench 1 on the site of the foundry (2m x 20 m); Trench 2 on the site of the iron warehouse (2m x 17m) and Trench 3 on the site of the smith's shop (2m x 25m).
- 4.1.5 Prior to work commencing it was agreed with Tyne and Wear Archaeology Service to not investigate Trench 2 during this phase of works (as it lay outside of the proposed walkway) and to split the meterage within Trench 3 to form three shorter trenches within Area 1 to better characterise the level of preservation. The final agreed trenching comprised Trench 1 (2m x 25m), Trench 4 (2m x 9m), Trench 5 (2m x 10m) and Trench 6 (2m x 12m).
- 4.1.6 Trench 1 was located to target the remains of Wright & Brown's Foundry while Trenches 4, 5 and 6 targeted the remains of the smith's shop and workshops of Robert Stephenson and Co. Engineering Works.
- 4.1.7 Due to the extent of preservation within Trench 1, a 28m x 20m area was excavated to a depth of c. 1m below ground level to target the remains of the stoves within Wright & Brown's Foundry across the area of ground reduction for the walkway (SFT17). The excavation of a foundation trench which measured c. 10.6m by 3m and 4.36m deep for the

UTC building was also monitored under archaeological supervision. This third phase of work was undertaken between 23rd of August to the 27th of September 2017.

- 4.1.8 All fieldwork was undertaken in compliance with the codes and practice of the Chartered Institute for Archaeologists and the relevant CIfA standard and guidance document (CIfA 2014 a, b & c). PCA is a CIFA 'Registered Organisation'. All fieldwork and post-excavation was also carried out in accordance with the Yorkshire, the Humber & The North East: Regional Statement of Good Practice (SYAS 2011). Historic England's (2015) *Archaeometallurgy- Guidelines for Best Practice* was also consulted.
- 4.1.9 Investigation of archaeological levels was undertaken by hand, with cleaning, examination and recording both in plan and section, where appropriate. Cleaning was restricted to portions of probable and certain archaeological features identified during machine removal of overburden. Investigations followed the normal principles of stratigraphic excavation and were conducted in accordance with the methodology set out in PCA's site manual (PCA 2009) and the Museum of London Site Manual (Museum of London 1994).
- 4.1.10 An overall plan of all archaeological features was compiled using a mixture of GPS survey and hand-drawn plans. Plans were drawn at 1:20 and sections/elevation at 1:10 & 1:20.
- 4.1.11 A photographic record of the investigations was compiled using a digital SLR camera illustrating in both detail and general context the principal features and finds discovered. The photographic record also included 'working shots' to illustrate more generally the nature of the archaeological operation mounted. All record photographs included a legible graduated metric scale.
- 4.1.12 A survey grade GPS was used to establish Temporary Bench Marks (TBMs) on the site. The height of all principal strata and features were calculated relative to Ordnance Datum using the TBM and indicated on the appropriate plans and sections in metres above Ordnance Datum (m AOD).

4.2 Post-excavation

- 4.2.1 The stratigraphic data for the project comprises written and photographic records. A total of 344 archaeological contexts were defined with the Area 1, the four evaluation trenches, the UTC foundation trench and the Area 2 Strip, map and record (Appendix 2). Post-excavation work involved checking and collating site records, grouping contexts and phasing the stratigraphic data.
- 4.2.2 The archaeological features recorded during the investigation have been placed within six phases of activity; Phase 0, the geological substratum; Phase 1, 19th-century levelling; Phase 2, 19th-century industrial; Phase 3, 19th/20th-century industrial modifications as well as ground raising dumps and levelling; Phase 4, Early 20th-century industrial and Phase 5, Modern. A written summary of the archaeological sequence was then compiled, as described in Section 5.

- 4.2.3 Artefactual material from the investigations comprised an assemblage of pottery, clay tobacco pipes and brick samples. For each category of material, an assessment report has been produced including a basic quantification of the material, and a statement of its potential for further analysis. The reports are contained in Appendix 5, 6, and 7 (pottery, clay tobacco pipe and brick assessment respectively). A small quantity of lag was also recovered; this will be examined by a specialist along with the material recovered from the work being undertaken at the time of writing.
- 4.2.4 The complete Site Archive, in this case comprising the written, drawn and photographic records (including all material generated electronically during post-excavation) and retained elements of the artefactual assemblage, will be packaged for long term curation. In preparing the Site Archive for deposition, all relevant standards and guidelines documents referenced in the Archaeological Archives Forum document (Brown 2007) will be adhered to, in particular a well-established United Kingdom Institute for Conservation (UKIC) document (Walker 1990) and a ClfA publication (ClfA 2014c). The depositional requirements of the body to which the Site Archive will be ultimately transferred will be met in full.
- 4.2.5 At the time of writing the Site Archive is housed at the Durham regional office of PCA (Unit 19a, Tursdale Business Park, Durham, DH6 5PG). When complete, the Site Archive will be deposited with the Great North Museum, Newcastle upon Tyne, under the site codes SSQ17/SQN17 and SFT17. The Online Access to the Index of Archaeological Investigations (OASIS) reference number for the project is: preconst1-302740.

5. RESULTS: THE ARCHAEOLOGICAL SEQUENCE

During the archaeological investigation, separate stratigraphic entities were assigned unique and individual context numbers, which are indicated in the following text as, for example [123]. The archaeological sequence is described by placing stratigraphic sequences within broad phases, assigned on a site-wide basis in this case. An attempt has been made to add interpretation to the data and correlate these phases with recognised historical and geological periods. The figures can be found in Appendix 1 with the context index and stratigraphic matrix located in Appendix 2 and 3 respectively. A selection of plates can be found within Appendix 4.

5.1 Phase 0: Geological substratum

5.1.1 Phase 0 represents the geological material only exposed within the foundation trench and this comprised very firm mid greyish brown clay [1230] mottled white and yellow (Figure 19 – Section 1).

5.1.2 The maximum and minimum height of the upper interfaces of natural substratum was 27.89m AOD and 27.35m AOD at the north-east and south-west ends of the trench respectively.

5.1.3 Natural clay was encountered at a depth of 3.08m below the existing surface at the north-east end of the foundation trench and 3.74m at the south-west end. Topographically the site is above the valley that sloped from north-east to south-west down to the Skinner Burn (c. 115m to the south-west). Area 2 was reduced to a depth of c. 1m below ground level so geological deposits were not observed during excavation.

5.2 Phase 1: Post-medieval (19th-century levelling)

5.2.1 Phase 1 represents ground raising/levelling activity that occurred prior to the 19th century industrial development at the site, and may well have taken place immediately prior to construction of buildings to prepare the ground. These were the basal deposits encountered in Trenches 1 & 6, the foundation trench and Area 2 (Figures 2, 3, 6, 7, 10, 11 & 14).

Trench 1 (Figure 3)

5.2.2 Five ground raising/levelling deposits were encountered extending across the base of Trench 1. These deposits were variously coloured and had varying compositions of ash, slag, sand, silt and clay, [306], [307], [316], [326] & [339]. The full thickness of these deposits was not established within two sample excavations undertaken at the northern and southern ends of the trench and the deposits were excavated to maximum combined thicknesses of at least 1.46m and 0.30m, respectively (Figure 3, Sections 12 & 13). The maximum and minimum heights encountered for the uppermost ground raising/levelling deposits, [316] and [306], was 30.19m AOD and 29.90m AOD, respectively.

Trench 6 (Figure 6)

- 5.2.3 A ground raising/levelling ash deposit [235] was exposed at the north-eastern extent of Trench 6 across an area measuring 3.80m NE-SW by 1.50m NW-SE and was encountered at a maximum height of 29.99m AOD.

Foundation Trench (Figure 8 & 14)

- 5.2.4 The foundation trench of the UTC building was sited along the southern edge of Area 2 adjacent to a retaining wall and measured c. 10.6m by 3m and 4.36m deep (Figure 8).
- 5.2.5 Two levelling deposits were encountered across the base of the foundation trench (Plate 1). The lowest layer [1231] consisted of soft dark grey/black silty clay that contained brick fragments, pieces of timber, iron slag and charcoal flecks and measured 0.5m thick. Its extent could not be established but it extended beyond the limit of excavation. It was overlain by a c. 1.2m thick levelling deposit [1109] that consisted of friable dark brownish grey silty clay and contained brick fragments, stone blocks and metal slag. The maximum and minimum heights encountered for the uppermost ground raising/levelling deposit [1109] were 29.57m AOD and 29.25m AOD, respectively.

Area 2 (Figure 2, 8, 10, 11)

- 5.2.6 Area 2 was located in the south-western part of the site in an area of hard standing that measured c. 667m². The strip map and record excavation involved ground reduction to a depth of c. 1m below the present ground level. Area 2 was sited to examine the below ground remains of the Wright and Brown's foundry (Ordnance Survey 1862 and 1896 maps and Goad's Fire Insurance Map of 1896, Figures 16, 17 & 18 respectively) that had been located in this part of the site.
- 5.2.7 The lowest deposits, [1169] and [1167], encountered in Area 2 were observed below the footings of outer wall [1141] and inner walls [1191] and [1152] of the foundry building in three sondages. Deposit [1169] was observed under walls [1141] and [1191] on the western side of the building and consisted of firm light grey clay with yellow mottling and charcoal flecks. It measured 0.26m thick but its extent was not established. Deposit [1167] was observed next to wall [1152] on the eastern side of the building remains. It was a soft mid grey sandy silt that measured 0.1m thick but its full extent was also not established. The maximum heights encountered were 28.32m AOD and 28.50m AOD respectively.

5.3 Phase 2: Post-medieval (19th-century Industrial)

- 5.3.1 Phase 2 represents 19th century industrial activity that included structures and ground raising deposits recorded in Area 1, all three trial trenches and Area 2 (Figure 2-12 & 16).

Trench 1 (Figure 2 & 3)

- 5.3.2 Trench 1 was sited to determine if archaeological remains of the foundry (Ordnance Survey 1862 map, Ordnance Survey 1896 map and Goad's Fire Insurance Map of 1896, Figures 16, 17 & 18) survived in this part of the site.
- 5.3.3 A brick and sandstone structure was partially exposed at the southern part of Trench 1 that probably represents part an internal wall associated with the rooms described as Drying Stoves (Plate 2). Where exposed, the wall was built within a narrow construction cut, [305]. The brick element of the wall, [304], was up to 0.82m wide and constructed using unfrosted firebrick (240mm x 110mm x 70mm) and unfrosted red brick (230mm x 110mm x 70mm), bonded with light grey lime mortar. It survived up to five courses (0.41m high) with the upper three courses laid in stretcher bond and the lower two courses laid in header bond. The lower course stepped out 60mm with the north-western half of the bricks laid on edge and the south-eastern half of the bricks laid on bed. Only a small portion of the sandstone element, [303], was exposed and comprised of medium to large roughly hewn blocks (maximum 430mm x 180mm x 110mm), bonded with light grey lime mortar.
- 5.3.4 Due to the limited area exposed of the sandstone element its overall dimensions were not established, but it probably forms the south-western stone-built elevation of the wall. The overall dimensions of the structure as exposed were 2.40m NW-SE by 0.90m NE-SW with a maximum height recorded of 30.04m AOD. A narrow linear chamber formed by the brick and sandstone elements of the structure measured 1.30m long by 0.30m wide and probably represents a flue that carried waste gases away from the Drying Stoves.
- 5.3.5 A brick surface, [313], which overlay Phase 1 levelling deposits was exposed across the central portion of the trench for a maximum distance of 4.95m NW-SE by 2.50m NE-SW and was encountered at height of 29.99m AOD (Plate 3). The surface was constructed with frosted and unfrosted red brick (230mm x 120mm x 60mm) and firebrick (230mm x 120mm x 60mm) that were laid on edge and bonded by light grey lime mortar. The surface represented a brick floor within Wright & Brown's iron foundry (Figure 3, 17, 17 & 18).
- 5.3.6 At the north-eastern extent of brick surface, [313], a presumed to be square inspection chamber and associated service trenches were recorded. As exposed the inspection chamber had dimensions of at least 1.00m NE-SW by 1.30m NW-SE, encountered at a maximum height of 29.92m AOD, and the two service trenches were each c .0.30m wide extending north-eastwards from the inspection chamber beyond the limit of excavation. The construction cut, [341], and sandy ash backfill, [340], of the inspection chamber and service trenches were overlain by brick surface [313] and the inspection chamber covered by a substantial iron sheet, [342], that in turn directly overlay the brick surface. Its construction indicates that the inspection chamber is contemporary with the brick surface however the inspection chamber and services trenches were not excavated therefore its function was not established.

- 5.3.7 Located immediately to the north of the inspection chamber, [341], part of a substantial feature, [320], was recorded cutting Phase 1 ground raising/levelling deposits. As exposed it had dimensions of at least 1.80m NE-SW by 1.80m NW-SE and was encountered at a height of 30.00m AOD. Along the north-western side of the feature the upper course of wall, [318], was exposed for 1.50m NE-SW and was 0.24m wide. It was built using unfrogged red brick and firebrick (220mm x 110mm x 70mm) with the exposed course of bricks laid on edge in header bond and bonded by light grey lime mortar. The wall itself probably represents a surviving portion of the brick lining of the feature. Its ash and clay backfills, [317] & [319], were not excavated therefore no datable material was recovered. The function of this feature was not established however, based on its location relative to the 19th-century foundry building it could possibly represent the basal remains of a furnace within Wright & Brown's foundry.

Trenches 4, 5, 6 and Area 1

- 5.3.8 Trenches 4, 5, 6 & Area 1 were sited to investigate the below ground remains of the 'Smiths Shops' or 'Workshop' associated with the Stephenson Engine Works as depicted on the Ordnance Survey map of 1862 (Figure 16) along with any remains of its later expansion 'High Smithy' as depicted on the Ordnance Survey of 1896 (Figure 17) or Goads Fire Insurance Map of 1896 (Figure 18).

Trench 4 (Figure 2 & 4)

- 5.3.9 A substantial wall, [274], overlain by Phase 3 ground raising/levelling deposits, was recorded extending along the northern edge of Trench 4 for a distance of 6.20m NE-SW (Figure 4, Sections 11 & 14; Plate 4). At its north-eastern extent, the wall turned to a NE-SW alignment and was exposed for a maximum distance of 1.00m. The wall was encountered at maximum and minimum heights of 30.53m AOD and 30.03m AOD, respectively. The wall itself was uniformly 0.44m wide and constructed with roughly hewn sandstone blocks (maximum 450mm x 300mm x 120mm), bonded with light grey lime mortar. Sample excavation undertaken at its north-eastern corner exposed at least six courses of sandstone blocks, to at least 1.04m high, with the lowest exposed course stepped out by c. 0.10m forming part of its foundation.
- 5.3.10 A square column base, [286], overlain by Phase 3 ground raising/levelling deposits, was recorded at the north-eastern end of the trench and measured 1.20m NW-SE by 1.00m NE-SW, encountered at a maximum height of 30.91m AOD (Plate 4). It was exposed to seven random courses of roughly hewn sandstone blocks (maximum 420mm x 320mm x 150mm – minimum 180mm x 150mm x 80mm) to at least 0.97m high and bonded with light grey lime mortar.

Trench 5 (Figure 2 & 5)

- 5.3.11 A substantial structure was partially exposed across the south-western half of the trench for a maximum distance of 3.85m NE-SW by 2.20m NW-SE, encountered at a maximum height

of 31.04m AOD (Plate 5). The structure probably represents part of a larger system of flues that carried waste gases away from the Smiths Shops of the Stephenson Engine Works (Figure 5 & 16). The flue structure comprised a sandstone flag surface, [203], and two substantial ENE-WSW aligned walls, [200] & [201], c. 0.40m apart (Plate 5). The walls were uniformly 0.70m thick and survived up to four courses (c. 0.71m high) of roughly hewn sandstone blocks (maximum 400mm x 260mm x 170mm – minimum 210mm x 220mm x 170mm), bonded with light grey lime mortar.

- 5.3.12 Late 19th-century refurbishment works involved the narrowing of the flue with the northernmost stone-built wall [200] retained and a brick wall, [202], built directly onto the sandstone flag surface, [203], forming a 0.40m-wide aperture (Figure 5, Section 3). The wall, [202], was 0.22m wide constructed with unfrogged red brick (220mm x 100mm x 70mm) and survived to seven courses of brick (up to 0.55m high) in both header and stretcher bonds, bonded with light grey lime mortar. A square aperture measuring 0.28m by 0.28m was inserted into the ENE extent of wall [202] and probably represents a vent. No finds were recovered from the ashy sand, [232], that infilled the void between the original stone-built wall, [201], and brick wall [202] or the Phase 3 sandy ash and slag backfill [204].
- 5.3.13 Brick infill, [228], blocked the ENE extent of the flue and was constructed using unfrogged red brick (220mm x 110mm x 70mm) bonded by light grey lime mortar. It is unclear if this is contemporary with the later refurbishment of the flue and contemporary with flue wall [202] or represents the flue being blocked at a later date.
- 5.3.14 Adjoining the WNW extent of flue wall [202] a similarly constructed brick flue was recorded extending to the south beyond the limit of excavation. It comprised two parallel walls 0.24m apart and a brick surface, [230], within a broad construction cut [229] at least 0.94m wide (Figure 5, Section 4). The flue walls were constructed with unfrogged red brick (220mm x 110mm x 70mm) and survived up to two courses (up to 0.16m high) laid in stretcher bond, bonded by light grey lime mortar. Although no finds were recovered from its clay silt infill, [234], or its silty clayey ash backfill [231] construction techniques show that this flue structure is contemporary in date to flue wall [202].
- 5.3.15 Part of a ENE-WSW aligned wall, [221], was recorded in a sample excavation at the ENE end of Trench 5 (Figure 5, Section 1). The wall was at least 0.70m wide and was constructed with roughly hewn sandstone blocks (maximum 420mm x 250mm x 240mm) bonded with light grey lime mortar. It was exposed to three courses (at least 0.44m high) and encountered at a maximum height of 30.57m AOD. The alignment and construction of wall [221] is similar to that of the northernmost flue wall, [200], and wall [221] may represent a continuation of this to the ENE.

Trench 6 (Figure 2 & 6)

- 5.3.16 At the south south-western end of Trench 5 a substantial NW-SE aligned wall [251] was overlain by Phase 4 ground raising/levelling deposits and exposed for a maximum distance

of 2.20m. The wall was 0.50m wide and constructed with roughly hewn sandstone blocks (maximum 440mm x 240mm x 230mm) bonded with light grey lime mortar (Figure 6, Section 8 & 9). It was exposed for up to four courses, to a maximum height of 0.66m at 30.73m AOD. Due to the limited exposure of the wall its function was not determined but based on its location it probably represents a wall forming part of the workshop building of the Stephenson Engine Works as depicted on the Ordnance Survey map of 1862 (Figure 6 & 16).

- 5.3.17 Cutting through Phase 1 ground raising/levelling deposits at the north-eastern end of the trench was a large NW-SE aligned culvert, [237], and a smaller adjoining NE-SW aligned culvert, [264], both recorded within narrow construction cuts, [236] & [263], respectively. The large culvert, [237], was exposed for a maximum distance of 2.00m and comprised of two parallel brick walls c. 0.50m apart and was capped by large sandstone flags (maximum 840mm x 320mm x 80mm) (Figure 6, Section 6). The smaller culvert, [264], comprised of a tile base and two parallel brick wall c. 0.18m apart. The walls of both culverts were constructed with a combination of whole bricks (220mm x 110mm x 70mm) and half-bats (140mm x 110mm x 70mm) bonded by light grey lime mortar. The maximum and minimum heights at which these culverts were encountered was 29.89m AOD and 29.80m AOD respectively. No datable material was recovered from backfill [238] of the larger culverts construction cut.

Area 1 (Figure 2 & 7)

- 5.3.18 Located immediately to the south of Trench 5 part of a further flue structure was recorded abutting the south-eastern elevation of the earlier sandstone flue structure wall [201]. It was 0.60m wide (external dimension) and comprised two parallel walls, [145] & [146], c. 0.28m apart and was exposed for a maximum distance of 1.41m ENE-WSW at a height of c. 30.94m AOD. Only the upper course of the flue was exposed and this was constructed with unfrogged red bricks (220mm x 110mm x 70mm) and bonded with light grey lime mortar. The construction of this flue is identical to flue [202] recorded in Trench 5 forming part of a larger system of flue structures within this area.
- 5.3.19 A short length of wall, [148], located immediately to the south of flue wall [146] was exposed for a distance of 0.30m and constructed using unfrogged red bricks (220mm x 110mm x 70mm), bonded with light grey lime mortar. Although only a small portion of this wall was exposed it is almost certainly contemporary with brick flue structure [146].
- 5.3.20 At the western extent of Area 1 the upper course of a substantial NW-SE aligned sandstone wall, [154], was partially exposed for a maximum distance of 3.30m. It was at least 1.30m wide and constructed using roughly hewn sandstone blocks (maximum 300mm x 300mm) around a rubble core, bonded by light grey lime mortar. This wall probably represents the south-western external wall of the Smith's Shop of the Stephenson Engine Works depicted on the Ordnance Survey map of 1862 (Figure 16) with this wall probably retained during its expansion during the latter part of the 19th century (Figure 17 & 18).

Area 2 (Figure 2, 8, 9, 10 & 11)

- 5.3.21 Structure [1222] consisted of outer wall [1141], inner walls [1191] and [1152], column bases [1170] and [1171], and formed the surviving remains of the Wright and Brown foundry that were visible within Area 2 (Figure 8, 9; Plate 6). Historic map overlay with the recorded remains shows that the external walls match exactly the south-western corner of the foundry building (Figures 16-18) with internal wall [1191] correlating to a division between rooms on labelled as *Mill (edge runners)* and *Stoves* on the 1896 Goad Fire Insurance map (Figure 18).
- 5.3.22 A sandstone wall [1141] was partially exposed on the western side of the area (Figures 8, 9, 10: Section 5; Plate 6 & 7). The wall was built with medium to large roughly hewn sandstone blocks (maximum 430mm by 200mm by 150mm) that were laid in uneven courses, bonded with light grey lime mortar. The wall as exposed had two sections aligned NE-SW and one aligned NW-SE with overall dimensions of the exposed part of the structure 28.46m long by 0.60m wide by 1.3m high (maximum height of 30.13m AOD). At the base of the wall, the top of a sandstone footing [1154] was exposed and this was stepped out by 0.12m forming part of its foundation. A small portion was visible (c. 50mm thick) and consisted of roughly hewn sandstone blocks (300mm by 120mm by 40mm), bonded with light grey lime mortar. It was not fully excavated but potentially continued to a depth of 0.60m as sample excavation of footing [1153] for wall [1152] has shown. There were no visible construction cuts for the outer or inner walls. The sample excavations revealed several infill deposits abutting the walls that suggested the walls were built up and the spaces were infilled by c. 1m of deposits to the required floor level.
- 5.3.23 The south-east ends of inner walls [1191] and [1152] were incorporated into the inner side of [1141]. The wall represented the south-western elevation of the outer wall of the foundry (structure number [1222]) and formed the outer part of four rooms labelled *Mill Edge Runners*, *Drying Stoves* and *Under Construction Oct 1896* (Figure 18) along with [1191] and [1152]. Its south-west end continued beyond the limit of excavation while its north-east side was truncated by a modern concrete column base and surface. A ceramic pipe went through a section of the wall near the south corner but was it was not clear if it punched through the wall or was a replaced pipe which appeared to be a later phase of activity (Phase 4). There was another similar type of ceramic pipe to the north-east, but this pipe cut through [1141], inner wall [1191] and surface [1139].
- 5.3.24 Sandstone wall [1191] was located on the south-west side of the foundry building [1222] incorporated into the inner side of wall [1141] (Figures 8, 9 & 12 – Section 10; Plate 8). It was aligned NW-SE and the section exposed measured c. 9.5m long by 0.6m wide by 0.83m high (maximum height of 29.63m AOD). The wall was constructed free-standing and was built with medium to large roughly hewn sandstone blocks (maximum 360mm by 210mm by 130mm), bonded with light grey lime mortar. A sample excavation revealed footing [1195], stepped out by 0.12m from the wall forming part of its foundation with the top

0.03m of thickness exposed. Although its extent was not established it presumably went down a further c.0.60m as was observed in wall [1152]. It consisted of roughly hewn sandstone blocks bonded with light grey lime mortar. The wall appeared to form a partition wall for the 'Mill edge runners room', to the south-west and the drying stove room to the north-east. Its north-east side was damaged by a ceramic pipe that ran on roughly the same alignment. There was no visible construction cut for the wall.

- 5.3.25 Sandstone wall [1152] was located to the north-east of and parallel to wall [1191] (Figures 8, 9, 11; Plate 9) and was incorporated into the inner side of wall [1141]. It was aligned NW-SE and the section exposed measured c. 8.6m long by 0.6m wide by 0.63m high (maximum height of 29.6m AOD). The wall was constructed free-standing and was built with medium to large roughly hewn sandstone blocks (maximum 400mm by 250mm by 250mm), bonded with light grey lime mortar. A sample excavation revealed footing [1153], stepped out by 0.20m from the wall forming part of its foundation which went down a further c. 0.60m. It consisted of roughly hewn sandstone blocks, bonded with light grey lime mortar. There was no visible construction cut for either the wall or the footing. The wall appeared to form a partition within the drying stove room.
- 5.3.26 Within the north-east drying stove room of the foundry building [1222], three ground raising deposits were encountered abutting the north-east facing side of inner wall [1152] and the north-west facing side of wall [1141]. Following the construction of the walls, these deposits infilled this space, presumably prior to the floor surface which no longer survived being laid down. These deposits were variously coloured (dark grey, yellow & mid grey/brown) and had varying compositions of silty clay, clay with mortar and charcoal flecking, brick fragments, slag and pottery, [1187], [1186] & [1185]/[1224]. Deposits [1186] and [1185]/[1224] were 0.07m and 0.55m thick respectively and [1187] 0.30m thick but the full thickness was not established (Figures 8, 9 & 10; Section 8). The maximum and minimum heights encountered for the uppermost ground raising deposit, [1185]/[1224], was 29.66m AOD. Recovered from deposit [1224] was the broken off 'legs' of kiln furniture known as 'Stilts with fishtail ends' (see Appendix 5) These particular stilts were used at the Forth Banks Pottery which was located to the south-west of the site (see Figure 2 Appendix 5); Kiln stilts with wedged or 'fishtail' feet were used for elevating different forms and sizes of vessels during firings, with bigger examples made for holding larger serving dishes or plates in the kiln and smaller examples used for separating several smaller plates or saucers within a saggars (Robinson 2017). An examples of the saggars used at Forth Banks pottery was also recovered in the infilling layer [1224]; this particular fragment of saggars has substantial internal and external ware as well as iron residues; it was likely discarded due to the damage of overuse and this material along with wasters recovered from other deposits at the site demonstrates that waste material from the pottery was brought to the Stephenson's Quarter site to be used as levelling and ground raising deposits.

- 5.3.27 Eight ground raising/levelling deposits were encountered between inner walls [1191] and [1152] which formed the south-west drying stove room, abutting their north-east and south-west facing sides, respectively. These deposits were variously coloured and had varying compositions of clinker fragments, iron slag fragments, gravel, mortar, ash, sand, silt and clay, [1166], [1165], [1164], [1163], [1168], [1162], [1161] & [1160]/[1151]. The full thickness of these deposits was established within the first of two sample excavations undertaken near the centre of wall [1152] and were excavated to a maximum combined thickness of 1.19m and 0.16m with the latter only cutting the upper layer [1151]/[1160] (Figures 8, 9 & 11; Sections 3 & 11, 6). The maximum and minimum heights encountered for the uppermost ground raising/levelling deposits, [1160]/[1151], was 29.639m AOD and 29.607m AOD, respectively. Following the construction of the walls, these deposits infilled this space, presumably prior to the floor surface of which only a small section, [1203] remained to the north-east of wall [1191] within the southwest drying stove room.
- 5.3.28 Three ground raising/levelling deposits were encountered between inner wall [1191] and outer wall [1141], within the south-west room annotated *Mill Edge Runners* on the 1896 Goad map (Figure 18). These deposits were variously coloured and had varying compositions of clinker fragments, iron slag fragments, brick, gravel, mortar, ash, sand, silt and clay, [1194]/[1157], [1193]/[1156] & [1192]/[1155]. The deposits also contained glass fragments, pieces of clay pipe and pottery. The full thickness of these deposits was not established within two sample excavations undertaken in the south corner abutting wall [1141] and near the centre of wall [1191] and were excavated to maximum combined thicknesses of 0.85m and 0.91m, respectively (Figure 10, Section 7). The maximum and minimum heights encountered for the uppermost ground raising/levelling deposits, [1155] and [1192], was 29.73m AOD and 29.17m AOD (truncated by machine), respectively. Following the construction of the walls, these deposits infilled this space, presumably prior to the floor surface, which no longer survived, being laid down.
- 5.3.29 The pottery assemblage recovered from deposits [1157] and [1192] included sherds which can be identified as products and/or furniture from the Forth Banks Pottery. Deposit [1192] had sherds which are in a biscuit fired state with no final glost firing. This indicates the sherds were wasters dumped following a firing or manufacturing issue. Context [1157] has one sherd of later glazed redware which has distinct bloating to the interior glaze (Fraser 2005) which was a common firing fault identified on this fabric in the Forth Banks assemblage (Robinson 2017). Deposit [1157] also produced two clay tobacco pipe bowls, one elaborately decorated with arcaded ribs and wheatears along the front seam and one decorated with swags along the rim which date to 1820-1860 (see Appendix 6).
- 5.3.30 Two ground raising/levelling deposits were encountered abutting against the exterior side of wall [1141] and were visible around the southern corner and the south-west side of the foundry building (Figures 8 & 9).

5.3.31 The lower ground raising deposit [1220] was blackish dark grey/brown silty clay and contained CBM and stone fragments. Fragments of kiln furniture known as 'Stilts with fishtail ends' were recovered from deposit [1220]. These particular stilts were used at Forth Banks; Kiln stilts with wedged or 'fishtail' feet were used for elevating different forms and sizes of vessels during firings, with bigger examples made for holding larger serving dishes or plates in the kiln and smaller examples used for separating several smaller plates or saucers within a saggar (Robinson 2017). The upper levelling deposit [1206] was loose light yellow/ brown/ grey sand and contained stone and brick fragments. The full thickness of [1220] was not established was excavated to maximum thicknesses of 0.22m. Deposit [1206] measured 0.12m thick. The maximum heights encountered for the uppermost ground levelling deposit, [1206], was 29.752m AOD. Deposit [1206] covered an iron pipe and abutted a small brick lined opening [1226] that in turn abutted the south corner of wall [1141]. It was roughly square shaped with two courses exposed of unfrogged fire and common brick that were bonded with light grey lime mortar. It appeared to be a drain opening. The thickness and heights for each Phase 2 ground raising/levelling deposit is summarised in the table below:

Context	Thickness	Maximum Height (mAOD)	Minimum Height (mAOD)	Section No.
Area 2				
1166	0.14m	28.667	28.667	6
1165	0.11m	28.777	28.777	6
1164	0.06m	28.877	28.877	6
1163	0.12m	28.967	28.967	6
1168	0.06m	29.007	29.007	6
1162	0.18m	29.187	29.187	6
1161	0.01m	29.197	29.197	6
1160/1151	0.41m	29.639	29.607	6 / 3 & 11
1194/1157	0.3m	29.129	28.620	N/A / 7
1193/1156	0.05m	29.219	28.670	N/A / 7
1192/1155	0.51m	29.730	29.170	N/A / 7
1220	>0.2m	29.642	29.642	N/A
1206	0.13m	29.772	29.772	N/A

Phase 2 ground raising/levelling deposits

5.3.1 Contexts [1220] and [1224] have the broken off 'legs' of kiln furniture known as 'Stilts with fishtail ends'. These particular stilts were used at Forth Banks; Kiln stilts with wedged or 'fishtail' feet were used for elevating different forms and sizes of vessels during firings, with bigger examples made for holding larger serving dishes or plates in the kiln and smaller examples used for separating several smaller plates or saucers within a saggar (Robinson 2017). An examples of the saggars used at Forth Banks pottery was also recovered in the infilling layer [1224]; this particular fragment of saggar has substantial internal and external

ware as well as iron residues; it was likely discarded due to the damage of overuse and has been relocated to the Stephenson's Quarter site through landfill

- 5.3.2 A small section of stone surface [1203], which overlay infill deposit [1155] was exposed to the north-east of wall [1191] for a maximum distance of 0.72m NW-SE by 0.48m NE-SW and was encountered at height of 29.70m AOD. The surface was constructed with roughly hewn sandstone slabs (220mm by 220mm by 50mm) laid in a single layer flat on top of deposit [1151]/[1160] and were bonded by light grey lime mortar. It could potentially represent a surface associated with the room annotated Drying Stoves (Figure 16 & 18). Its south-west side had been truncated by a later ceramic pipe.
- 5.3.3 There were two in-situ column bases exposed during the excavation. To the south of the north-west corner of wall [1141] an exterior column base [1170] was placed on top of sand deposit [1206] (Figure 8 & 9; Plate 10). It consisted of a single sandstone block that was roughly squared and measured 1.35m by 0.95m by 0.39m. It had a single iron bolt (25mm diameter) in its centre. Interior column base [1171] (Figure 8 & 9; Plate 11) was to the north-west of the north-west corner of [1141]. A metal plate (Fe) [1205] that measured c. 1.20m by 1m by 0.02m lay on top of deposit [1155] and was covered by a mortar layer [1204] that was 0.05m thick. The column base consisting of a single roughly squared sandstone block was placed on the mortar. There was a square recess 4mm deep in the centre of the base with a single damaged iron bolt next to the east corner. There were six similar sandstone blocks [1116] – [1121] that had been left on the existing concrete surface [1100] that presumably were disturbed by later groundworks on the site.
- 5.3.4 At the north-eastern extent of Area 2, several courses of a NW-SE aligned sandstone wall, [1115], were partially exposed for a maximum distance of 2.14m by 0.3m wide (visible) and 0.64m high but its overall dimensions were not established (Plate 12). It was constructed using roughly hewn sandstone blocks (maximum 340mm by 280mm by 250mm) laid in random courses, bonded by light grey lime mortar. This wall probably represents the south-western external wall of the Smith's Shop of the Stephenson Engine Works depicted on the Ordnance Survey map of 1862 (Figure 16) with this wall probably retained during its expansion during the latter part of the 19th century (Figures 17 & 18). The wall may be the continuation of wall [154], to the north-west that was observed in Area 1.

5.4 Phase 3: Modifications to industrial remains and ground raising dumps/levelling

- 5.4.1 Phase 3 represents late 19th- to early 20th-century modifications to the foundry in Area 2 and ground raising/levelling activity recorded in Trenches 4, 5 & 6, Area 1, the foundation trench and Area 2.

Trenches 4, 5 & 6 (Figure 2, 4, 5, 6 & 7)

- 5.4.2 The ground raising/levelling deposits comprised various compositions of clay, sand, silt, ash and clinker. The full combined thickness of these deposits was not established in Trenches 4 and 5 and were exposed to at least 0.65m and 0.58m thick respectively (Figure 4:

Sections 5, 10, 14, 15 & 16; Figure 5: Section 1) in a sample excavation undertaken at the north-eastern end of Trench 6. The full thickness of such deposits was 0.92m (Figure 6, Sections 6 & 8).

5.4.3 The thickness and heights for each Phase 3 ground raising/levelling deposit is summarised in the table below. The maximum and minimum heights encountered for the upper most strata of these ground raising/levelling deposits were 30.99m AOD in Trench 6 and 30.66m AOD in Trench 5, respectively. A very small quantity of pottery dated to 1775-1900 was recovered from deposits [215] and [253]. The fabrics recovered are usual for a 19th-century assemblage with the majority being later glazed redwares and similar utilitarian fabrics (Appendix 5). There was one fragment of a cup base in a biscuit fired state which is likely to have been moved in the landfill from the Forth Banks Pottery situated to the south-west of the site along Forth Banks/Pottery Lane (see Figure 2 in Appendix 5).

Context	Thickness	Maximum Height (mAOD)	Minimum Height (mAOD)	Section No.
Trench 4				
267	n/a	30.47	30.45	10
277	n/a	30.42	n/a	n/a
282	n/a	30.03	n/a	n/a
289	n/a	30.17	n/a	n/a
290	n/a	30.76	30.33	n/a
291	0.28m	30.90	30.33	10
292	0.14m	30.90	30.36	10
293	0.36m	30.90	30.36	10
294	0.30m	30.90	29.63	10
329	0.55m	30.90	30.30	10
331	0.42m	30.99	30.34	10
332	0.21m	30.34	29.94	10
333	0.43m	30.24	29.81	15, 16
334	0.34m	30.14	29.80	15, 16
335	50mm	29.79	29.74	15, 16
336	0.40m	29.64	29.24	15, 16
Trench 5				
215	0.17	30.81	n/a	n/a
216	>0.16	30.64	n/a	n/a
224	0.22m	30.62	n/a	1
225	0.22m	30.52	n/a	1
226	>0.14m	30.23	n/a	1
227	0.39m	30.58	n/a	1
Trench 6				

239	0.20m	30.14	24.54	6
240	0.27m	30.87	26.54	6
241	0.44m	30.69	30.40	6
242	0.40m	30.82	30.71	6
243	0.10m	30.84	30.78	6
252	n/a	30.36	30.16	8
253	0.44m	30.82	30.52	8
254	0.14m	30.91	30.82	8
255	0.18m	30.90	30.88	8
256	n/a	30.12	30.06	8
257	0.40m	30.54	30.42	8
258	0.16m	30.73	30.62	8
259	0.24m	30.86	30.73	8

Phase 3 ground raising/levelling deposits

Foundation Trench (Figure 8 & 14)

5.4.4 Phase 3 represents later 19th-century ground raising/levelling activity observed in the foundation trench excavated in the area to the southeast of foundry building [1222] (Area 2) and overlay Phase 1 ground raising deposits. The dump deposits varied in colour, from dark grey to light yellow/grey/brown and comprised clayey sand, clinker, slag and brick fragments, [1108], [1105] & [1107]. They measured c. 1.72m wide and c. 0.14m thick (Figure 14; Section 1). These deposits were covered by ground raising layer [1106] that comprised dark brown silty clay, contained brick and stone fragments and measured 0.22m thick. The maximum and minimum heights encountered for the upper most strata of these ground raising/levelling deposits were 29.63m AOD and 29.52m AOD at the south-west and north-east end of the foundation trench respectively.

Area 2 (Figure 8, 9, 11, 12 & 13)

5.4.5 Phase 3 represents late 19th-century industrial activity that included modified or added structures recorded in Area 2 that overlay Phase 2 structures (Figure 8 & 9).

5.4.6 Furnace [1217] was located within the south-west drying stove room and extended outwards beyond the outer wall [1141] (Figures 8, 9, 13: Section 16-19; Plate 13). Prior to the construction of furnace walls [1172], [1140] & [1142] a mid-brown mortar bedding layer [1219] up to 0.05m thick was laid down and a section of wall [1141] was removed. There was no visible construction cut but presumably it was trench built, right up against the edge of the cut. Upper levelling deposit [1160] abutted the outer edges of the furnace walls. Brick floor [1211] was laid on top of [1219] and comprised yellow and red fire bricks (210mm by 110mm by 40mm to 110mm by 110mm by 40mm) and included some broken or half-bricks. They were laid flat and end to end with a section near the centre that was laid side by side.

- 5.4.7 The furnace was rectangular in plan and measured 2.94m NW-SE by 1.94m NE-SW. The walls comprised [1140] (outer SW & SE sides), [1142] (inner SW and NW side) and [1172] (NE side). A maximum of eleven and thirteen courses remained for outer wall [1140] and inner wall [1142] respectively with both laid in English Garden bond. Firebricks stamped VGC were used in wall [1142]. The firebrick works at Victoria Garesfield Colliery, near Rowland's Gill, was apparently worked by Priestman and Piele between 1875 and 1914, producing hand-moulded bricks with this mark (see Appendix 7).
- 5.4.8 The NW end of [1140] and the SE end of [1142] abutted the outer and inner sides of wall [1141]. Wall [1140] was constructed using unfrogged red brick (225mm by 105mm by 65mm), bonded by light grey lime mortar and measured 1.32m NW- SE / 1.8m SW-NE by 0.22m wide by 0.85m high. Wall [1142] was constructed using red and orange fire bricks (225mm by 105mm by 65mm), bonded by light grey lime mortar and measured 1.02m SE-NW / 1.94m SW-NE by 0.22m wide by 1.02m high. There was slag residue adhered to sections of both the SE and NE facing sides of the wall. The surrounding area around the furnace showed signs of being heat affected as the clay levelling layer [1160], wall [1141] and surface [1139] had turned red.
- 5.4.9 Surface [1139] was located to the south-east side of the foundry building [1222] that abutted the outer sides of wall [1141] and brick wall [1140] of the furnace [1217] (Figures 8 & 9). It consisted of a single layer of roughly hewn sandstone blocks (240mm by 230mm by 140mm to 100mm by 80mm by 60mm) that were randomly laid down on levelling deposit [1220] and was bonded with light grey lime mortar. It measured 2m NE-SW by 0.89m NW-SE by 0.14m thick. It appeared to be contemporary with the furnace and had been heat affected as the sandstone had turned red. It had been truncated by a ceramic pipe and a concrete footing at its SW end and by another concrete footing along its SE side.
- 5.4.10 The remains of three stove structures were built on top of and incorporated into inner wall [1191] and the upper most levelling layer [1155]/[1192]. The three stoves were situated along an internal wall shown on the 1896 Goad Fire Insurance map with the room to the north-east labelled as *Stoves* and to the south-west *Mill (edge runners)* (Figure 18). The stoves [1196]/[1197] (SE end; Plate 14), [1198]/[1199] (middle; Plate 15) & [1200]/[1201] (NW end; Plate 16) each comprised remnants of a brick wall and stone floor (Figures 8 & 9). The floors [1197], [1199], [1201] consisted of a single course of three roughly hewn and shaped sandstone slabs (630mm by 630mm by 90mm to 370mm by 280mm by 90mm) laid flat side by side on layer [1155]/[1192] with the inner corners removed to fit the shape of the brick wall and bonded with light grey lime mortar. The floors measured c. 1.6m by 0.63m by 0.09m. All the sandstone slabs were heat affected. The brick walls [1196], [1198], [1200] comprised up to two rows of bricks c. 1.44m long by 0.6m wide with between four courses to a single uppermost course exposed and were laid in stretcher bond. The walls sat in the centre of wall [1191] on the same NW-SE alignment. At either end the walls split outwards in a V-shape comprising two single rows with the stone wall filling the gap in-between. They

were constructed using unfrogged red brick (220mm by 100mm by 80mm), bonded by light grey lime mortar. The uppermost course of stove [1200]/[1201] extended out in a single row along the outer edge of the stone floor forming a bay.

- 5.4.11 All three stove structures had been truncated by later activity. A trench for a ceramic pipe ran roughly parallel along the north-east side of wall [1191] and damaged the north-east sides of the three stoves and potentially removed a fire-brick back wall similar to what was recorded on wall [1152], to the north-east. A concrete footing that ran parallel to the south-west truncated parts of [1196]/[1197] and [1198]/[1199].
- 5.4.12 The remains of another three south-west facing stove structures were built on top of and incorporated into inner wall [1152] and the upper most levelling layer [1160]. The stoves, [1188]/[1182] (NW end; Plate 17), [1214]/[1215]/[1216] (middle; Plates 18 & 19) & [1146]/[1144]/[1145] (SE end; Plates 18 & 19) comprised a brick wall, stone floor, firebrick wall and firebrick back wall (Figures 8 & 9). Floor [1188] consisted of c. 10 roughly hewn square and rectangular shaped sandstone slabs (260mm by 260mm by 90mm; 400mm by 280mm by 90mm) laid in two rows side by side. Floors [1214] and [1146] comprised six and three roughly hewn and shaped sandstone slabs (700mm by 400mm by 90mm to 700mm by 260mm by 90mm) respectively. The slabs were laid in a single course on levelling layer [1160] with the inner corners removed to fit the shape of the brick wall and bonded with light grey lime mortar. The floors measured c. 1.46m by 0.70m by 9mm thick. All the sandstone slabs were heat affected and had turned red.
- 5.4.13 The brick walls [1182], [1214], [1144] comprised two rows of bricks c. 1.44m long with up to seven courses exposed, laid in stretcher bond. A sample excavation across [1144] revealed it to be 0.48m high. The walls sat in the centre of wall [1152] on the same north-west/south-east alignment. At either end of the wall it split outwards in a V-shape comprised of two single rows with the stone wall filling the gap in-between. They were constructed using unfrogged red brick (220mm by 100mm by 80mm), bonded by light grey lime mortar.
- 5.4.14 The three upper courses of [1182] were laid in a single row along the outer edge of the floor enclosing an area 1.24m by 0.48m. It was filled by firm mid reddish grey mortar/slag silty sand mix [1181] that contained charcoal flecks, slag pieces and measured 0.19m thick. It was partially exposed in Trench 1. The two uppermost courses of [1215] were laid in a single row along the outer edge of floor [1214] enclosing an area 0.9m by 0.48m. Within this space, two courses of wall [1216] which comprised red fire brick (230mm by 110mm by 60mm) laid in English bond abutting the southwest facing inner side of [1215] and measured 0.9m by 0.23m by 0.12m. The bricks were bonded with fireclay. Its north-west end was truncated by concrete column base [1221]. The south-east end of wall [1144] was truncated/incorporated by concrete base [1147]. Most of its north-west corner had been damaged removing [1144] and sections of [1145]. Wall [1145] comprised a single course (NW end) to five courses (SE end and visible in section) of red fire brick (230mm by 110mm by 60mm) laid in English bond. It measured 0.98m long by 0.23m wide by 0.06m to 0.38m

- high. It was bonded by fireclay. The space within [1144] was covered by loose red/white mix of brick rubble and mortar [1148].
- 5.4.15 Brick samples from the drying stove bay walls were all identified as common bricks (Samples <18> and <20> from [1182], <24> from [1196], <21> from [1198], and <22> from [1200]), where firebrick might have been expected (see Appendix 7). Possibly the relatively lower temperatures needed for mould-drying made firebrick less crucial.
- 5.4.16 Wall [1143]/[1225] was located on top of the north-east side of wall [1152] on the same north-west/south-east alignment and levelling layer [1224] (Figure 9; Plates 18 & 19). It abutted the north-east sides of stove walls [1182], [1214], [1144] and the higher course of wall [1152] that was in-between the stoves. It comprised three courses (six visible in section) laid in English bond and measured 8.64m by 0.54m by 0.21m to 0.63m high. The lowest course stepped out 0.08m and appeared to form a footing. It was constructed with red and cream firebricks (230mm by 110mm by 60mm) bonded with light grey lime mortar. Its south-east end appeared to abut the inner side of wall [1141]. It appeared to form a back wall that incorporated the three stoves.
- 5.4.17 Wall [1175] was located to the south-east of stove [1144]/[1145]/[1146] (Figure 9). It was similarly constructed as the stove but consisted of just a single row of bricks with the last brick on the south-east end angled out and was laid in English bond that abutted wall [1152], to the south-west and constructed over wall [1141], next to its outer edge. It was constructed using unfrogged red brick (220mm by 100mm by 80mm), bonded by light grey lime mortar and measured 1m by 0.3m by 0.39m high. It appeared to be incorporated within wall [1143]/[1225] but its function was unclear as its north-west end was truncated by concrete column base [1147] and there was no stove on the opposite side like with the other stoves. There were remnants of a fire brick wall [1174] that consisted of three courses of red and cream fire bricks (230mm by 110mm by 60mm) that were laid in English bond and measured 0.66m by 0.40m by 0.18m high. Fire bricks stamped Benson (probably dating to between 1875 and 1929) and Gardner (1858 to 1915) were used in the wall; see Appendix 7. The feature abutted the inner north-west and south-west sides at the junction of walls [1141] and [1152]. It also abutted the north-east wall of furnace [1217]. Its north-west side was truncated by [1147].
- 5.4.18 Located 0.68m to the north-east of stove [1200]/[1201] was a brick and stone feature [1202] (Figure 9). It comprised a single course of red brick, red fire brick (220 mm by 100mm by 70mm) and a single sandstone block (320mm by 120mm by 100mm), bonded with light grey lime mortar. It ran straight, parallel to wall [1191], measured 1.4m then curved around to the east for 0.5m and was 0.12m to 0.7m wide by 0.1m high. A sample excavation revealed footing [1223], stepped out by 0.20m from the wall forming part of its foundation that sat on levelling layer [1155]. It consisted of roughly hewn sandstone blocks, bonded with light grey lime mortar that measured 1.2m by 0.23m by 0.07mm thick. It was truncated along its

southwest side by a ceramic pipe. It was unclear what its function was though it is possibly the remnants of a back wall, similar to [1143] that was above wall [1152], to the north-east.

- 5.4.19 Brick feature [1176] was located abutting the outer side of wall [1141], to the north-east of furnace [1217] (Figure 9). It had been badly truncated, but the remnants consisted of red brick and firebrick (220mm by 100mm by 80mm) that covered the opening into a ceramic pipe [1177] that was next to the wall and presumably formed a drain opening. It measured 0.55m by 0.41m by 0.35m.
- 5.4.20 Linear feature [1184] was located next to the surviving north-east end of wall [1141]. It was cut into levelling layer [1185] and was next to and followed the line of wall [1141] for 1.1m. It was 0.15m wide and 0.15m deep. It was filled by loose light grey stone and sand mix [1183] that contained charcoal and mortar flecks. Its function was unclear.

5.5 Phase 4: Late 19th- to Early 20th-Century Industrial

- 5.5.1 Features assigned to Phase 4 activity represent the intensification of industrial activity at the site sometime in the latter part of the 19th century and into the 20th century. At the time of the Ordnance Survey map of 1896 (Figure 17) the layout of the foundry building remains unchanged however, by this time it had been incorporated into the Robert Stephenson & Company Engineering Works. The buildings to the east, formally the Smith's Shop and Workshop, had expanded and now formed part of a larger range of industrial buildings denoted as the High Smithy within the Stephenson works (Figure 18).

Trench 1 (Figure 2 & 3)

- 5.5.2 At the SSE end of the trench an inspection chamber [309], and an associated service trench, [328], were recorded truncating Phase 3 ground raising/levelling deposits. The inspection chamber measured c. 1.00m square, built within a narrow construction cut, [310], and constructed using frogged red bricks (230mm x 110mm 70m), bonded with cementitious mortar. Its sandy ash backfill, [308], remained unexcavated.
- 5.5.3 A service trench, [328], extended south-eastwards from the inspection chamber for a distance of at least 2.00m and was 0.36m wide. Its single clayey silt backfill [327] was partially excavated within a sample excavation located to the south to a depth of 0.31m where a small portion of a salt-glazed ceramic drain was exposed.
- 5.5.4 At the NNW end of the trench similar salt-glazed ceramic drain, [323], was present within a NNW-SSE aligned service trench, [325], that was exposed for a maximum distance of 5.40m and was 0.38m wide. The ceramic drain was encased by brick walls, [324], constructed using unfrogged red brick and firebrick half bats (120mm x 110mm x 70mm), bonded by light grey lime mortar.
- 5.5.5 Located within the central part of the trench, a substantial sandstone column base, [312], was recorded in construction cut, [337], measuring 1.90m NW-SE by at least 1.00m NE-SW. The column base itself was a single large sandstone block [312] (800mm x 600mm) located

centrally in the construction cut, [337], and backfilled by brick rubble [314] and ashy silt [311] from which no finds were recovered.

Area 1 and Trenches 4, 5 & 6

High Smithy Flue Structures (Figures 2 & 4-7)

- 5.5.6 Various elements of a system of flue structures were recorded extending across Area 1 and were also recorded in Trenches 4, 5 & 6. These flues probably carried waste gases from ovens/furnaces to external vents. Although no datable material was recovered from any of these structures they probably represent part of a wider system of flue structures associated with the High Smithy of Robert Stephenson & Company Engineering Works as depicted on Goads Fire Insurance Map of 1896 (Figure 18). The flues were likely in use until the early part of the 20th century.
- 5.5.7 Prior to the construction of the brick flue structures a silty, ashy slag ground raising/levelling deposit [223]/[214] up to 0.13m thick was laid down. The flue structures were built in a narrow construction cut, [210] & [247], cutting Phase 4 ground raising/levelling deposits [223]/[214] in Trench 5 & Area 1 and Phase 3 ground raising/levelling deposit [240] in Trench 6. The flues were variously aligned and generally comprised two parallel brick walls c. 0.20m apart (up to 0.40m wide) that survived up to two courses high laid in stretcher bond (Plate 20 & 21). They were constructed using unfrogged red brick (220mm x 110mm x 70mm), bonded by light grey lime mortar, and where exposed, the bases of the flues comprised circular iron sheets (c. 0.35m diameter) and rectangular iron sheets (620mm x 480mm x 5mm thick). The flues were capped with similar iron sheets, [233] and [249], however the majority of the flues had been truncated by modern levelling activity with only small sections of the iron sheet capping surviving in Trenches 5 & 6.
- 5.5.8 Due to modern levelling activity, the survival of the flue structures across Area 1 was variable (Plate 21). Such structures were well preserved within the central portion of Area 1 with these extending into Trenches 5 and 6 (Figure 7). At this location, these structures were variously aligned and formed part of an interconnecting system of flues that probably would have extended across Area 1. The survival of the flue structures across the remaining parts of Area 1 was intermittent, either truncated or overlain by Phase 5 modern ground raising/levelling deposits (Figure 7).
- 5.5.9 The table below summarises the surviving elements of the flue structures exposed during the archaeological evaluation work.

Context	Length	Width	Thickness/ height	Height (mAOD)	Description
Trench 4					
268	>2.42m	1.06m	n/a	30.43	Construction cut for flue [269]
269	>2.42m	1.06m	n/a	30.43	Brick flue

270	>2.42m	0.10m	n/a	30.43	Backfill of construction cut [268]
271	>1.22m	0.44m	0.30m	30.78	Backfill of flue [269]
272	>1.36m	0.50m	n/a	30.76	Backfill of flue [269]
273	0.40m	0.11m	0.19m	30.46	Brick infill
Trench 5					
210	>4.00m	0.49m	0.20m	30.90	Construction cut for flue [211]
211	>4.00m	0.49m	0.19m	30.90	Brick flues
212	n/a	n/a	5mm	30.76	Iron sheets forming base of flues [211]
213	>4.00m	0.23m	0.17m	30.093	Backfill of flues [211]
218	>7.00	0.17m	n/a	30.78	Cast iron pipe
233	n/a	n/a	5mm	30.89	Iron sheets capping flue [211]
Trench 6					
247	>2.20m	0.50m	>0.25m	30.87	Construction cut for flue [248]
248	>2.20m	0.50m	0.22m	30.87	Brick flue
249	n/a	n/a	5mm	30.87	Iron sheets capping flue [248]
Area 1					
104	>1.16m	0.14m	0.25m	30.90	Brick flue wall, part of [105]
105	>0.40m	0.12m	0.25m	30.87	Brick flue wall, part of [104]
106	2.24m	0.16m	0.23m	30.84	Brick flue wall, part of [113]
107	>0.58m	0.12m	n/a	30.87	Brick flue wall
112	0.30m	0.28m	n/a	30.62	Brick infill blocking flue [106] & [113]
113	2.36m	0.12m	0.23m	30.84	Brick flue wall, part of [106]
116	>1.20m	0.39m	0.19m	30.90	Brick flue, part of brick flue [248] in Trench 6
117	n/a	n/a	n/a	n/a	Same as flue [211] in Trench 5
118	n/a	n/a	n/a	n/a	Same as flue [211] in Trench 5
119	n/a	n/a	n/a	n/a	Same as flue [211] in Trench 5
120	>2.20m	0.26m	n/a	30.71	Iron sheets forming base of flue [211], same as [212]
121	>2.20m	0.18m	n/a	30.90	Brick flue wall, same as [211]
122	1.80	0.18m	n/a	30.89	Brick flue wall, part of [123]
123	3.10m	0.18m	n/a	30.89	Brick flue wall, part of [122]
124	1.22m	0.70m	n/a	30.64	Bricks forming flue surface
125	>2.20m	0.18m	n/a	30.90	Brick flue wall, same as [211]
128	n/a	n/a	n/a	n/a	Same as flue [211] in Trench 5
129	1.00m	0.20m	n/a	30.82	Brick flue wall
134	>1.10m	0.32m	n/a	30.92	Brick flue

135	>1.10m	0.80m	n/a	30.93	Brick flue
136	0.40m	0.10m	n/a	30.99	Brick flue wall, part of [137]
137	0.38m	0.12m	n/a	30.99	Brick flue wall, part of [136]
153	>2.20m	1.50m	n/a	31.03	Brick flues
155	0.80m	0.26m	n/a	30.80	Brick flue
156	2.40m	0.36m	n/a	30.86	Brick flue wall, part of [157]
157	1.28m	0.28m	n/a	30.78	Brick flue wall, part of [156]

Phase 4 elements of brick flues exposed across Area 1 and Trenches 4, 5 & 6.

Structures and features associated with High Smithy (Figures 2 & 4-7)

5.5.10 Various brick-built structures probably associated with the High Smithy were recorded across Area 1 and were either truncated or overlain by Phase 5 modern ground raising/levelling activity. Due to the limited exposure of these structural remains their functions were impossible to determine however, they probably represent parts of surfaces and walls associated with the High Smithy building of Robert Stephenson & Company Engineering Works (Figure 18). The table below summarises the surviving elements of structures exposed during the archaeological evaluation work with the main structural elements discussed below:

Context	Length	Width	Thickness/ height	Height (mAOD)	Description
Trench 4					
276	0.88m	0.22m	0.34m	30.83	Brick wall
278	>1.72m	>1.68m	0.20m	30.42	Levelling/dump deposit
279	0.44m	0.24m	0.10m	30.24	Brick wall
280	0.66m	0.36m	0.13m	30.80	Brick wall
343	>0.66m	0.24m	0.22m	30.05	Construction cut for wall [279]
344	0.66m	0.36m	0.13m	30.80	Construction cut for wall [280]
347	>2.00m	0.10m	n/a	30.47	Backfill of construction cut [348]
348	>2.00m	0.32m	n/a	30.47	Construction cut for wall [276]
Area 1					
108	0.74m	0.74m	n/a	30.78	Brick structure
127	2.35m	0.26m	>0.66mm	30.74	Brick structure
150	0.60m	0.42m	n/a	30.98	Brick structure
152	1.28m	0.70m	n/a	31.02	Brick structure
158	>0.80m	0.25m	n/a	30.83	Stone structure
159	0.88m	0.22m	0.34m	30.83	Brick wall, same as [276]

Phase 4 structural elements exposed across Area 1 and Trench 4

5.5.11 At the eastern part of Area 1 and in the central portion of Trench 6 a substantial rectangular structure was partially exposed that had maximum dimensions of 4.50m NW-SE by 4.20m

NE-SW (Figure 6 & 7; Plate 22). The structure comprised of wall [246] in Trench 6 and walls [102], [110], [111] & [114] in Area 1, built within a narrow construction cut [345]. The walls varied in width ranging from 0.50m to 0.30m with the south-easternmost wall [246] exposed in a sample excavation to at least eleven courses of brick (up to 0.80m high) in nine courses of stretcher bond and two courses in header bond (Figure 6, Section 7). The walls were constructed using unfrogged red brick and firebrick (240mm x 110mm x 70mm) and bonded by light grey lime mortar, encountered at a maximum height of 30.88m AOD. Internally the structure had at least two bays with the south-westernmost bay measuring 0.90m wide by 0.50m deep and the south-eastern most bay measuring 1.20m wide by 2.00m deep. Further bays are likely to be located to the northeast and northwest however this was not established with the structure at this location overlain by Phase 5 ground raising/levelling deposits. Although the function of this structure is uncertain it is likely to be contemporary with the aforementioned flue structures and may represent a furnace or engine housing. Its backfills, [250], [260], [261] & [262], had a combined thickness of c. 0.80m and contained various compositions of sand, silt, ash and slag from which no artefactual material was recovered (Figure 6, Section 7).

- 5.5.12 A NE-SW aligned drainage feature [219] was partially exposed for a distance of 0.50m in a sample excavation at the north-eastern end of Trench 5 and was up to 0.76m wide and at least 0.60m deep. A salt-glazed ceramic pipe was partially exposed the base of the drain that had been backfilled by sandy ash [222]; a few sherds of pottery dated 1775-1900 were recovered from this deposit (Appendix 5). This drainage feature was recorded cutting the upper strata of Phase 3 ground raising/levelling deposits and was directly overlain by Phase 4 ground raising and levelling deposit [223] and probably represents part of a wider system of drainage features that was installed prior to the construction of the High Smithy.
- 5.5.13 The remains of a brick surface [101] was recorded at the eastern part of Area 1. This surface was directly overlain by Phase 5 concrete surface [100] and was heavily truncated by modern ground levelling activity with the brick surface only observed in section. The surface itself was built with unfrogged firebrick (max 240mm x 110mm x 80mm – min 160mm x 110mm x 80mm) and its bonding material and full dimensions were not observed. The brick surface occurred at roughly the same elevation as the Phase 4 flues and could potentially represent a surface associated with the High Smithy. However due to truncation this could not be definitively proven therefore it could potentially represent a later surface associated with the Robert Stephenson & Hawthorn Ltd building in 1937 or the later Vulcan Foundry in 1944.

Column bases (Figures 2, 4, 5, 6 & 7)

- 5.5.14 Seven column bases [103], [109], [115], [126], [205], [245] & [285], were recorded in Area 1 and Trenches 4, 5 & 6. The table below summarises all elements associated with the column bases:

Context	Length	Width	Height/ Depth	Height (mAOD)	Description
Trench 4 Column Base [285]					
283	1.12m	0.96m	>0.95m	30.91	Construction cut for column base [285]
284	0.80m	80mm	>0.95m	30.93	Backfill of construction cut [283]
285	1.14m	0.88m	>0.95m	30.93	Sandstone block column base
287	1.02m	0.60m	0.11m	30.91	Brick and lime mortar structure abutting [285]
288	0.60m	0.40m	n/a	30.86	Backfill of structure [287]
Trench 5 Column Base [205]					
205	1.17m	1.06m	>0.35m	30.90	Sandstone column base
Trench 6 Column Base [245]					
244	1.10m	0.92m	0.30m	30.78	Concrete slab abutting column base [245]
245	1.00m	0.96m	n/a	30.89	Sandstone block column base
346	0.92m	0.92m	n/a	30.76	Construction cut for column base [245]
Area 1 Column Bases					
103	1.00m	0.90m	n/a	30.80	Sandstone block column base
109	1.06m	0.98m	n/a	30.96	Sandstone block column base
115	1.78m	1.00m	n/a	30.88	Sandstone block column base
126	1.06m	0.96m	n/a	30.96	Sandstone block column base
144	1.17m	1.06m	>0.35m	30.90	Sandstone block column base, same as [205] in Trench 5
151	1.14m	0.88m	>0.95m	30.93	Sandstone block column base, same as [285] in Trench 4

Phase 4 column bases and associated structural elements.

- 5.5.15 All column bases were similarly constructed using roughly hewn sandstone blocks (max 980mm x 970mm x 180mm – min 270mm x 170mm x 170mm) bonded with light grey lime mortar. Only column base [285] recorded in Trench 4 was fully exposed with the remaining column bases partially overlain by Phase 5 ground raising/levelling deposits exposed and had dimensions of 1.14m by 0.88m. It was exposed to at least five courses of large sandstone blocks up to 0.95m high (Figure 2 & 7).
- 5.5.16 Although the remaining column bases were partially overlain by Phase 5 ground raising/levelling deposits they are probably contemporary in date and represent structural elements associated with the High Smithy building as depicted in Goad's Fire Insurance Map of 1896 (Figure 18).

- 5.5.17 A brick and lime mortar structure, [287], was recorded in Trench 4 abutting the south-eastern side of column base [285]. It comprised a single-skin brick wall c.0.11m wide and measured 1.00m NW-SE, turning to a NE-SW alignment at its south-eastern extent for a distance of 0.60m. At the interface of the column base and the brick wall, a rectangular brick and lime mortar element measured 0.50m by 0.36m and had a rectangular recess located centrally to this. The function of this structure is uncertain.
- 5.5.18 A concrete slab [244] measuring 1.10m by 0.92m was recorded abutting the north-eastern edge of column base [245]. The function of the concrete slab is unclear.

Foundation Trench (Figure 8 & 14)

- 5.5.19 Dump deposit [1104] was a compact dark grey/ black mix of clinker, slag and silty clay that measured c. 11m long by 0.10m thick and presumably extended across the site (Figure 14 – Section 1). It was probably waste material from furnace [1217] in the foundry building to the north-west of the trench. The maximum and minimum heights encountered for the upper most strata of this dump deposit were 29.83m AOD and 29.25m AOD at the south-west and northeast ends respectively. Ground raising deposit [1232] was visible in section in the northeast end of the trench and partially covered [1104]. It consisted of soft yellow brown clay that contained charcoal flecks and measured 0.46m thick and was encountered at a maximum height of 29.73m AOD.

Area 2 (Figure 8, 9, 10 & 13)

- 5.5.20 Phase 4 activity included repairs and or modifications to the furnace recorded in Area 2 which occurred at some time in the latter part of the 19th century and into the early 20th century. At the time of the Ordnance Survey map of 1896 (Figure 17) the layout of the Wright and Brown's foundry building had altered slightly with expansion to the west of the main foundry building, although no changes are noted to the stove section of the works. The furnace however, is not shown on the map or Goad's map of 1896 (Figure 18). The foundry had by this time been incorporated into the Robert Stephenson & Company Engineering Works.
- 5.5.21 Located within furnace [1217], on the inner north-west side, wall [1212] comprised twelve courses of yellow firebrick (230mm by 115mm by 60mm) that had been laid in stretcher bond abutting the inner side and along the central core of wall [1141] from the original furnace construction (Figure 13 – Section 16; Plate 13). It measured 0.73m long by 0.22m wide by 0.85m high and it replaced the south-east half of wall [1142]. There was slag residue adhered to sections of both walls. Abutting/incorporated into the inner side of the south-east end of [1212] was a brick column comprising nine courses laid in pairs of which six were in header bond and three were in stretcher bond and measured 0.22m by 0.22m by 0.7m high. It was constructed with yellow firebricks and red bricks (230mm by 115mm by 60mm and 110mm by 110mm by 65mm) bonded with light grey lime mortar. Column [1212] appeared to have been rebuilt following the repair work done to [1142]. Located 0.9m to the

north-east was a second brick column [1218]/[1173] (not fully excavated) that appeared to abut or was part of wall [1172] and wall [1141] and appeared to be similarly constructed as [1212]. Standing parallel against the outer south-east facing sides of both columns were two upright standing metal gates [1190]. They consisted of two reddish brown solid iron plates that measured 0.34m long by 0.015m thick by 0.88m high. The two columns and the gates appeared to form an opening to the inner part of the furnace with dividing gates to keep in the heat.

- 5.5.22 Three deposits were recorded on the floor [1211] of the furnace that appeared to be residue of industrial activity (Figure 13; Section 19). In the south corner [1210] consisted of compact dark grey slag fragments and measured 0.5m by 0.5m by 0.15m thick. In the south-east corner and most of the outer section of the furnace, [1209] comprised compacted dark grey brown slag/clinker mix with white mortar flecks that measured 1.45m NW-SE by 1.45m NE-SW by 0.1m thick. It may have been remnants of rakings from the furnace. In the north-west inner part of the furnace, [1208] comprised loose orangey brown clinker fragments and sand mix with white mortar flecks and measured 0.9m NW-SE by 1.45m NE-SW by 0.1m thick.

5.6 Phase 5: Modern

Area 1 and Trial Trenches (Figure 2, 3, 4, 5 & 7)

- 5.6.1 A substantial 1.70m wide NE-SW aligned duct, [321], cut the southern end of drain [323] in Trench 1 and was exposed for a maximum distance of 2m (Figure 3: Section 12). Only the upper part of the duct was exposed and this comprised a large concrete slab built in a narrow construction cut [322]. Its ashy sand backfill, [338], contained degraded wood throughout that probably represents hoarding associated with the construction of the concrete duct. The duct probably contained services associated with the foundry possibly in the 20th century when it was part of the Robert Stephenson & Hawthorn Ltd in 1937 or alternatively when it was later taken over by the Vulcan Foundry in 1944.
- 5.6.2 Immediately to the north of concrete duct [321], a brick surface [315] was recorded in section. The surface was built using frogged and unfrogged red bricks (230mm x 110mm x 70mm) laid on edge and bonded by light grey lime mortar. The surface is probably contemporary in date with duct [321].
- 5.6.3 A brick-built inspection chamber, [208], was recorded in the central portion of Trench 5 in a broad construction cut [206]. It was built using frogged red brick (230mm x 110mm x 80) and bonded by grey concrete. Internal to the inspection chamber was a NNW-SSE aligned open ceramic drain encased on concrete. The chambers backfill [209] and the construction cut backfill [207] contained modern late 20th-century material that was not retained.
- 5.6.4 Directly overlaying the brick inspection chamber [206] was a ENE-WSW aligned iron pipe [217]. The function of the pipe is uncertain.

- 5.6.5 Brick culverts [295] and [147] were recorded in Trench 4 and Area 1. These were similarly constructed and represent 20th century drainage features.
- 5.6.6 Modern buried concrete surfaces, [302] & [297], and associated ground raising/levelling deposits, [300], [301], [296], [298] & [299] were recorded extending across Trench 1. In Trench 4 a concrete surface [275] was partially exposed at the southern end of the trench along with modern ground raising/levelling deposits, [265], [266] & [281]. The table below summarise all modern deposits recorded in Trench 1.

Context	Length	Width	Thickness	Height (mAOD)	Description
Trench 1					
296	>6.90m	>2.00m	0.46m	30.85	Dolomite ground raising/levelling
297	<16.00m	>2.00m	0.60m	30.98	Concrete slab
298	>9.40m	>2.00m	70mm	30.91	Clayey silt ground raising/levelling deposit
299	>9.40m	>2.00m	0.20m	30.87	Dolomite ground raising/levelling
300	>11.70m	>2.00m	0.60m	30.80	Brick rubble deposit
301	4.30m	>2.00m	0.40m	30.78	Dolomite ground raising/levelling
302	>14.10m	>2.00	0.19m	30.40	Concrete slab
Trench 4					
265	1.72m	1.16m	80mm	30.89	Dolomite ground raising/levelling
266	3.02m	>2.00m	0.45m	31.09	Ash and cinder ground raising/levelling
275	0.45m	0.50m	0.26m	30.68	Concrete slab
281	0.60m	0.28m	0.40m	30.80m	Clinker ground raising/levelling

Phase 5 modern ground raising/levelling and concrete surfaces in Trench 1 & 4.

Foundation Trench and Area 2 (Figure 8 & 14)

- 5.6.7 Phase 5 represents modern ground raising activity and the existing surface across the site. The lowest of these deposits [1150] and [1149] were in Area 2 above wall [1152] and stove wall [1144] and comprised mid greyish brown sandy clayey silt and brown clay respectively and both were 0.2m thick. They appeared to be levelling deposits for concrete column [1147] that sat on top of wall [1152] along with a second concrete base [1221] to the northwest. These bases and the lower phases were covered by ground raising layer [1103] that was observed in both the foundation trench and Area 2. It consisted of dark grey brown silty clay with brick/rubble/slag inclusions and measured c.0.58m thick (30.38m AOD). In the southwest end of the site, a total of sixteen millstones ([1122] – [1136] & [1138]) were recovered from the deposit. A clay tobacco pipe with a 'Turks Head' bowl dated to 1800-1900 was also recovered from this deposit.
- 5.6.8 A modern brick surface [1233] was observed, in section only, above [1103], in the northeast end of the foundation and the southwest end. A modern concrete surface [1112] cut into the upper part of [1103].
- 5.6.9 Within furnace [1217], there were two demolition layers of which the lowest [1207] was a loose mix of sandstone, brick rubble and mortar with inclusions of timber, slag, ash and clinker. It measured 0.4m thick. It was sealed by [1189] that comprised soft dark grey silty

sand that measured 0.3m thick and contained clinker, slag ash and mortar pieces. It also covered a modern metal pipe that went through the stoke hole in furnace wall [1140].

- 5.6.10 Deposit [1103] and surfaces [1112] and [1233] were covered by dark brown silty clay demolition/levelling layer [1102] that contained stone blocks, brick, metal, slag and slate throughout and measured 0.26m thick (30.61m AOD). To the south-west of the foundation trench, three sandstone column bases, [1227], [1228] & [1229] had been placed on concrete surface [1112] and were part of deposit [1102]. These blocks were similar to unstratified blocks [1116] – [1121] and in situ blocks [1170] and [1171] and were probably contemporary in date and represent structural elements associated with the High Smithy building in Area 1 or the foundry building in Area 2. Levelling deposit [1101] covered [1102] and consisted of dolomite that was 0.24m thick. It in turn was sealed by the existing concrete surface [1100] that was 0.18m thick (30.99m AOD).

6. CONCLUSIONS AND RECOMMENDATIONS

- 6.1 This report detailed three phases of archaeological work undertaken at Stephenson Quarter which included a cleaning and recording exercise (SSQ17); a trial trenching evaluation (SQN17) and an open area excavation (SFT17). The archaeological investigations have demonstrated that below-ground remains of Wright & Brown's Foundry; and the multi-phase remains of the Stephenson Works survive in an excellent state of preservation, despite the scale of truncation after the change of uses of structures in the 20th century and subsequent demolition of buildings.
- 6.2 The post-medieval period in the North East was one of radical and deep-rooted change and saw the transition from an agricultural economy to an industrial one; the shift from a primarily rural population to an urban one and the move from horse power to first water, then steam. As such, the period saw a massive increase in industry reflecting and causing technological changes, new patterns in social organisation and an increased demand for consumer goods.
- 6.3 Within the North East, one of the most significant manufacturing industries was iron and steel working. Wright & Brown's iron foundry was established by 1849. The NERRF notes that by the 19th century foundries were common in urban areas; however, the archaeology of the foundry trade has received little attention nationally and virtually none within the region (Petts and Gerrard 2006, 97). Furthermore, the later development of engineering works, often incorporating both forging and foundry elements, have received little archaeological study either regionally or nationally, though it was of prime importance to 19th-century Tyneside (*ibid.* 97).
- 6.4 The structural remains of both the foundry and the multi-phase remains of the Stephenson Works are considered to be of regional significance. Despite the fact that a number of engineering works existed in the North-East during the post-medieval period, especially within Tyneside, archaeological excavation of such works has been very limited, with none to the scale of the Stephenson Quarter investigation. The Stephenson Works was a pioneering manufactory in the 19th century and is recognised as the first purpose built locomotive manufactory in the world. The significance of the remains is enhanced by documentary evidence and the historic map sequence which has allowed interpretation of some of the more fragmentary remains and preliminary phasing of the structural elements.
- 6.5 The historic maps, however, could not be relied on entirely as was seen with the discrepancies between the first edition Ordnance Survey and the inscribed stone with *Wright & Brown's* (rather than *White & Brown's*). It is not known whether the inaccuracy on the First Edition Ordnance Survey was an innocent mistake or an intentional error added to the map to combat plagiarism.
- 6.6 The excavation of this part of the Stephenson Engineering Works has made a significant contribution to archaeological knowledge of the post-medieval period. In terms of NERRF, it

can be concluded that the archaeological investigation has contributed to PMii Industrialisation.

- 6.7 It is therefore considered that the findings on the Stephenson Works require further analysis leading to the publication of a paper in an academic outlet. Further analytical work is considered necessary on the relevant archaeological data, as discussed below, with the final paper placing the findings in a broader archaeological context.
- 6.8 Further analysis of the structural remains, including overlay onto all suitable historic maps, will be undertaken with the aim of refining the structural sequence and identifying retained and modified elements of the works correlated with the ceramic data.
- 6.9 The archaeological investigations at Stephenson Quarter yielded a relatively small assemblage of pottery with 130 sherds in total being recovered. The majority of sherds were in relatively good condition, however, some showed signs of burning and iron residue. Several deposits contained kiln furniture, in particular kiln stilts and saggar fragments that would have likely come from Forth Banks (PCA 2017) and deposited at the site as ground raising dumps and levelling deposits. Overall the assemblage from the investigation dates between 1775-1900 which fits with the archaeology uncovered and the remains depicted on historic mapping.
- 6.10 The most interesting aspect of this assemblage is the link between dump deposits within the Stephenson and the Forth Banks assemblages. It can be confidently assumed that the kiln furniture, saggar fragments and fired faulted waster sherds are products and tools of the Forth Banks Pottery located nearby on Pottery Lane during its period of production between 1736 to 1893. Due to the small size of the assemblage, it has little significance and there are no recommendations for further works at this stage. The assemblage could be considered further in the publication of the entire Stephenson site.
- 6.11 The investigations yielded a small assemblage of clay tobacco pipe, a total of 32 fragments. The assemblage contains some interesting fragments, but due to its small size it has little significance. There are no recommendations for further work on the assemblage at this stage, but it is recommended to consider the clay pipes from SQN17 and SFT17 together and in a site wide context and to illustrate the Turks Head pipe.
- 6.12 Twenty-six firebricks and ten common bricks were sampled during the investigation. The samples all came from structures on the site of the foundry (Area 2). None of the material is identifiably earlier than the mid-19th century. Most would appear to date from the last quarter of that century, extending into the first quarter of the 20th century. A number of firebricks samples showed slag residues and vitrification indicative of subjection to high temperatures. Although firebrick was exclusive to the furnace structure, common brick was used in the stove bays, presumably because the heat intensity was less there.
- 6.13 None of the common brick or unmarked firebrick samples are worth retention. Of the stamped firebrick, if a record photograph showing the stamp and dimensional data are

included in the report and/or site archive there is little justification for retaining the actual bricks when most are by well-known makers. An example of the *Gardner* brick could however be offered to a regional museum collection such as Beamish.

- 6.14 Small quantities of industrial residues were recovered during this phase of works; these will be examine by an archaeometallurgist with the material recovered from the phase of work being undertaken at the time of writing.
- 6.15 Some correlation of documentary evidence with the remains as recorded during the investigations has been undertaken as part of this assessment. Further examination and analysis of documentary material in relation to the recorded evidence is required to refine the dating of various alteration and additions to the works. Examination of data from other recorded contemporary examples of engineering works elsewhere in the UK, including both published and grey literature sources, will inform further interpretation of the project results. Such documentary research can also aid interpretation of the function of various elements of the recorded structures and may allow the full range of activities carried out in various parts of the works to be ascertained.
- 6.16 At the time of writing a further phase of archaeological excavation was being undertaken at the site towards the eastern end of the proposed walkway. This area includes the entirety of Area 1 as well as an additional area extending to the north to the former access gate. It is proposed that a combined publication should be prepared, along with any further scheme of works at the site (such as the glass works to the north), detailing all the structural and archaeological remains recorded during all phases of work at the Stephenson Quarter. The scope and place of publication will be determined once all excavation work at the site is completed.

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Beckman, 1684

Cole & Roper, 1801

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Wood, 1827

Oliver, 1830

Oliver 1838

Ordnance Survey, 1862

Ordnance Survey, 1897

Goad, 1897

7.3 Online Sources

The **British Geological Survey** website: www.bgs.ac.uk. This was consulted for information regarding the geology of the study area.

8. ACKNOWLEDGEMENTS AND CREDITS

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PCA Credits

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Report: Aaron Goode, Mike McElligott & Scott Vance

Project Manager: Jennifer Proctor

CAD: Charlotte Faiers

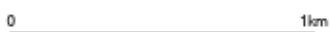
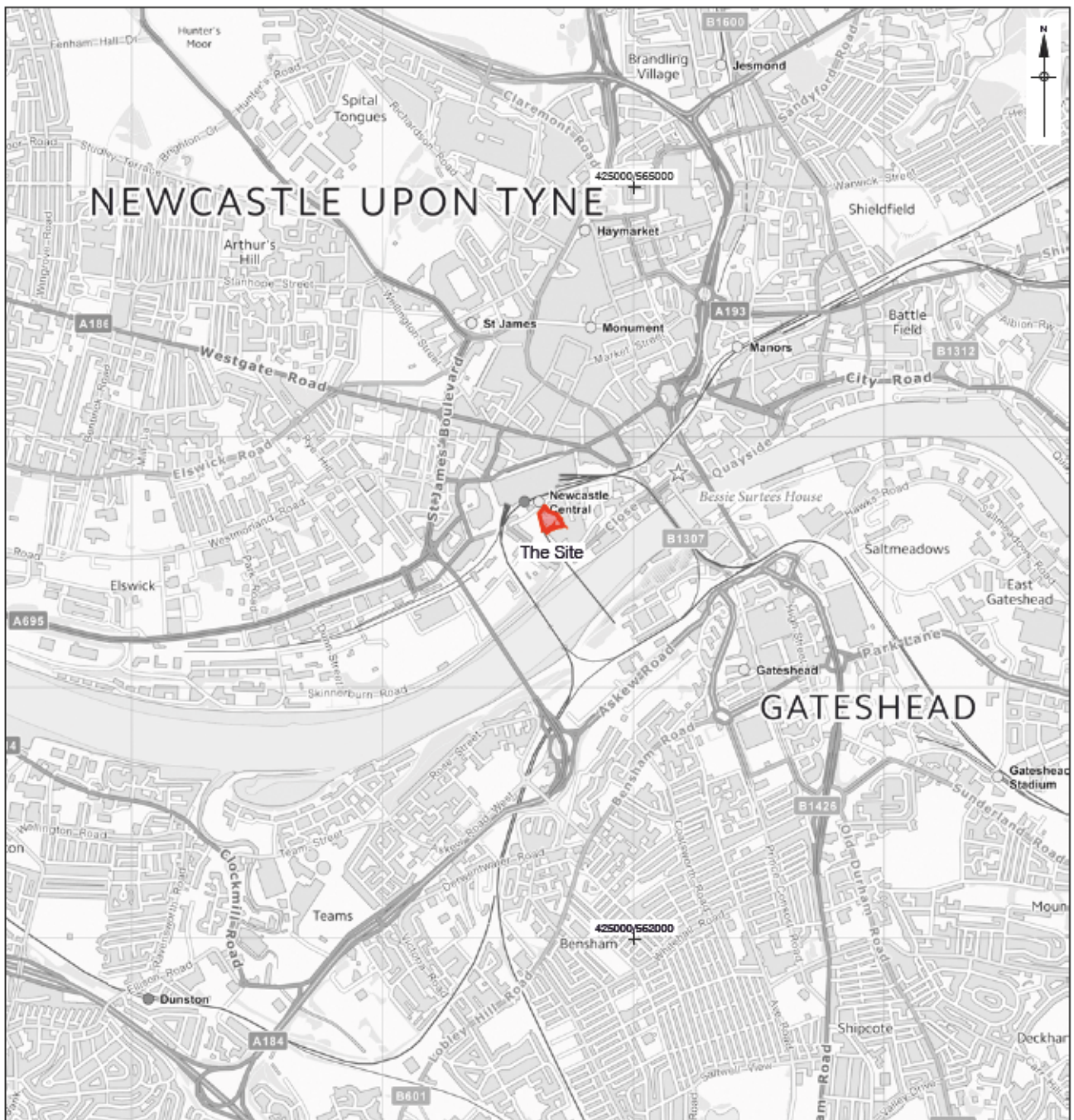
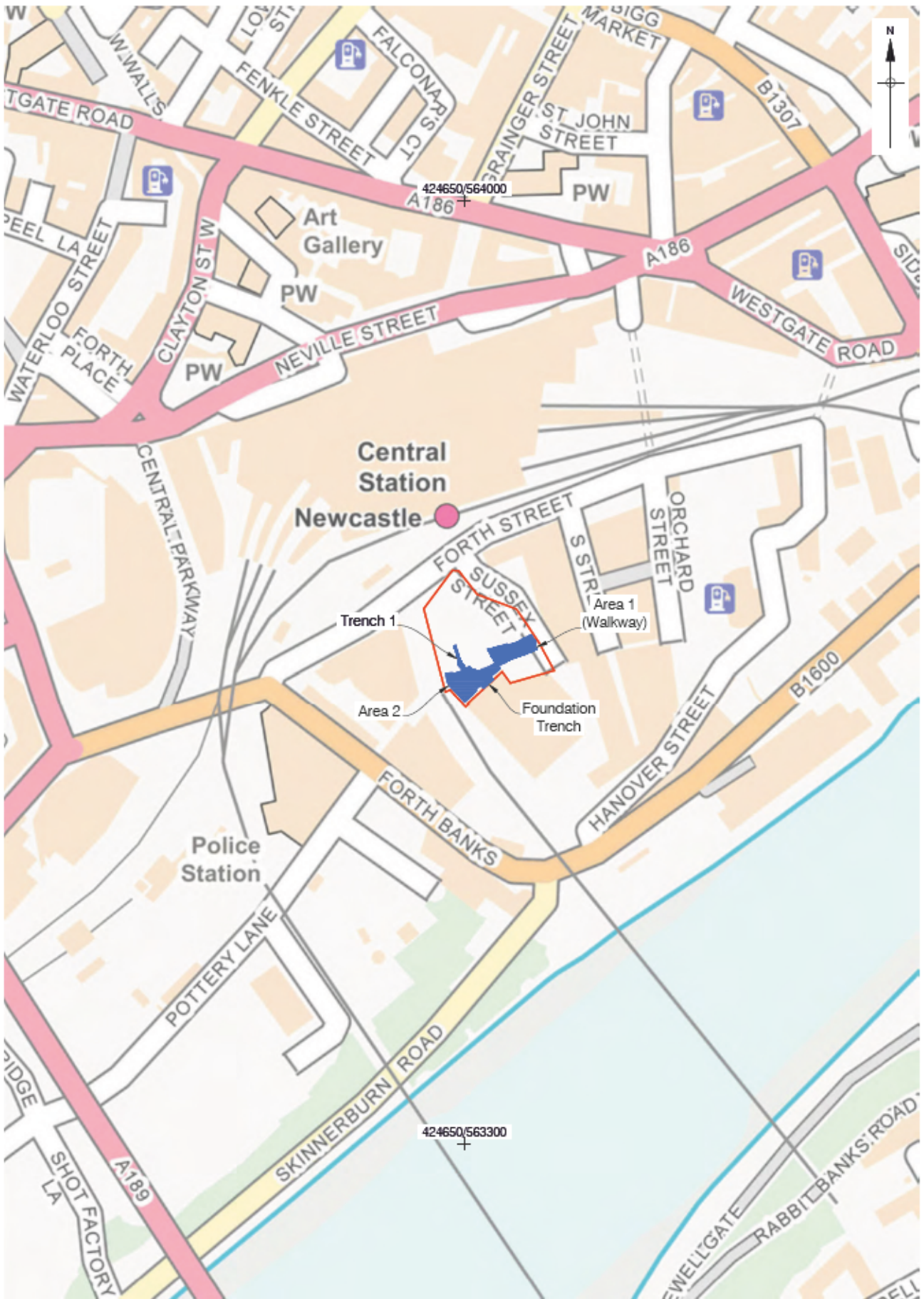


Figure 1a
 Site Location
 1:2,000,000, 1:250,000, 1:25,000 at A4



0 200m

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12/03/18 MR

Figure 1b
Detailed Site Location
1:4,000 at A4



- Phase 0 Feature
- Phase 1 Features
- Phase 2 Features
- Phase 3 Features
- Phase 4 Features
- Phase 5 Features

0 10m

Figure 2
 Trench Location with Phased Archaeological Features
 1:250 at A3

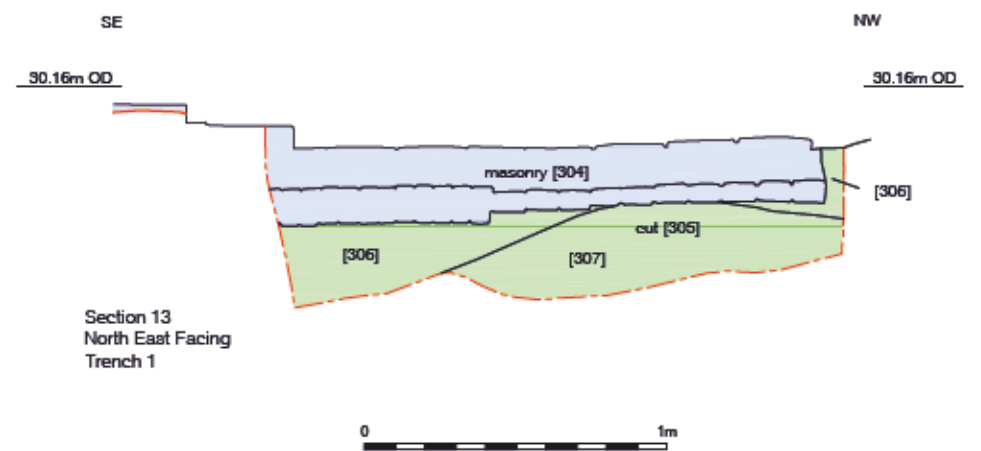
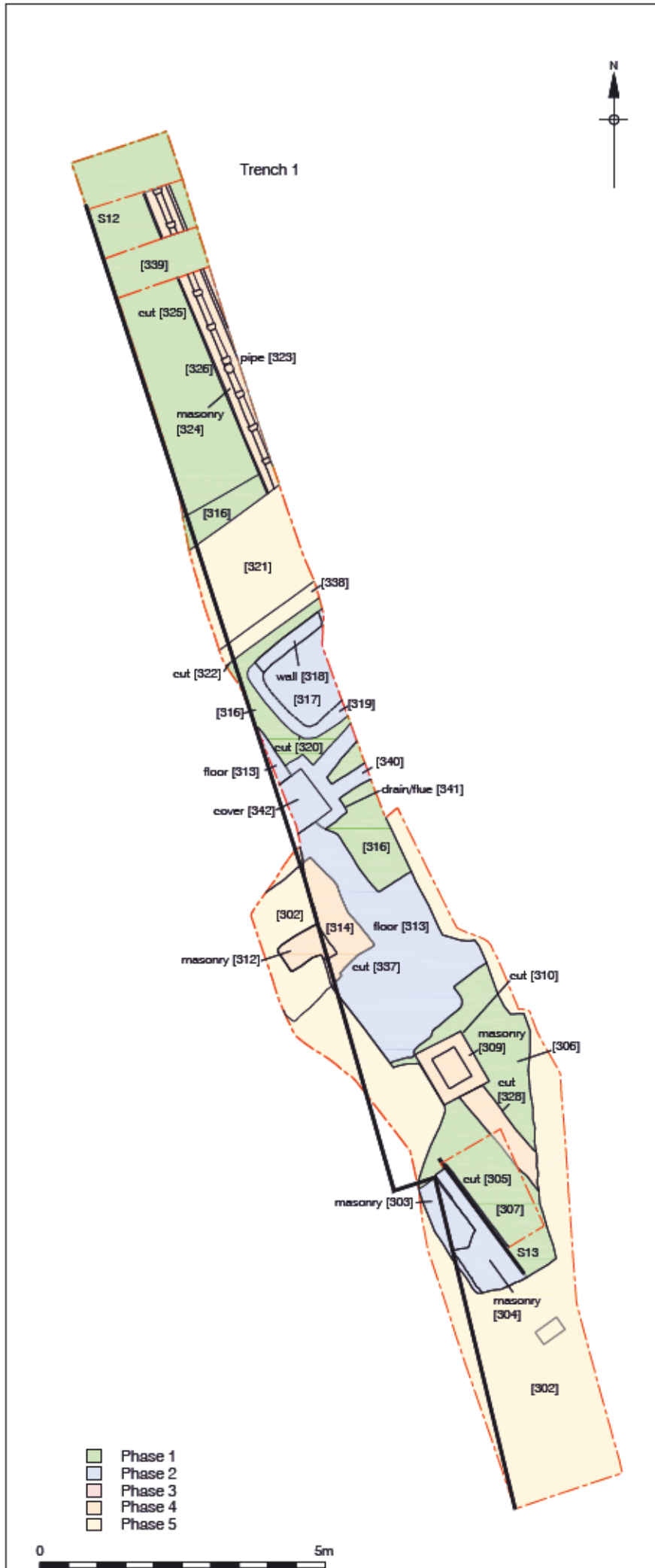
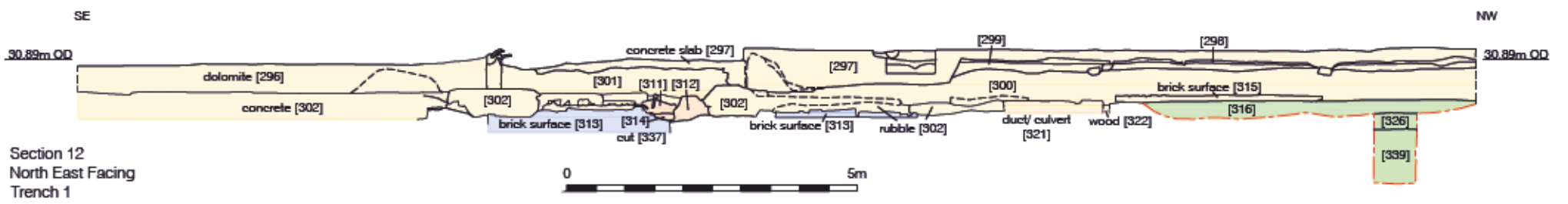
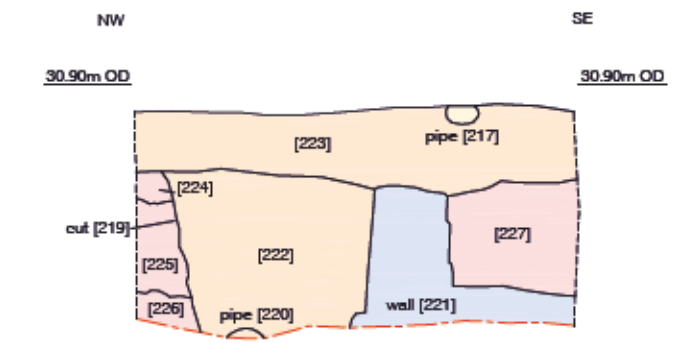
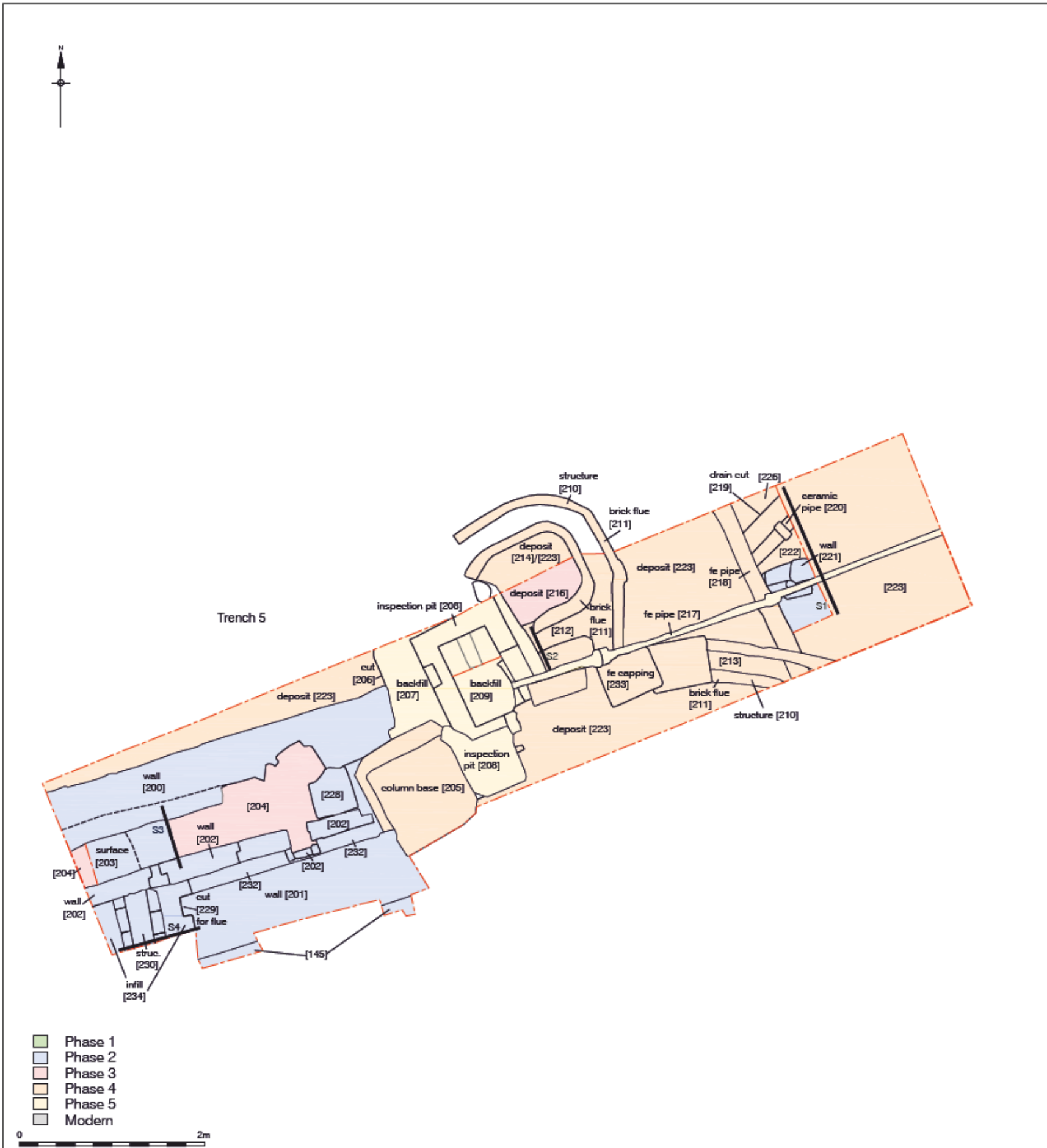
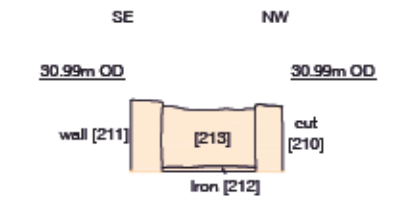


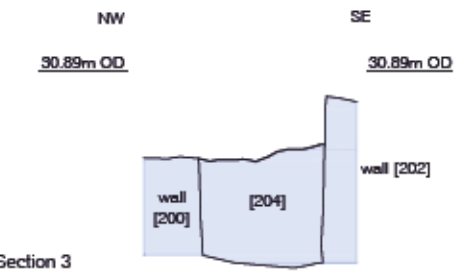
Figure 3
Trench 1 Plan and Sections
Plan and Section 12 1:100 and Section 13 1:25 at A3



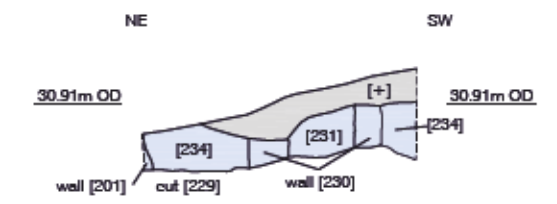
Section 1
South West Facing
Trench 5



Section 2
North East Facing
Trench 5



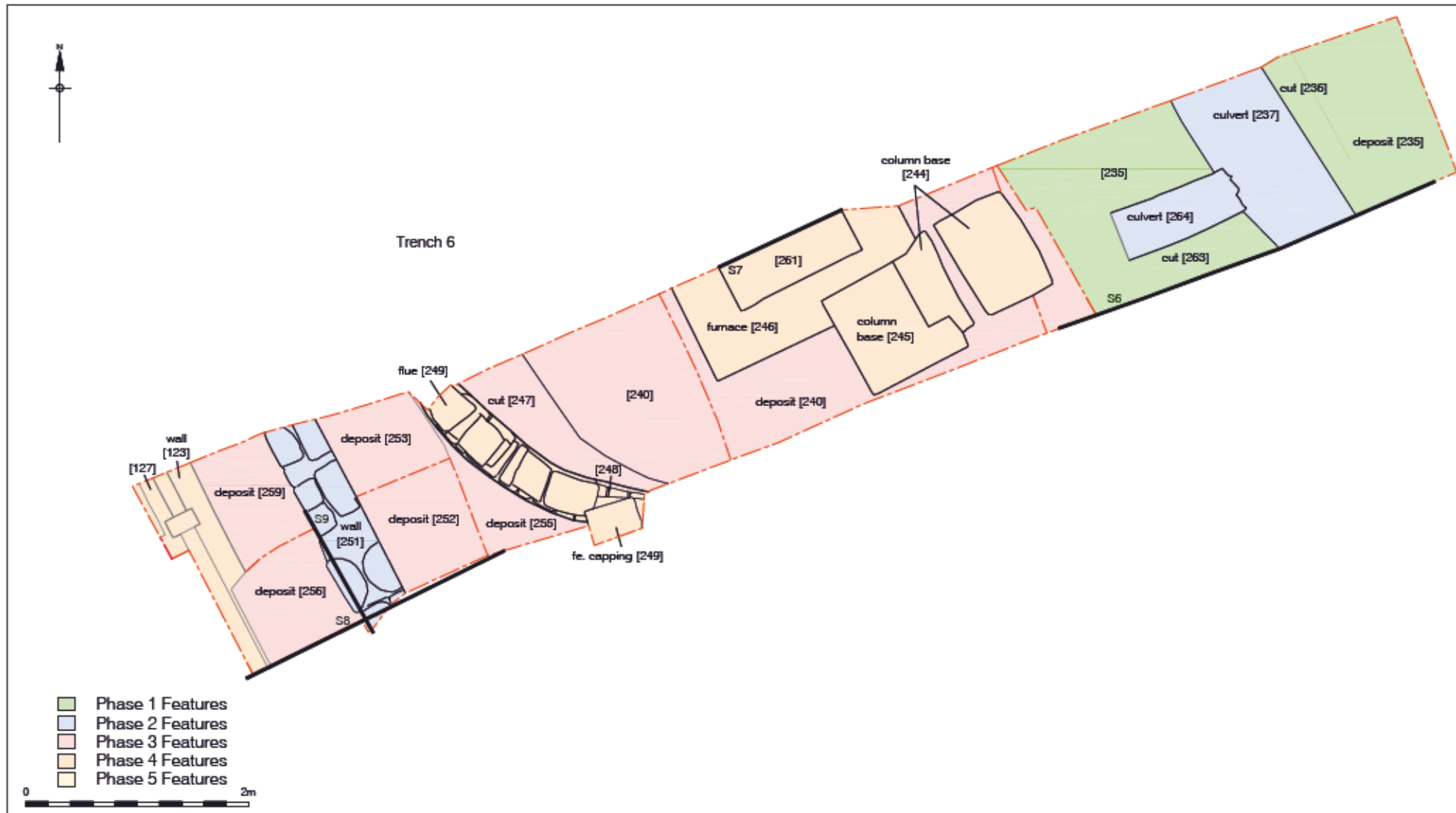
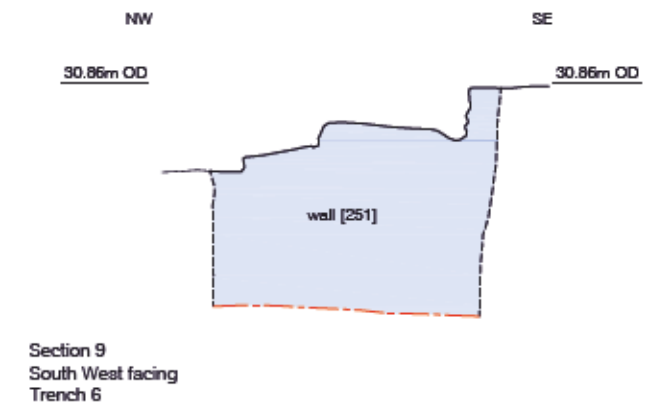
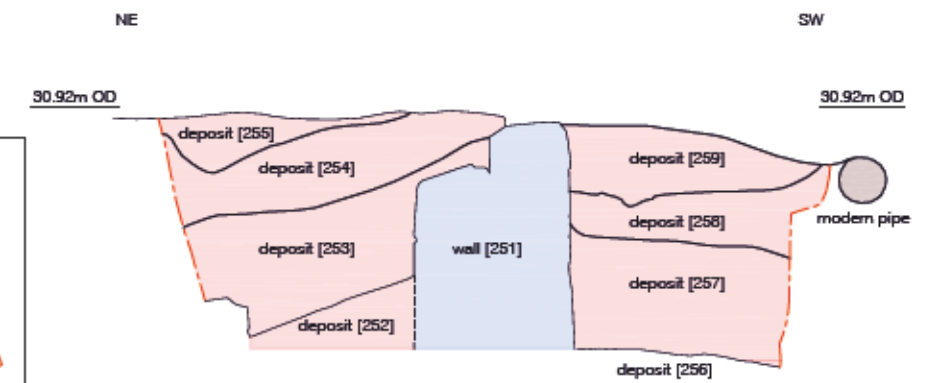
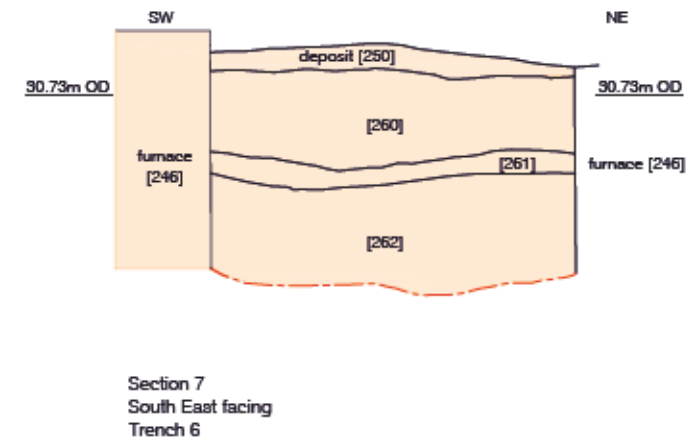
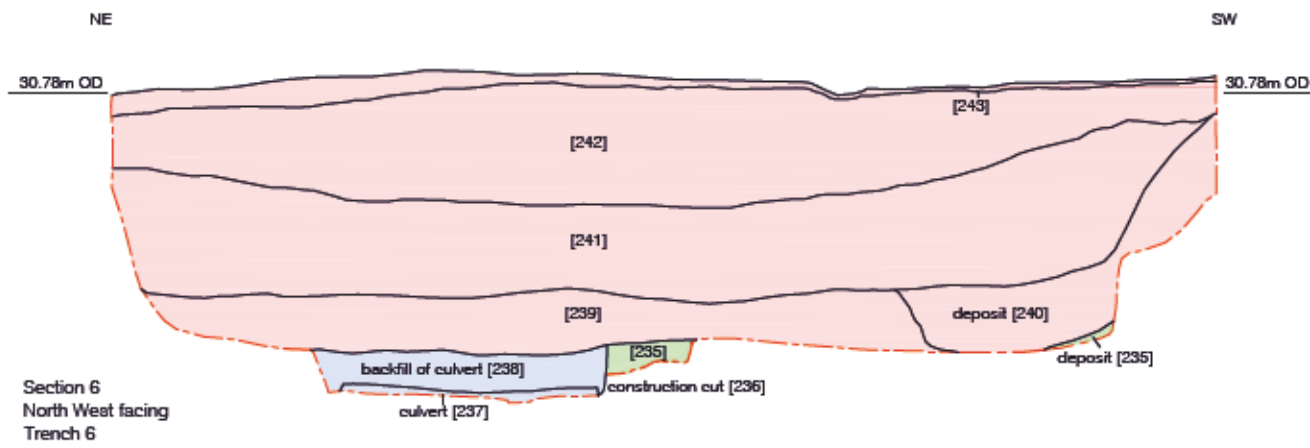
Section 3
South West Facing
Trench 5



Section 4
North West Facing
Trench 5

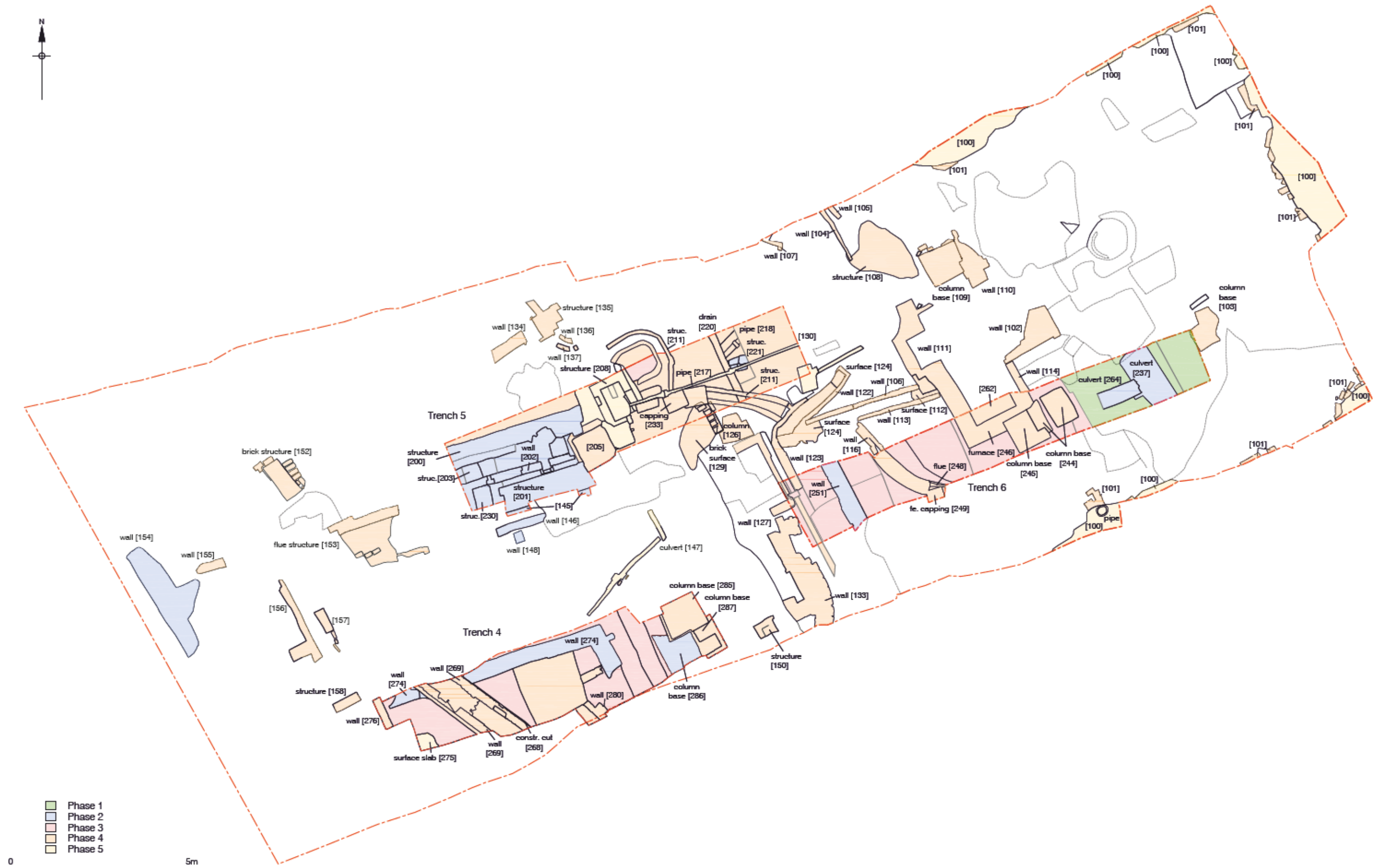


Figure 5
Trench 5 Plan and Sections
1:50 and 1:25 at A3



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Figure 6
Trench 6 Plan and Sections
1:50 and 1:25 at A3



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Figure 7
Area 1 and Trenches 4, 5 and 6: All Phases and Features
1:100 at A3



- Phase 0 Feature
- Phase 2 Features
- Phase 3 Features
- Phase 4 Features
- Phase 5 Features
- Excavated Slot

0 5m

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Figure 8
Phased Plan of Area 2
1:125 at A3



0 2m
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 27/10/17 CF

Figure 09
 Detail Plan of Foundry Structure [1222]
 1:50 at A3

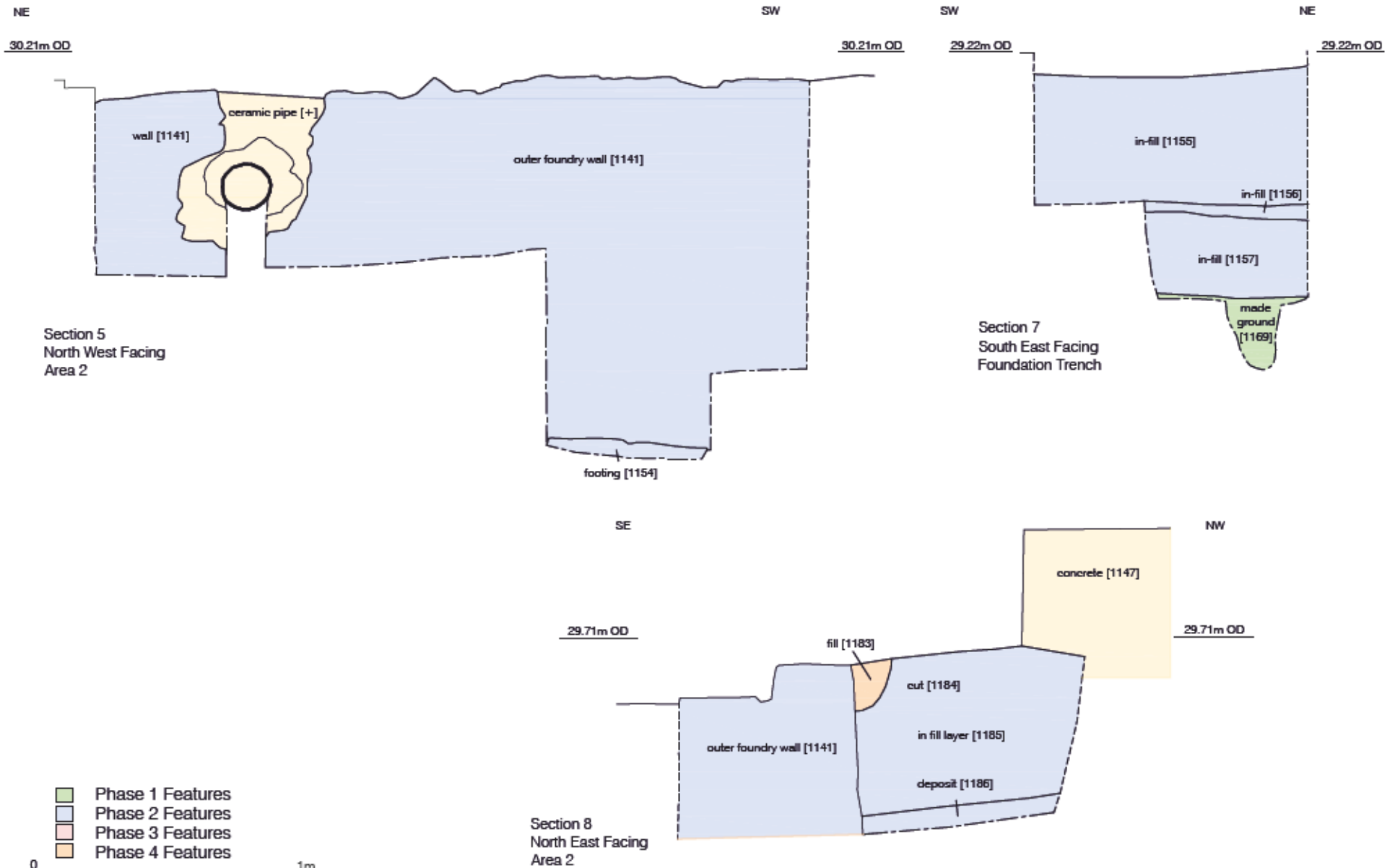
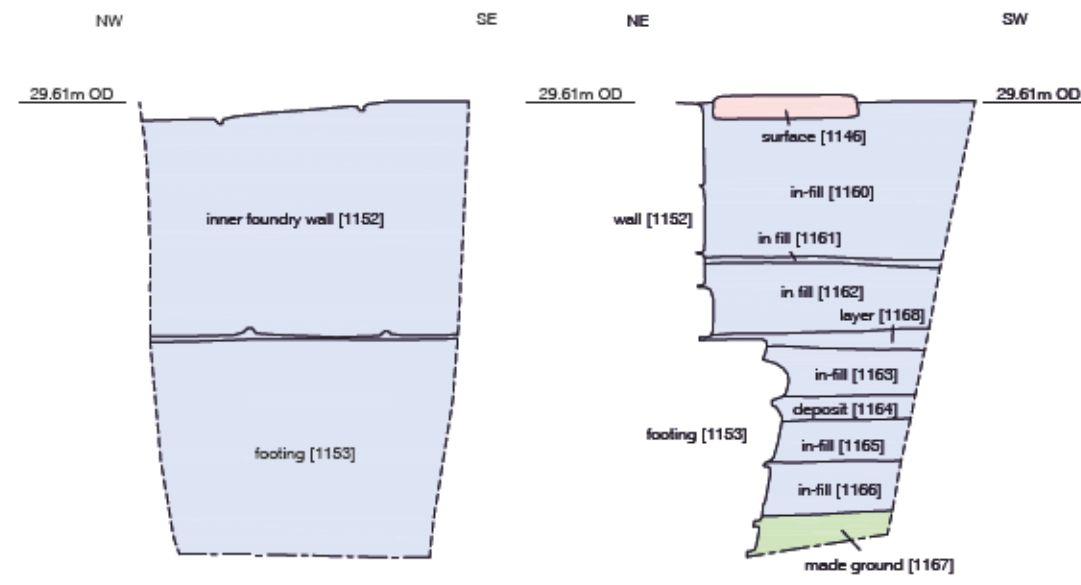
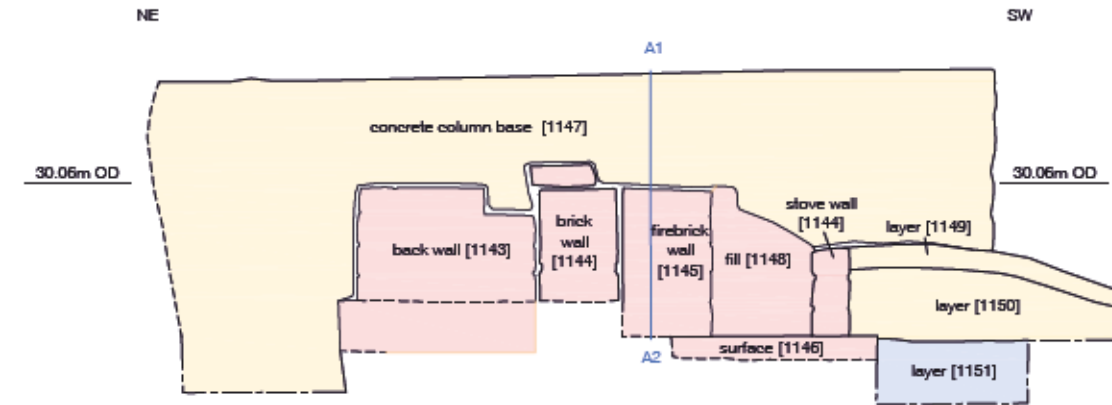


Figure 10
Elevation and Sections of foundry outer wall [1141]
1:20 at A4

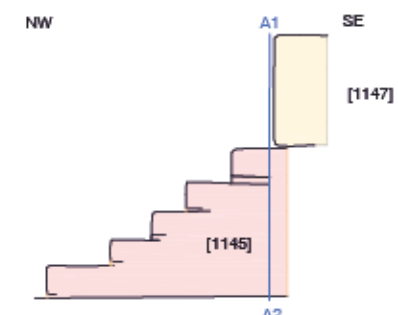


Section 4
South West Facing
Area 2

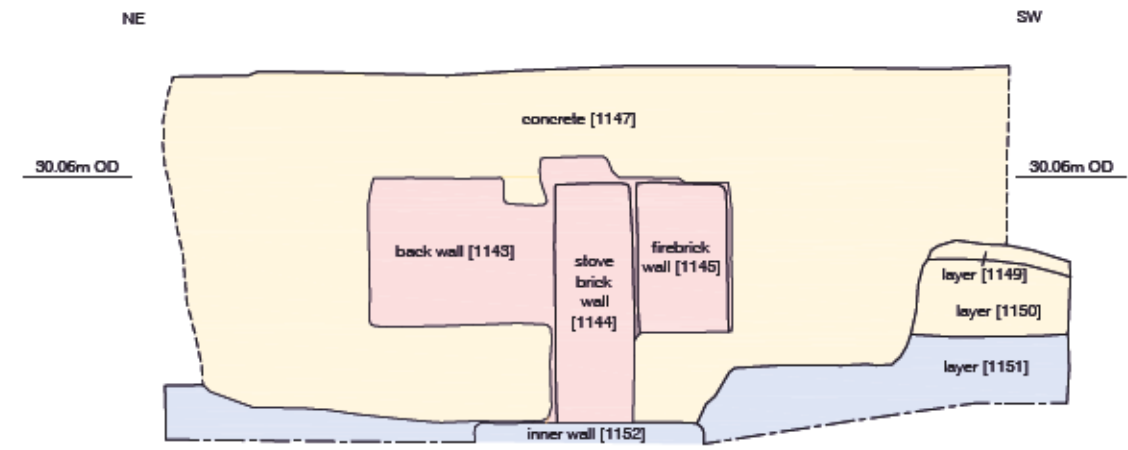
Section 6
North West Facing
Area 2



Section 3
North West Facing
Area 2

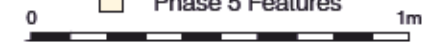


Profile showing projection of wall [1145]
North East Facing
Area 2



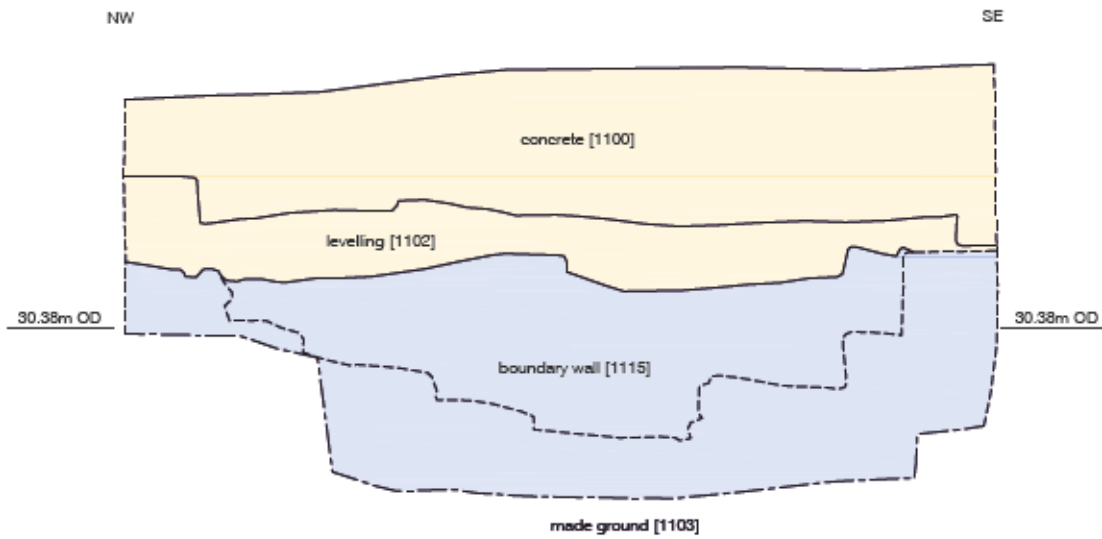
Section 11
North West Facing elevation drawn after removal of stove structure
Area 2

- Phase 1 Features
- Phase 2 Features
- Phase 3 Features
- Phase 4 Features
- Phase 5 Features

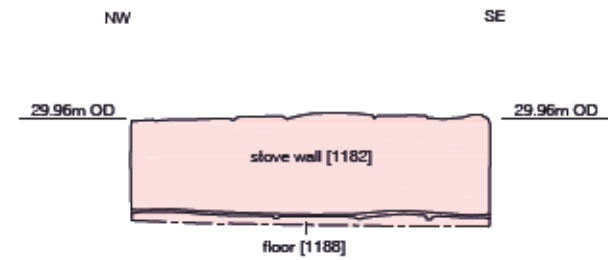


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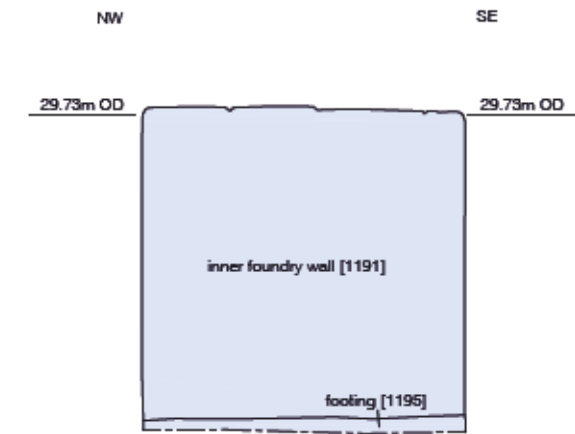
Figure 11
Elevation of wall [1152] and section of sondage showing in-fill layers
1:20 at A3



Section 2
South West Facing
Foundation Trench



Section 9
South West Facing
Area 2

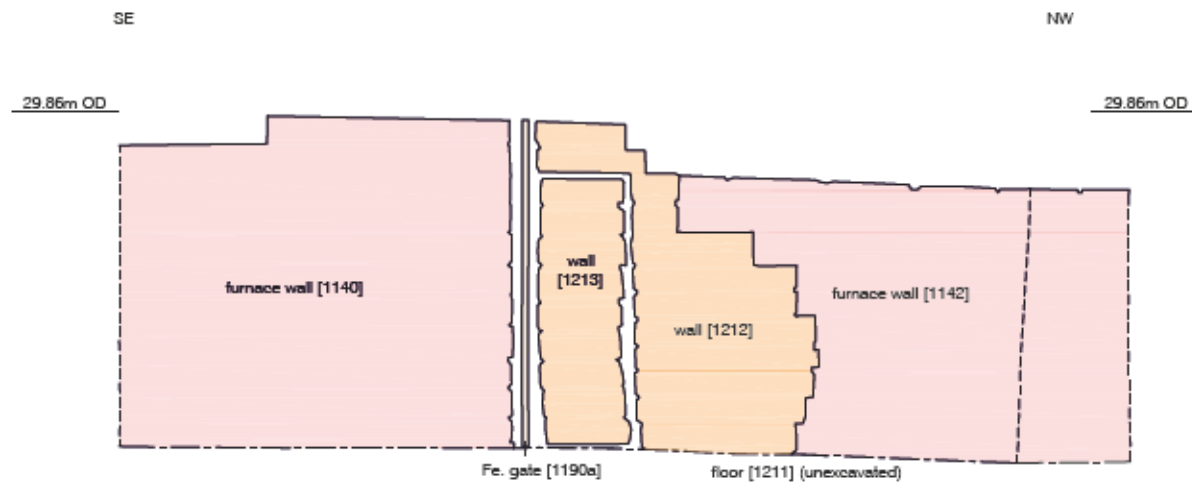


Section 10
South West Facing
Area 2

- Phase 2 Features
- Phase 3 Features
- Phase 5 (modern) Features

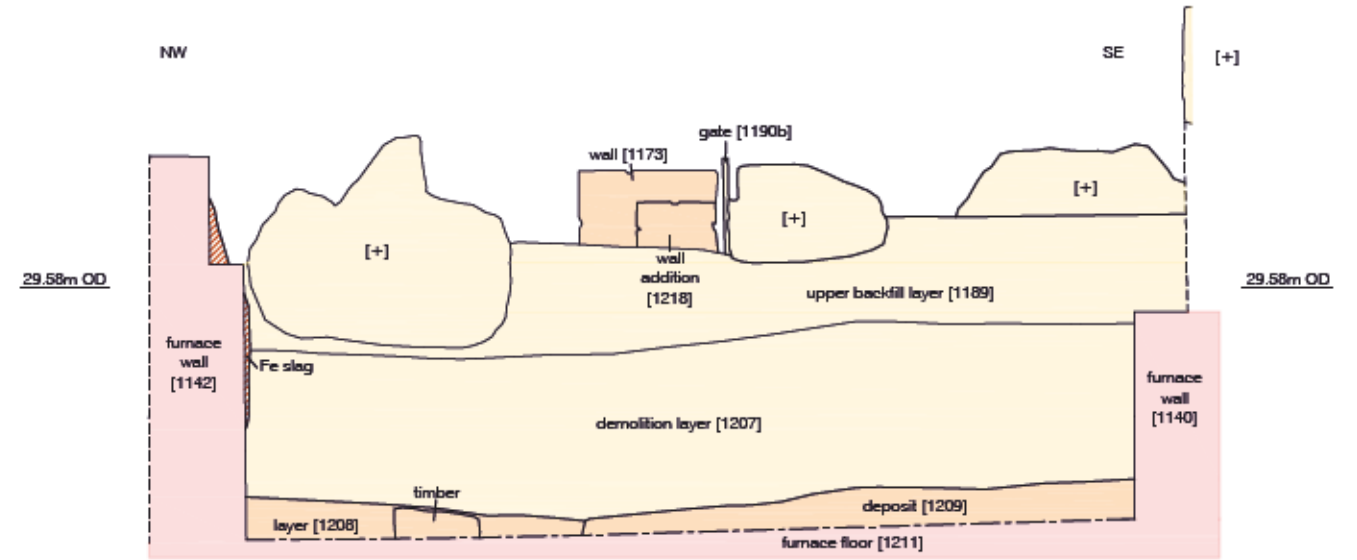


Figure 12
Elevation of boundary wall [1115]
1:20 at A4

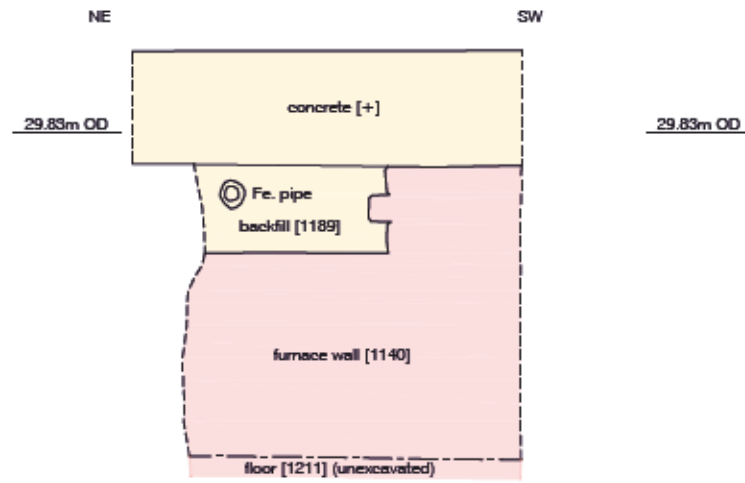


Section 15
North East Facing
Area 2

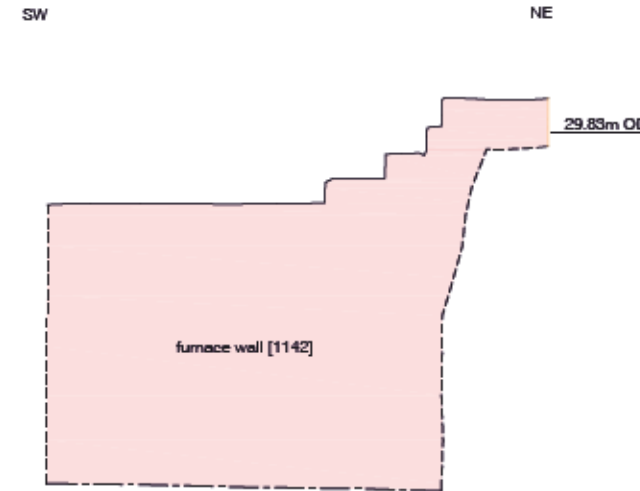
Section 16
North East Facing
Area 2



Section 19
South West Facing
Area 2



Section 17
North West Facing
Area 2



Section 18
South East Facing
Area 2

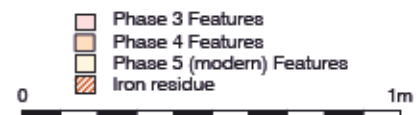
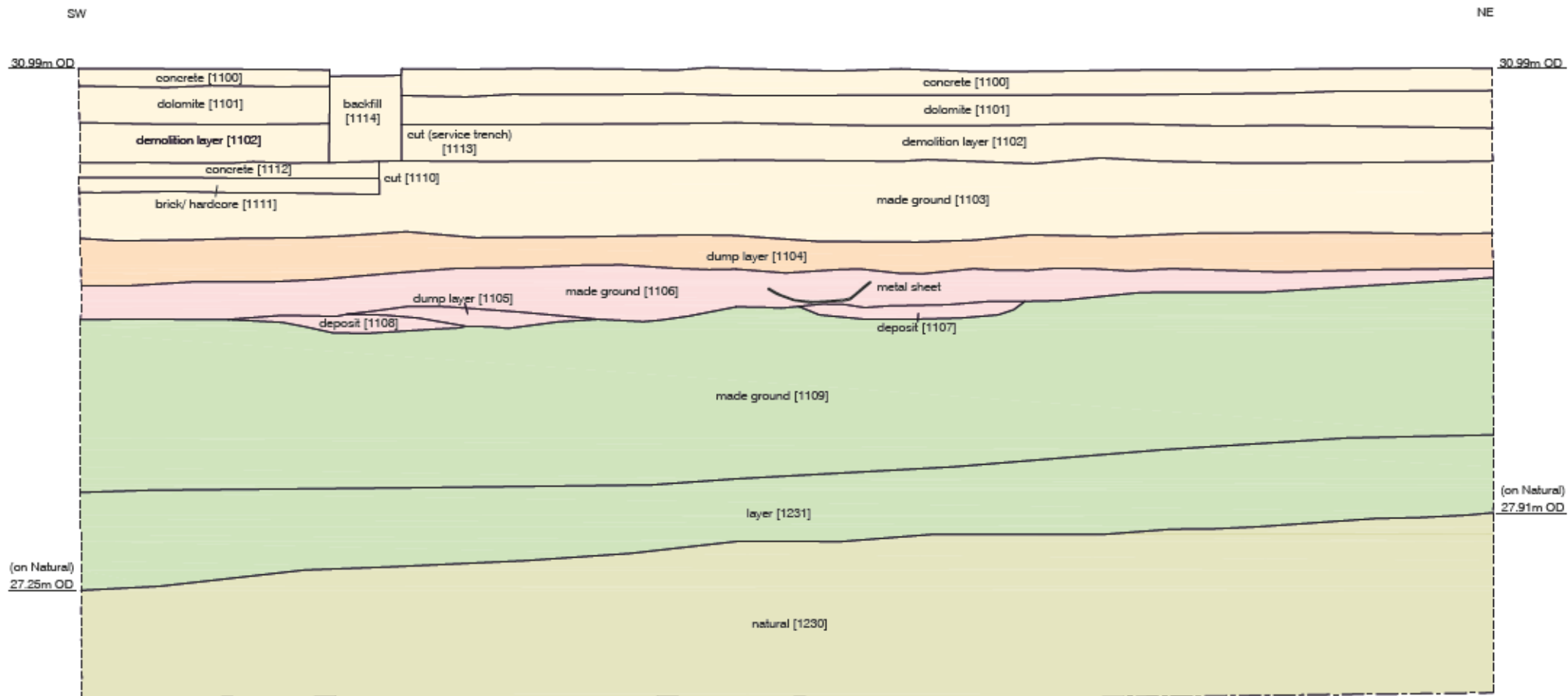


Figure 13
Elevation and Sections associated with furnace [1217]
1:20 at A3



Section 1
 South East Facing
 Foundation Trench



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Figure 14
 Section of Foundation Trench
 1:40 at A4



Figure 15
 Oliver's map of 1830 with trenches overlain
 1:625 at A3



Figure 16
 1862 OS map with trenches and phased features overlain
 1:250 at A3



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Figure 17
 Second Edition OS map of 1896 with trenches and features overlain
 1:250 at A3

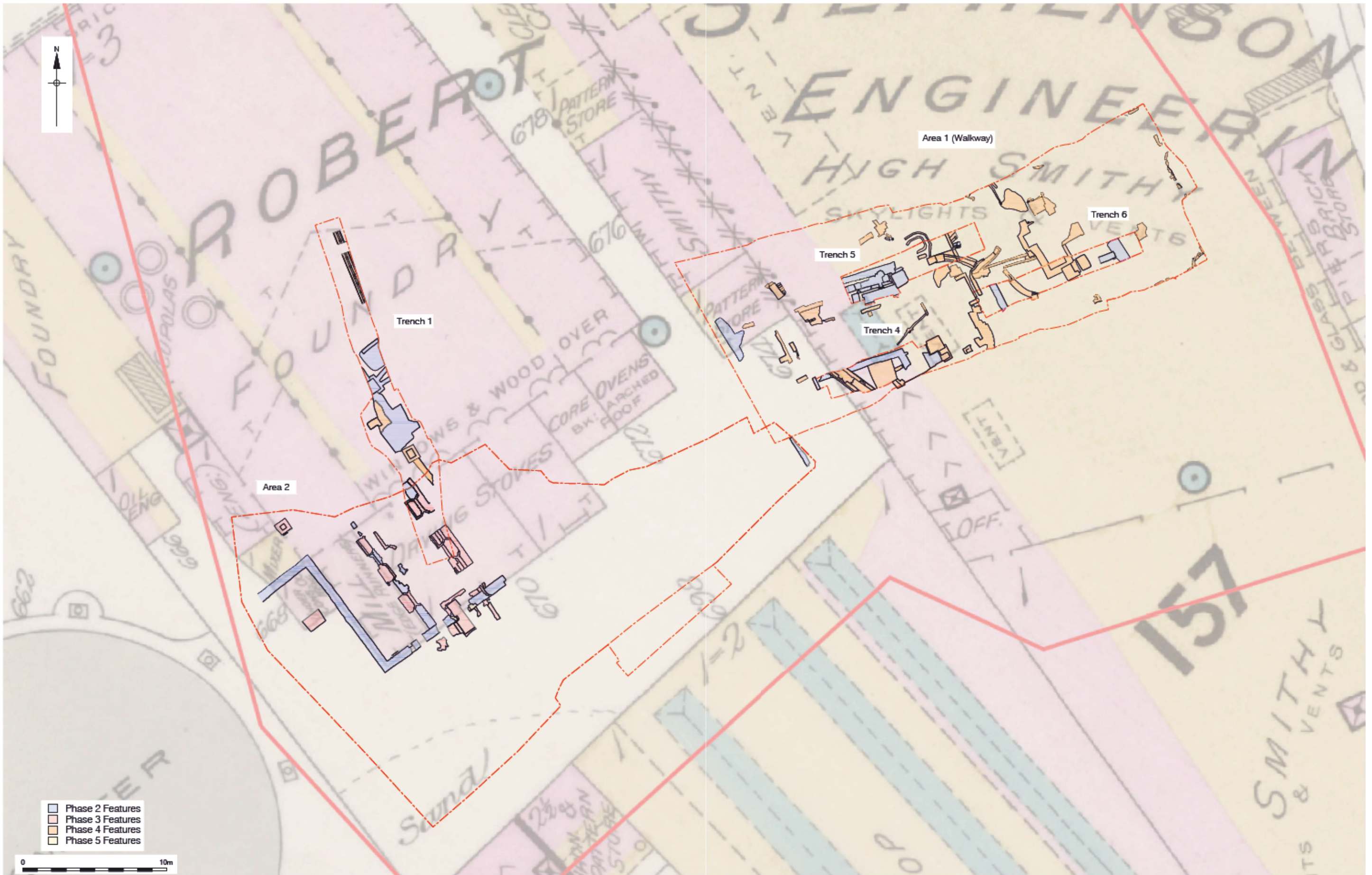


Figure 18
Goad Fire Insurance map of 1896 with trenches and features overlain
1:250 at A3

APPENDIX 2: CONTEXT INDEX

<i>Context</i>	<i>Area / Trench</i>	<i>Group</i>	<i>Phase</i>	<i>Fill of</i>	<i>Type 1</i>	<i>Type 2</i>	<i>Interpretation</i>
100	Area 1		5		Structure	Surface	Concrete slab
101	Area 1		4		Masonry	Surface	Brick surface
102	Area 1		4		Masonry	Furnace	Brick wall of Furnace
103	Area 1		4		Masonry	Column base	Sandstone block column base
104	Area 1		4		Masonry	Flue	Brick wall of Flue
105	Area 1		4		Masonry	Flue	Brick wall of Flue
106	Area 1		4		Masonry	Flue	Brick wall of Flue
107	Area 1		4		Masonry	Flue	Brick wall of Flue
108	Area 1		4		Masonry	structure	Brick structure and Fe pipe
109	Area 1		4		Masonry	Column base	Sandstone block column base
110	Area 1		4		Masonry	Furnace	Brick wall of Furnace
111	Area 1		4		Masonry	Furnace	Brick wall of Furnace
112	Area 1		4		Masonry	Surface	Brick surface of Flue
113	Area 1		4		Masonry	Flue	Brick wall of Flue
114	Area 1		4		Masonry	Furnace	Brick wall of Furnace
115	Area 1		4		Masonry	Column base	Sandstone block column base
116	Area 1		4		Masonry	Flue	Brick wall of Flue
117	Area 1		4		Masonry	Flue	Brick wall of Flue
118	Area 1		4		Masonry	Flue	Brick surface of Flue
119	Area 1		4		Masonry	Flue	Brick wall of Flue
120	Area 1		4		Structure	Flue	Fe sheet surface of Flue
121	Area 1		4		Masonry	Flue	Brick wall of Flue
122	Area 1		4		Masonry	Flue	Brick wall of Flue
123	Area 1		4		Masonry	Flue	Brick wall of Flue
124	Area 1		4		Masonry	Flue	Brick surface of Flue
125	Area 1		4		Masonry	Flue	Brick wall of Flue
126	Area 1		4		Masonry	Column base	Sandstone block column base
127	Area 1		4		Masonry	Flue	Brick wall of Flue?
128	Area 1		4		Masonry	Flue	Brick surface of Flue
129	Area 1		4		Masonry	Flue	Brick surface of Flue
130	Area 1		5		Masonry	Flue	Brick Flue and Iron cast pipe
131	Area 1		4		Masonry	Flue	Brick wall of Flue
132	Area 1		4		Masonry	Flue	Brick surface of Flue
133	Area 1		4		Masonry	Flue	Brick wall of Flue
134	Area 1		4		Masonry	Flue	Brick wall of Flue
135	Area 1		4		Masonry	Flue	Brick Flue structure
136	Area 1		4		Masonry	Flue	Brick wall of Flue
137	Area 1		4		Masonry	Flue	Brick wall of Flue
138	Area 1		5		Masonry	Structure	Brick drainage structure
139	Area 1		5		Masonry	Structure	Brick structure
140	Area 1		2		Masonry	Wall	Sandstone block wall, same as [200]

141	Area 1		2		Masonry	Wall	Brick wall for Flue, same as [202]
142	Area 1		2		Masonry	Wall	Brick wall for Flue, same as [202]
143	Area 1		2		Masonry	Wall	Brick wall for Flue, same as [228]
144	Area 1		4		Masonry	Column base	Sandstone column base
145	Area 1		2		Masonry	Flue	Brick wall of Flue
146	Area 1		2		Masonry	Flue	Brick wall of Flue
147	Area 1		5		Masonry	Culvert	Brick culvert
148	Area 1		2		Masonry	Flue	Brick wall of Flue
149	Area 1		2		Masonry	Column base	Sandstone block column base
150	Area 1		4		Masonry	Structure	Brick structure
151	Area 1		4		Masonry	Column base	Sandstone column base
152	Area 1		4		Masonry	Structure	Brick structure
153	Area 1		4		Masonry	Flue	Flue structure
154	Area 1		2		Masonry	Wall	Sandstone block wall
155	Area 1		4		Masonry	Flue	Brick wall of Flue
156	Area 1		4		Masonry	Flue	Brick wall of Flue
157	Area 1		4		Masonry	Flue	Brick wall of Flue
158	Area 1		4		Masonry	Structure	Brick structure
159	Area 1		4		Masonry	Structure	Brick structure, same as [276]
200	5		2		Masonry	Wall	Sandstone block wall, same as [140]
201	5		2		Masonry	Wall	Sandstone block wall
202	5		2		Masonry	Flue	Flue, same as [141] & [142]
203	5		2		Masonry	Surface	Sandstone flag surface
204	5		3		Deposit	Fill	Backfill of Flue
205	5		4		Masonry	Column base	Sandstone block column base
206	5		5		Cut	Drain	Construction cut for inspection pit [208]
207	5		5	[206]	Deposit	Fill	Backfill of construction cut [206]
208	5		5	[206]	Masonry	Drain	Brick inspection pit
209	5		5	[206]	Deposit	Fill	Backfill of inspection pit [208]
210	5		4		Cut	Flue	Construction cut for Flue [211]
211	5		4	[210]	Masonry	Flue	Brick Flue
212	5		4	[210]	Structure	Flue	Fe sheets forming base of Flue [211]
213	5		4	[210]	Deposit	Fill	Backfill of Flue [211]
214	5		4		Deposit	Layer	Levelling/consolidation deposit
215	5		3		Deposit	Layer	Levelling/consolidation deposit
216	5		3		Deposit	Layer	Levelling/consolidation deposit
217	5		5		Structure	Pipe	Fe pipe
218	5		4		Structure	Pipe	Fe pipe
219	5		4		Cut	Drain	Construction cut for ceramic drain

220	5		4	[219]	Structure	Drain	Ceramic salt glazed pipe
221	5		2		Masonry	Wall	Sandstone block wall
222	5		4	[219]	Deposit	Fill	Backfill of drainage feature
223	5		4		Deposit	Layer	Levelling/consolidation deposit
224	5		3		Deposit	Layer	Levelling/consolidation deposit
225	5		3		Deposit	Layer	Levelling/consolidation deposit
226	5		3		Deposit	Layer	Levelling/consolidation deposit
227	5		3		Deposit	Layer	Levelling/consolidation deposit
228	5		2		Masonry	Infill	Brick infill between walls [202] & [200], same as [143]
229	5		2		Cut	Flue	Construction cut for Flue [230]
230	5		2	[229]	Masonry	Flue	Brick flue
231	5		2	[229]	Deposit	Fill	Backfill of Flue [230]
232	5		2		Deposit	Fill	Backfill between walls [201] & [202]
233	5		4		Structure	Flue	Fe sheets capping Flue [211]
234	5		2	[229]	Deposit	Fill	Backfill of construction cut [229]
235	6		1		Deposit	Layer	Levelling/consolidation deposit
236	6		2		Cut	Culvert	Construction cut for culvert [237]
237	6		2	[237]	Masonry	Culvert	Culvert
238	6		2	[237]	Deposit	Fill	Backfill of culvert
239	6		3		Deposit	Layer	Levelling/consolidation deposit
240	6		3		Deposit	Layer	Levelling/consolidation deposit
241	6		3		Deposit	Layer	Levelling/consolidation deposit
242	6		3		Deposit	Layer	Levelling/consolidation deposit
243	6		3		Deposit	Layer	Levelling/consolidation deposit
244	6		4		Structure	Column base	Concrete slab
245	6		4	[346]	Masonry	Column base	Sandstone block column base
246	6		4	[345]	Masonry	Wall	Brick furnace
247	6		4		Cut	Flue	Construction cut for flue
248	6		4	[247]	Masonry	Flue	Flue
249	6		4	[247]	Structure	Capping	Fe sheets capping Flue [248]
250	6		4	[345]	Masonry	Wall	Sandstone block wall
251	6		2		Masonry	Wall	Sandstone block wall
252	6		3		Deposit	Layer	Levelling/consolidation deposit
253	6		3		Deposit	Layer	Levelling/consolidation deposit
254	6		3		Deposit	Layer	Levelling/consolidation deposit

							on deposit
255	6		3		Deposit	Layer	Levelling/consolidation deposit
256	6		3		Deposit	Layer	Levelling/consolidation deposit
257	6		3		Deposit	Layer	Levelling/consolidation deposit
258	6		3		Deposit	Layer	Levelling/consolidation deposit
259	6		3		Deposit	Layer	Levelling/consolidation deposit
260	6		4	[345]	Deposit	Fill	Backfill of Furnace [246]
261	6		4	[345]	Deposit	Fill	Backfill of Furnace [246]
262	6		4	[345]	Deposit	Fill	Backfill of Furnace [246]
263	6		2		Cut	Culvert	Construction cut for Culvert [264]
264	6		2	[263]	Masonry	Culvert	Culvert
265	4		5		Deposit	Layer	Levelling/consolidation deposit
266	4		5		Deposit	Layer	Levelling/consolidation deposit
267	4		3		Deposit	Layer	Levelling/consolidation deposit
268	4		4		Cut	Flue	Construction cut for Flue [269]
269	4		4	[268]	Masonry	Flue	Flue
270	4		4	[268]	Deposit	Fill	Backfill of construction cut [268]
271	4		4	[268]	Deposit	Fill	Backfill of Flue [269]
272	4		4	[268]	Deposit	Fill	Backfill of Flue [269]
273	4		4	[268]	Masonry	Infill	Brick infill associated with Flue [269]
274	4		2		Masonry	Wall	Sandstone block wall
275	4		5		Structure	Surface	Concrete slab
276	4		4		Masonry	Wall	Wall, same as [159]
277	4		3		Deposit	Layer	Levelling/consolidation deposit
278	4		4		Deposit	Layer	Levelling/consolidation deposit
279	4		4	[343]	Masonry	Wall	Wall
280	4		4	[344]	Masonry	Wall	Wall
281	4		5		Deposit	Layer	Levelling/consolidation deposit
282	4		3		Deposit	Layer	Levelling/consolidation deposit
283	4		4		Cut	Column base	Construction cut for column base [285]
284	4		4	[283]	Deposit	Fill	Backfill of construction cut [283]
285	4		4	[283]	Masonry	Column base	Sandstone block column base
286	4		2		Masonry	Column base	Sandstone block column base
287	4		4		Masonry	Column base	Brick and concrete column base
288	4		4		Deposit	Fill	Backfill of Column base [287]

289	4		3		Deposit	Layer	Levelling/consolidati on deposit
290	4		3		Deposit	Layer	Levelling/consolidati on deposit
291	4		3		Deposit	Layer	Levelling/consolidati on deposit
292	4		3		Deposit	Layer	Levelling/consolidati on deposit
293	4		3		Deposit	Layer	Levelling/consolidati on deposit
294	4		3		Deposit	Layer	Levelling/consolidati on deposit
295	4		5	[330]	Masonry	Culvert	Culvert
296	1		5		Deposit	Layer	Levelling/consolidati on deposit
297	1		5		Structure	Surface	Concrete slab
298	1		5		Deposit	Layer	Levelling/consolidati on deposit
299	1		5		Deposit	Layer	Levelling/consolidati on deposit
300	1		5		Deposit	Layer	Levelling/consolidati on deposit
301	1		5		Deposit	Layer	Levelling/consolidati on deposit
302	1		5		Structure	Surface	Concrete slab and piles
303	1		2	[305]	Masonry	Furnace	Sandstone block element of Furnace
304	1		2	[305]	Masonry	Furnace	Brick element of Furnace
305	1		2		Cut	Furnace	Construction cut for Furnace
306	1		1		Deposit	Layer	Levelling/consolidati on deposit
307	1		1		Deposit	Layer	Levelling/consolidati on deposit
308	1		4	[310]	Deposit	Fill	Backfill of inspection pit [309]
309	1		4	[310]	Cut	Inspection pit	Construction cut for inspection pit [309]
310	1		4	[310]	Masonry	Inspection pit	Brick inspection pit
311	1		4	[337]	Deposit	Fill	Backfill of Column base [312]
312	1		4	[337]	Masonry	Column base	Sandstone block column base
313	1		2		Masonry	Surface	Brick surface
314	1		4	[337]	Deposit	Fill	Backfill of Column base [312]
315	1		5		Masonry	Surface	Brick surface
316	1		1		Deposit	Layer	Levelling/consolidati on deposit
317	1		2	[320]	Deposit	Fill	Backfill of structure [318]
318	1		2	[320]	Masonry	Structure	Brick wall
319	1		2	[320]	Deposit	Fill	Backfill of structure [318]
320	1		2		Cut	Discrete	Construction cut for structure [318]
321	1		5	[322]	Structure	Capping	Concrete slab capping duct
322	1		5		Cut	Duct	Construction cut for duct [321]
323	1		4	[325]	Structure	Pipe	Ceramic salt glazed pipe

324	1		4	[325]	Masonry	Drain	Brick encasing ceramic pipe [323]
325	1		4		Cut	Drain	Construction cut for drain
326	1		1		Deposit	Layer	Levelling/consolidation deposit
327	1		4	[328]	Deposit	Fill	Backfill of drainage feature [328]
328	1		4		Cut	Drain	Drain
329	4		3		Deposit	Layer	Levelling/consolidation deposit
330	4		5		Cut	Culvert	Construction cut for Culvert [295]
331	4		3		Deposit	Layer	Levelling/consolidation deposit
332	4		3		Deposit	Layer	Levelling/consolidation deposit
333	4		3		Deposit	Layer	Levelling/consolidation deposit
334	4		3		Deposit	Layer	Levelling/consolidation deposit
335	4		3		Deposit	Layer	Levelling/consolidation deposit
336	4		3		Deposit	Layer	Levelling/consolidation deposit
337	1		4		Cut	Column base	Construction cut for Column base [312]
338	1		5	[322]	Deposit	Fill	Backfill of construction cut [322] duct [321]
339	1		1		Deposit	Layer	Levelling/consolidation deposit
340	1		2	[341]	Deposit	Fill	Backfill of Drain/Flue
341	1		2		Cut	Drain/Flue	Construction cut for Drain/Flue
342	1		2	[341]	Structure	Capping	Fe sheet capping Drain/Flue [341]
343	4		4		Cut	Linear	Construction cut for wall [279]
344	4		4		Cut	Linear	Construction cut for wall [280]
345	6		4		Cut	Furnace	Construction cut for Furnace [246]
346	6		4		Cut	Column base	Construction cut for column base [245]
347	4		4		Deposit	Fill	Backfill of construction cut [348], wall [276]
348	4		4		Cut	Linear	Construction cut for wall [276]
1100	Foundation Trench		5		Structure	Surface	Existing concrete surface
1101	Foundation Trench		5		Deposit	Layer	Dolomite bedding layer
1102	Foundation Trench		5		Deposit	Layer	Demolition/ levelling layer
1103	Foundation Trench		5		Deposit	Layer	Made ground layer
1104	Foundation Trench		4		Deposit	Layer	Dump layer - industrial waste?
1105	Foundation Trench		3		Deposit	Layer	Clinker/ slag dump layer
1106	Foundation Trench		3		Deposit	Layer	Made ground layer
1107	Foundation		3		Deposit	Layer	Clayey sand deposit

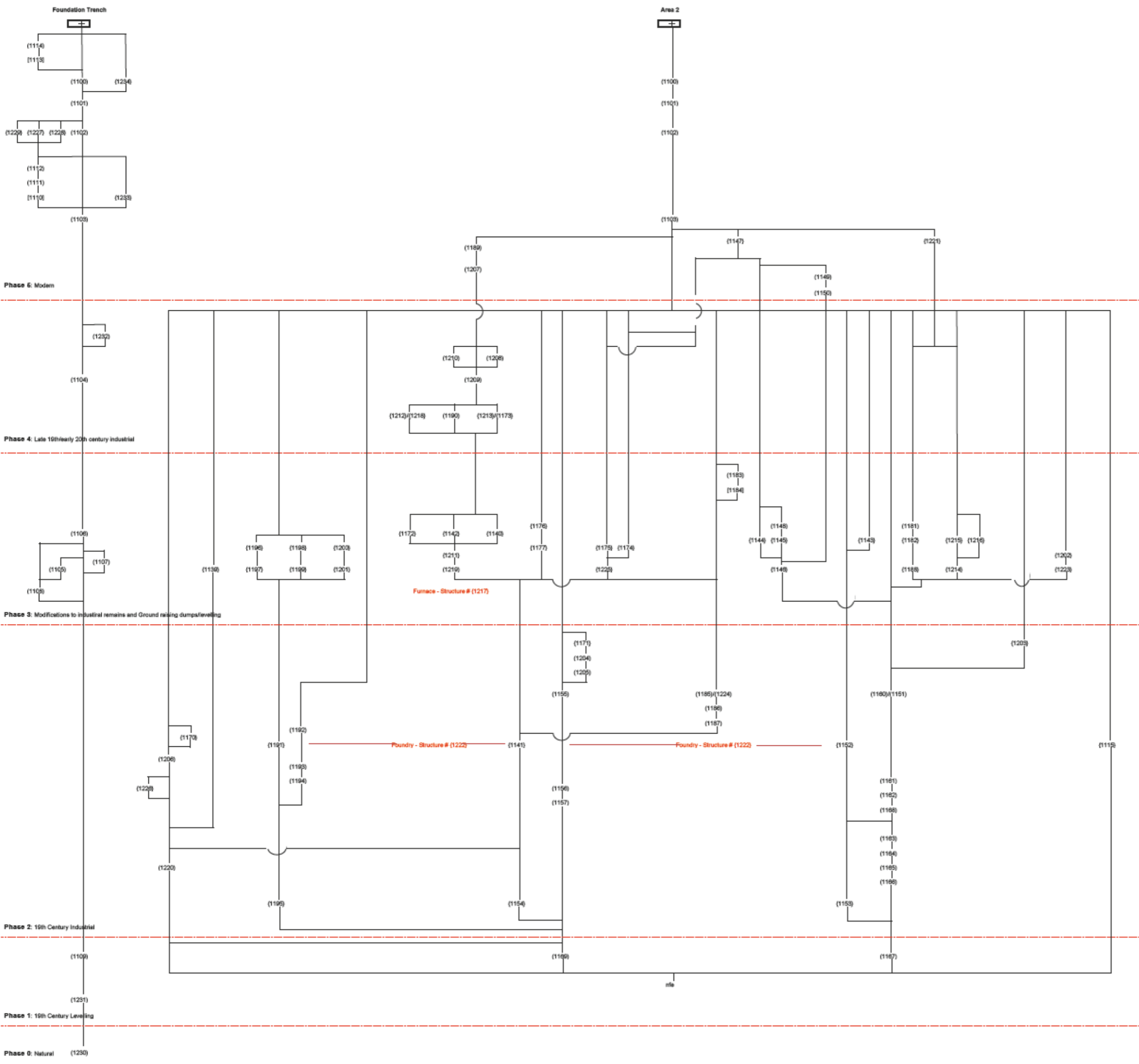
	Trench						(similar to (1108))
1108	Foundation Trench		3		Deposit	Layer	Clayey sand deposit (similar to (1107))
1109	Foundation Trench		1		Deposit	Layer	Made ground layer
1110	Foundation Trench		5		Cut	Discrete	Construction cut for concrete surface
1111	Foundation Trench		5	[1110]	Deposit	Layer	Bedding layer for {1112}
1112	Foundation Trench		5		Structure	Surface	Concrete surface
1113	Foundation Trench		5		Cut	Linear	Cut for service trench
1114	Foundation Trench		5	[1113]	Deposit	Fill	Backfill of [1113]
1115	Area 2		2		Masonry	Wall	Sandstone boundary wall
1116	Area 2		U/S		Masonry	Column b+G18:G39ase	Sandstone column base
1117	Area 2		U/S		Masonry	Column base	Sandstone column base
1118	Area 2		U/S		Masonry	Column base	Sandstone column base
1119	Area 2		U/S		Masonry	Column base	Sandstone column base
1120	Area 2		U/S		Masonry	Column base	Sandstone column base
1121	Area 2		U/S		Masonry	Column base	Sandstone column base
1122	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1123	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1124	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1125	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1126	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1127	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1128	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1129	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1130	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1131	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1132	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1133	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1134	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1135	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1136	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1137	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1138	Area 2		U/S		Masonry	Millstone	Sandstone millstone block
1139	Area 2		3		Masonry	Surface	Sandstone floor

						(outer)	
1140	Area 2		3		Masonry	Wall	Common brick wall of furnace {1217}
1141	Area 2		2		Masonry	Wall	Outer sandstone wall of the foundry
1142	Area 2		3		Masonry	Wall	Fire brick wall of furnace {1217}
1143	Area 2		3		Masonry	Wall	Outer fire brick wall (= {1225})
1144	Area 2		3		Masonry	Wall	Brick dividing wall of stove bay - SE end
1145	Area 2		3		Masonry	Wall	Inner wall of stove bay - SE end
1146	Area 2		3		Masonry	Surface	Sandstone surface for stove - SE end
1147	Area 2		5		Structure	Column base	Concrete column base
1148	Area 2		3		Deposit	Fill	Fill within stove bay - SE end
1149	Area 2		5		Deposit	Layer	Thin clay layer to the SW of {1144}
1150	Area 2		5		Deposit	Layer	Ash deposit to the SW of {1144}
1151	Area 2		2		Deposit	Layer	Ashy deposit (= 1160) to SW of {1144}
1152	Area 2		2		Masonry	Wall	Inner sandstone wall of the foundry
1153	Area 2		2		Masonry	Footing	Sandstone footing for wall {1152}
1154	Area 2		2		Masonry	Footing	Sandstone footing for outer wall {1141}
1155	Area 2		2		Deposit	Layer	In-fill deposit within the foundry
1156	Area 2		2		Deposit	Layer	In-fill deposit within the foundry
1157	Area 2		2		Deposit	Layer	In-fill deposit within the foundry
1158	Area 2				Masonry	Millstone	Re-used millstone within concrete footing {1179}
1159	Area 2				Masonry	Millstone	Re-used millstone within concrete footing {1179}
1160	Area 2		2		Deposit	Layer	Ashy deposit (= 1151) - in-fill deposit
1161	Area 2		2		Deposit	Layer	In-fill deposit within the foundry
1162	Area 2		2		Deposit	Layer	In-fill deposit within the foundry
1163	Area 2		2		Deposit	Layer	In-fill deposit within the foundry
1164	Area 2		2		Deposit	Layer	Fe slag waste deposit
1165	Area 2		2		Deposit	Layer	In-fill deposit within the foundry
1166	Area 2		2		Deposit	Layer	In-fill deposit within the foundry
1167	Area 2		1		Deposit	Layer	Made ground layer
1168	Area 2		2		Deposit	Layer	Red sandy gravel layer
1169	Area 2		1		Deposit	Layer	Made ground layer
1170	Area 2		2		Masonry	Column base	Sandstone column base (outer)
1171	Area 2		2		Masonry	Column base	Sandstone column

							base (inner)
1172	Area 2		3		Masonry	Wall	Common brick wall of furnace {1217}
1173	Area 2		4		Masonry	Wall	Fire brick wall of furnace {1217} (= {1213})
1174	Area 2		3		Masonry	Wall	Fire brick wall to NE of furnace {1217}
1175	Area 2		3		Masonry	Wall	Common brick of wall of possible stove bay
1176	Area 2		3		Masonry	Drain	Brick opening - possible drain for pipe {1177}
1177	Area 2		3		Structure	Pipe	Ceramic pipe
1178	Area 2				Deposit	Layer	Bedding layer for {1179}
1179	Area 2				Structure	Footing	Possible concrete footing
1180	Area 2				Structure	Wall/barrier	Possible concrete wall/ barrier
1181	Area 2		3		Deposit	Fill	In-fill of stove bay NW end
1182	Area 2		3		Masonry	Wall	Common brick wall of stove bay - NW end
1183	Area 2		3	[1184]	Deposit	Fill	Fill of shallow linear feature next to {1141}
1184	Area 2		3		Cut	Linear	Cut of shallow linear feature
1185	Area 2		2		Deposit	Layer	In-fill layer (= {1224}) within {1222}
1186	Area 2		2		Deposit	Layer	Deposit abutting NW side of {1141}
1187	Area 2		2		Deposit	Layer	Deposit abutting NW side of {1141}
1188	Area 2		3		Masonry	Surface	Sandstone floor of stove bay - NW end
1189	Area 2		5		Deposit	Layer	Upper back fill layer of furnace
1190	Area 2		4		Structure	Metal	Metal gates within the furnace
1191	Area 2		2		Masonry	Wall	Inner sandstone wall of the foundry
1192	Area 2		2		Deposit	Layer	In-fill layer
1193	Area 2		2		Deposit	Layer	In-fill mortar layer
1194	Area 2		2		Deposit	Layer	In-fill slag and charcoal layer
1195	Area 2		2		Masonry	Footing	Sandstone footing for wall {1191}
1196	Area 2		3		Masonry	Wall	Common brick wall of stove bay in wall {1191}
1197	Area 2		3		Masonry	Floor	Sandstone floor of stove bay in wall {1191}
1198	Area 2		3		Masonry	Wall	Common brick wall of stove bay in wall {1191}
1199	Area 2		3		Masonry	Floor	Sandstone floor of stove bay in wall {1191}
1200	Area 2		3		Masonry	Wall	Common brick wall of stove bay in wall

						{1191}
1201	Area 2		3		Masonry	Floor Sandstone floor of stove bay in wall {1191}
1202	Area 2		3		Masonry	Floor Remains of a sandstone floor
1203	Area 2		2		Masonry	Wall Brick and stone wall of possible stove bay
1204	Area 2		2		Deposit	Concrete Concrete bedding layer for {1171}
1205	Area 2		2		Structure	Metal Metal plate base for {1171}
1206	Area 2		2		Deposit	Layer Sand deposit abutting SW side of wall {1141}
1207	Area 2		5		Deposit	Layer Demolition layer covering furnace
1208	Area 2		4		Deposit	Layer Industrial residue in NW end of furnace
1209	Area 2		4		Deposit	Fill Fe slag residue in SE end of furnace
1210	Area 2		4		Deposit	Layer Slag residue in S corner of furnace
1211	Area 2		3		Masonry	Surface Brick floor of furnace
1212	Area 2		4		Masonry	Wall Repairs/ additions to wall {1142} (= {1218})
1213	Area 2		4		Masonry	Wall Addition to wall {1142}
1214	Area 2		3		Masonry	Floor Sandstone floor of stove bay in wall {1152}
1215	Area 2		3		Masonry	Wall Brick wall of stove bay in wall {1152}
1216	Area 2		3		Masonry	Wall Inner brick wall of stove bay in wall {1152}
1217	Area 2		3		Structure	Furnace Structure number of furnace
1218	Area 2		4		Masonry	Wall Repairs/ additions to wall {1142} (= {1212})
1219	Area 2		3		Deposit	Layer Mortar layer below floor {1211} of furnace
1220	Area 2		2		Deposit	Layer Made ground layer
1221	Area 2		5		Structure	Column base Concrete column base
1222	Area 2		2		Structure	Foundry building Structure number of the foundry building
1223	Area 2		3		Masonry	Footing Sandstone footing of wall {1203}
1224	Area 2		2		Deposit	Layer In-fill layer (= {1185}) within {1222}
1225	Area 2		3		Masonry	Wall Outer fire brick wall (= {1143})
1226	Area 2		2		Masonry	Drain Brick drain opening/ manhole
1227	Foundation Trench		5		Masonry	Column base In-situ re-used sandstone block in (1102)
1228	Foundation Trench		5		Masonry	Column base In-situ re-used sandstone block in (1102)

1229	Foundation Trench		5		Masonry	Column base	In-situ re-used sandstone block in (1102)
1230	Foundation Trench		0		Geological	Natural	Natural clay substrate
1231	Foundation Trench		1		Deposit	Layer	Lowest layer within the trench
1232	Foundation Trench		4		Deposit	Layer	Sand deposit at NE end of the trench
1233	Foundation Trench		5		Masonry	Surface	Possible brick surface at NE end of the trench
1234	Foundation Trench		5		Structure	Footing	Concrete footing for a brick wall



APPENDIX 4: PHOTOGRAPHIC PLATES

Plate 1: North-east end of Foundation Trench: view north-east, 1m scale



Plate 2: Drying Stove [304]: view south-west, 1m scale



Plate 3: Floor [313]: view north-west, 1m scale



Plate 4: Trench 4, Wall [274], and column bases ([286] & [285] left to right in foreground).
Brick wall in background represent flue [269]: view north-west, 1m scale



Plate 5: Trench 5 structures: view north-east, 1m scale



Plate 6: Aerial shot of foundry structure [1222]: view east-north-east, 2x1m scale



Plate 7: Outer wall [1141]: view south-west, 1m scale



Plate 8: Inner wall [1191] showing surface [1139] in foreground: view north-west, 1m scale



Plate 9: Inner wall [1152] after removal of wall [1143] & stoves [1214] & [1146]: view east, 1m scale



Plate 10: Sandstone column base [1170]: view south-east, 1m scale



Plate 11: Sandstone column base [1171]: view north, 0.5m scale



Plate 12: Wall [1115]: view north-east, 1m scale



Plate 13: Furnace [1217] showing walls [1140], [1142], floor [1211] and surface [1139] in the background: view south-west, 1m scale



Plate 14: Stove [1196]/[1197] showing wall [1191]: view south-west, 1m scale



Plate 15: Stove [1198]/[1199]: view south-west, 1m scale



Plate 16: Stove [1200]/[1201] showing wall [1191]: view south-west, 1m scale



Plate 17: Stove [1182]/[1188] & wall [1143]: view north-west, 1m scale



Plate 18: Stoves [1215]/[1216]/[1214] & [1144]/[1144]: view north-east, 1m scale



Plate 19: Backwall [1143] and stoves [1214] & [1144] with Furnace [1217] in the background:
view south, 1m scale



Plate 20: Flue [248] Trench 6: view south, 1m scale



Plate 21: Flues across Area 1: view south, 2m scale



Plate 22: Brick structure [246]: view looking south, 1m scale



APPENDIX 5: POTTERY ASSESSMENT

Lucy Robinson

The archaeological investigations at Stephenson Quarter, Newcastle upon Tyne (SQN17 and SFT17) yielded a relatively small assemblage of pottery with 130 sherds in total weighing 2.758kg. The majority of sherds are in relatively good condition, however some show signs of burning and iron residue.

The assemblage was quantified by the standard measures of sherd count and weight, (Orton, Tyers and Vince 1993:168) and the information was entered into an MS Access database using the fabric codes shown in Table 1 below.

The main objective of this assessment is to catalogue and date the assemblages. The 'context considered dates' have been identified through a process of seriation using the fabric and decoration to date the sherds within a given context.

Fabric	Sherd count	EVEs	Weight (g)
BISC – Biscuit Fired state	7		33
BLGRE – Black Glazed Redware	4		64
BONE – Bone China	2		9
COLGE – Colour Glazed Earthenware	3		34
CREA – Creamware	4	0.12	37
ENGS – English Stoneware	1		49
ENPO – English Porcelain	1		3
EYGE – English Yellow Glazed Refined Earthenware	1		7
FACTSL – Factory Slipware	5	0.18	19
LGRE- Later Glazed Redware	44	4.17	906
PEARLW – Pearlware	8	0.14	60
PEARLWTP- Pearlware with Transfer Printed Decoration	7	0.13	39
REFW CHROM- Refined White Earthenware with under-glaze polychrome-painted decoration in 'chrome' colours	1		3
SAG – Saggur Fabric	2		1045
TGW – English Tin-Glazed ware	1	0.05	6
UNGRE – Unglazed Redwares	3		58
WGLEW- White Glazed Earthenware	22	0.22	275
WGLEWSP – White Glazed Earthenware with sponged decoration	2		6
WGLEWTP- White Glazed Earthenware with Transfer Printed decoration	9	0.14	33
YELL – Yellow ware	3		71

Table 1- Total assemblage from SQN17 and SFT17 by Fabric, Count, EVEs and Weight (g)

The Pottery Types

The site was excavated in three phases during 2017; of these investigations two yielded assemblages of pottery. The entire assemblage is shown below in Figure 1 by count percentage.

The pottery will be discussed in two parts according to which period of excavation it was recovered during (SQN17 or SFT17). The excavations during the evaluation in January 2017 (SQN17) focused primarily on an area of culverts and flues on the NE extent of the area and recovered only 10 sherds of pottery weighing 237g. The excavations of the Foundry area to the SW extent of the area uncovered a large external sandstone wall and several dividing walls with pottery recovered inside from levelling deposits ; 120 sherds in total weighing 2521g.

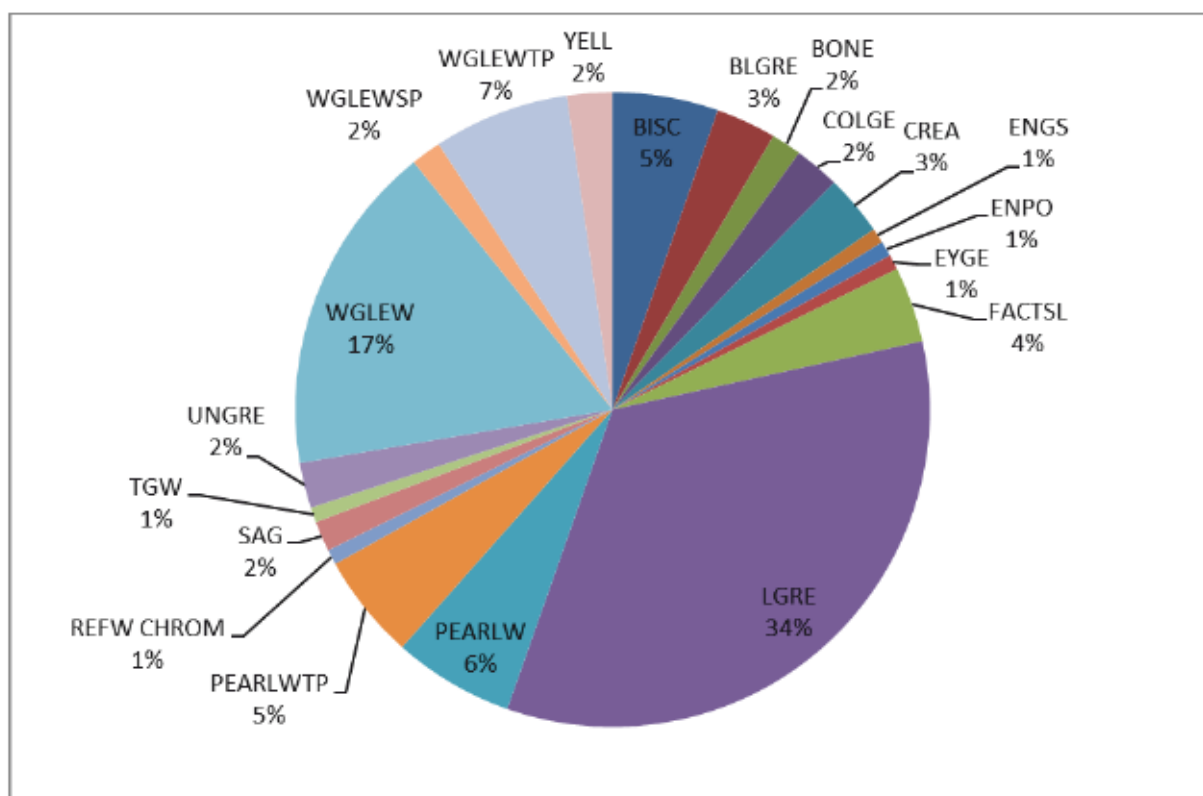


Figure 1- Fabric Percentage within the assemblage by count

SQN17

Context	Context Considered Date	Fabric	Form	Sherd Count	Weight (g)
215	1775-1900	BISC		1	17
215	1775-1900	FACTSL	JUG	1	4
215	1775-1900	LGRE	BOWL	1	80
215	1775-1900	YELL	CYLINDRICAL JAR	2	21
222	1775-1900	LGRE		1	2
222	1775-1900	YELL	CYLINDRICAL JAR	1	50
253	1775-1900	LGRE		1	13
253	1775-1900	LGRE	BOWL	1	39
253	1775-1900	WGLEW	TEA CUP	1	11

Table 2 SQN17 Fabrics by context with forms, count, weights and context dates

Contexts 215 & 253

Both context [215] and [253] are levelling deposits from trial trenches within Area 1. The fabrics recovered are usual for a 19th-century assemblage with the majority being later glazed redwares and similar utilitarian fabrics. There was one fragment of a cup base in a biscuit fired state which is likely to have been moved in the landfill from the Forth Banks Pottery situated to the south-west (Figure 2).



Figure 2- Location of Stephenson's Quarter (Yellow) and Forth Banks Pottery (Red). Oliver 1849

Context 222

Context 222 was the backfill of a drainage feature which held only two sherds; one later glazed redware and one yellow ware.

All contexts within this period of excavation date to between 1775-1900. The sherds excavated during the cleaning and recording of this area of Stephenson's quarter are more likely to relate to the infilling and levelling of the area rather than the occupation.

SFT17

Context	Context Considered Date	Fabric	Form	Sherd Count	Weight (g)
1157	1775-1900	BONE		1	1
1157	1775-1900	CREA	DISH	1	9
1157	1775-1900	WGLEW		3	13
1157	1775-1900	BONE	SAUCER	1	8
1157	1775-1900	LGRE		9	40
1157	1775-1900	LGRE	DEEP BOWL	1	55
1157	1775-1900	LGRE	DEEP FLARED BOWL	1	26
1157	1775-1900	WGLEW	JUG	1	4
1157	1775-1900	WGLEWTP		2	5
1160	1745-1900	WGLEW		1	2
1160	1745-1900	ENPO		1	3
1160	1745-1900	LGRE	BOWL	1	75
1160	1745-1900	LGRE	DEEP BOWL	1	107
1160	1745-1900	REFW CHROM	SAUCER	1	3
1187	1740-1900	ENGS		1	49
1187	1740-1900	PEARLW		3	19
1187	1740-1900	WGLEW		3	140
1187	1740-1900	WGLEW	DISH	1	25
1187	1740-1900	COLGE		2	32
1187	1740-1900	CREA		1	14
1187	1740-1900	FACTSL		2	11
1187	1740-1900	FACTSL	CUP	1	2
1187	1740-1900	LGRE		5	108
1187	1740-1900	PEARLW	DISH	1	11
1187	1740-1900	PEARLWTP		1	27
1187	1740-1900	PEARLWTP	CUP	1	2
1192	1600-1900	BISC		1	2
1192	1600-1900	CREA	DISH	2	14
1192	1600-1900	EYGE		1	7
1192	1600-1900	PEARLW		2	5
1192	1600-1900	UNGRE		1	7
1192	1600-1900	WGLEW		3	13

1192	1600-1900	BLGRE		1	17
1192	1600-1900	COLGE		1	2
1192	1600-1900	LGRE		4	81
1192	1600-1900	PEARLWTP		3	4
1192	1600-1900	TGW	BOWL	1	6
1192	1600-1900	WGLEW		1	1
1220	1775-1900	BISC		1	3
1220	1775-1900	BISC	STILT WITH FISHTAIL END	1	3
1220	1775-1900	LGRE		1	4
1220	1775-1900	WGLEWTP	DISH	1	10
1224	1600-1900	BISC	STILT WITH FISHTAIL END	3	8
1224	1600-1900	SAG		2	1045
1224	1600-1900	UNGRE		2	51
1224	1600-1900	WGLEW		8	66
1224	1600-1900	BLGRE		3	47
1224	1600-1900	FACTSL	JUG	1	2
1224	1600-1900	LGRE		17	277
1224	1600-1900	PEARLW	DISH	2	25
1224	1600-1900	PEARLWTP		2	6
1224	1600-1900	WGLEWSP		2	6
1224	1600-1900	WGLEWTP		4	13
1224	1600-1900	WGLEWTP	CUP	2	5

Table 3- SFT17 Fabrics by context with forms, count, weights and context dates

Context 1157, 1160, 1187, 1192, 1220 and 1224

All contexts (excluding made ground layer [1220]) discussed in this section are infilling deposits surrounding or relating to the external sandstone wall [1141] at the Foundry site of Stephenson's Quarter.

Contexts [1160] and [1187] produced sherds of little intrinsic interest; most were utilitarian later glazed redwares and whitewares which are commonplace in any 19th-century assemblage. There were several sherds recovered from deposit [1187] with decoration, including blue shell edged scalloping and factory slip banding. These decorations are commonly found in Post-Medieval assemblages.

Contexts [1157], [1192], [1220] and [1224] have largely similar fabrics to the other infilling layers within the Foundry area; however, within these deposits there are sherds which can be identified as products and/or furniture from the Forth Banks Pottery which is located nearby (Figure 3). Contexts [1192], [1220] and [1224] all have sherds which are in a biscuit fired state with no final glost firing. This indicates the sherds were wasters dumped following a firing or manufacturing issue. Context [1157] has one sherd of later glazed redware which has distinct bloating to the interior glaze (Fraser 2005) which was a common firing fault identified on this fabric in the Forth Banks assemblage (Robinson 2017). It is likely these sherds were relocated to the Stephenson's site through landfill.

Contexts [1220] and [1224] have the broken off 'legs' of kiln furniture known as 'Stilts with fishtail ends'. These particular stilts were used at Forth Banks; Kiln stilts with wedged or 'fishtail' feet were used for elevating different forms and sizes of vessels during firings, with bigger examples made for holding larger serving dishes or plates in the kiln and smaller examples used for separating several smaller plates or saucers within a saggar (Robinson 2017). An examples of the saggars used at Forth Banks pottery was also recovered in the infilling layer [1224]; this particular fragment of saggar has substantial internal and external ware as well as iron residues; it was likely discarded due to the damage of overuse and has been relocated to the Stephenson's Quarter site through landfill.

Overall the assemblage from the Stephenson's Quarter site dates between 1775-1900 (Table 4). Some contexts date slightly earlier due to broad ranging fabric date ranges (such as that of the later glazed redwares) and cannot be narrowed down due to the small assemblage size.

The most interest aspect of this assemblage is the link between the infilling deposits at Stephenson's quarters and the Forth banks assemblage. It can be confidently assumed that the kiln furniture, saggar fragments and firing faulted waster sherds which have been recovered during the Stephenson's Quarter excavations are products and tools of the Forth Banks Pottery during its period of production between 1736-1893.

There are some sherds of interest in terms of the narrative of landfill movement between the areas around Forth Banks, however due to the small size of the assemblage it has little significance. There are no recommendations for further work on the assemblage at this stage, however the material should be discussed in any publication of the Stephenson's site. This assemblage could also be considered during the publication discussion of the Forth Banks Pottery assemblage.

	Context	Context Considered Date
SFT17		
	1220	1775-1900
	1160	1745-1900
	1192	1600-1900
	1224	1600-1900
	1220	1775-1900
	1157	1775-1900
	1187	1740-1900
SQN17		
	253	1775-1900
	222	1775-1900
	215	1775-1900

Table 4 Spot dates by context

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APPENDIX 6: CLAY TOBACCO PIPE ASSESSMENT

By Eniko Hudak

Introduction

The archaeological investigations at Stephenson Quarter, Newcastle upon Tyne (SFT17) yielded a small assemblage of clay tobacco pipe, a total of 32 fragments weighing 101g. All the clay tobacco pipes were recorded into a relational database based on the guidelines by Higgins and Davey (2004), and were identified with the help of the Tyneside clay tobacco pipe typologies as established by Parsons (1964) and Edwards (1987, 1988), and updated by Vaughan (2007). Bowl forms prefixed 'T' refer to the Tyneside typology (Edwards 1987, 1988); and forms prefixed 'P' refer to Parsons' types, as Edwards' typology only concerns 17th and 18th century pipes. The pipes were quantified by fragment count and weight; and were further coded for decoration and quantified by fragment count and weight.

The pipes were recovered from five individually numbered contexts, and all individual context assemblages were small (less than 30 fragments). All fragments are in a fair condition, some abraded and some showing signs of usage.

Assemblage composition

The clay tobacco pipe assemblage consists of three bowls, 28 stem fragments, and a single nib (mouthpiece). The bowls range in date from 1800-1900, and all are decorated. There are two makers' marks in the assemblage, one on a decorated bowl and another on a short section of stem, both from (1157). There are a few stem fragments with yellow or green glaze, and a plain, flattened nib also with green glaze.

Context	Size	FC	Context ED	Context LD	Bowl types/parts	Context Considerate Date
1103	S	1	1800	1900	Turks Head novelty pipe	1800-1900
1157	S	9	1667	1910	P16; P17; stamp of Thomas Parke; spur marks IN	1820-1860 (poss. 1840-1860)
1160	S	3	1730	1910	Stem fragments	1730-1910
1192	S	3	1730	1910	Stem fragments	1730-1910
1224	S	16	1730	1910	1x nib; stem fragments	1730-1910

Table 1 - Distribution of clay tobacco pipes by fragment count and types per context

Bowl types

1800-1900

Novelty pipes

One example of a so-called Turks Head pipe was found in context (1103) (SF1). It is moulded in the shape of a male head with facial hair and a headdress. The features of the face are very sharp and the two halves of the pipe are well aligned, however, the seams from the moulding process are still

present. The bowl is in great condition, it probably was smoked only a few times. A similar, but rather poorly finished and well smoked example was also found during the evaluation of the site (SQN17).

Decorated moulded pipe bowls were increasingly popular in the 19th century, and there was a range of 'head-bowls' including military, ethnic, women, as well as Royalty (Oswald 1975). There seems to be a marked resemblance in many types of moulded bowls, thus assigning this example to a maker may prove difficult.

1820-1860

P17 – Parsons 17

Two bowls of this type were found in (1157), SF2 and SF3.

SF2 is elaborately decorated with arcaded ribs and wheatears along the front seam. It compares well to No.192 from the Oakwellgate excavations in Gateshead (Vaughan 2007: Fig. 49). It also shows signs of being smoked.

SF3 is ribbed on the base of the bowl and is decorated with swags along the rim. The spur bears relief initials: I or J on the left, and N on the right. This is and Edwards' type E mark (1987: 106), and is dated to between 1680 and 1750, however, Vaughan notes that this type of mark was continued to be used up to the 19th century (2007: 201). According to Parsons' *List of North-Eastern Pipemakers* the following makers can be attributed to these initials:

John Norris from Gateshead, 1801-1841

John Newton from Gateshead, 1844-1858 (1964: 252).

Stamped Stem

There is a small fragment with a maker's mark from context (1157). It is the stamp of Thomas Parke, Gateshead pipemaker, c. 1667-87. It is an oval shaped incuse mark reading 'THO/PARK' with foliate decoration above and below. This is a Tyneside stamp type D, and is dated to 1675-1710 (Edwards 1987), and according to Edwards it is associated with spurred bowl T6 dated to 1650-1680 (Edwards 1988: 52). This fragment is most certainly residual, and it is most likely to have arrived to the site with landfill.

Significance and recommendations

The assemblage contains some interesting fragments, but due to its small size it has little significance. There are no recommendations for further work on the assemblage at this stage, but it is recommended to consider the clay pipes from SQN17 and SFT17 together and in a site wide context, and to illustrate the Turks Head pipe.

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APPENDIX 7: BRICK ASSESSMENT

By John Nolan

Introduction

Twenty-one numbered samples of bricks or fragments of brick, were catalogued and assessed from twenty-one post-medieval contexts. Because some sample numbers included more than one brick, thirty-six pieces were actually catalogued. Of these, twenty-six were firebricks and the remainder were common bricks.

None of the material had been washed but all samples were labelled with context and sample numbers.

The material appears to range in date from broadly mid-19th century, to the early 20th century.

Methodology

The assemblage was examined and catalogued. Dimensions - length, width, and thickness – were recorded (in millimetres) where possible, as was any evidence for manufacture, use, or re-use.

The terms 'upper face', 'lower face', 'sides' and 'header/end faces' are used in the descriptions.

Fragments were not weighed as part of this assessment, as experience has shown this is not significantly helpful to identification and dating. Nor can it be considered valid statistical data when, as with this assemblage, the material was unwashed and many samples still had mortar adhering. Weight by context had however been recorded in preparing the initial catalogue.

The dimensions and form of the common brick was compared with examples from dated buildings in NCAS's reference collection, and identification of manufacturer's stamps on the firebricks was sought in secondary sources, principally *Brickworks of the North East* (Davison 1986).

This report summarises the catalogued data, and offers date-ranges for the samples. Suggestions are made for any sample that should be retained. Context numbers are given in square [0] brackets, sample numbers in <0>.

Common bricks

Six complete bricks were examined. All were hand-moulded, dark red in fabric, and 'lumpy' in appearance. Their size and character suggest a broadly mid-19th-century date. Where visible one <20> [1182] had a wiped upper face, and one <22> [1200] had a diagonal scored or impressed groove by way of a frog on the lower bedding face. Another <24> [1196] had a faint combed frog. All samples had white/grey lime mortar with coal/charcoal flecks on their faces. Samples <18> and <20> from [1182], <24> from [1196], <21> from [1198], and <22> from [1200], came from the drying stove bay walls, where firebrick might have been expected. Possibly the relatively lower temperatures needed for mould-drying made firebrick less crucial.

Firebricks

Twenty-six bricks or fragments of brick were examined. The fabrics were generally gritty and pale yellow-buff in colour. All were plain brick forms: no quarls, side or end wedges were present. All had the *appearance* of being pressed, though there is documentary evidence that those marked 'VGC' were actually hand-moulded (Davison, 174). Un-stamped samples <11>, <14> and <17> from [1143] had very clean, sharp, edges, suggesting these were actually pressed.

Three firebricks, <5> [1142], had one header end struck off obliquely to create a rough bevel. These samples came from a furnace wall, and the sheared faces were covered with slaggy residues indicative of exposure to great heat. One stamped VGC <8> [1212] with compacted ferrous waste on its upper bedding face was associated with a repair to the same furnace wall [1142] and two <9> [1211] with heavily-eroded, heat-discoloured, upper faces. These derived from the furnace floor. Sample <28>, a Gardner firebrick from [1174], had several deep scars hacked into its upper face, perhaps to provide a key for mortar.

Mortar adhering to the firebricks was grey to dark grey in colour and appeared less coarse than that on the common bricks. The colouration may be a product of the heat to which the firebricks were subjected, though use of coal dust as an aggregate - 'black mortar' - was a common practice on many industrial sites.

Eleven firebricks had maker's stamps, all directly impressed into the lower face: none had frogs. Most of the stamps belong to manufacturers with working dates spanning the second half of the 19th century to the early 20th century (context and number of examples given in square brackets):

BENSON [1174 x 1] The works began at Fourstones, Hexham, in the mid-1850s, and subsequently expanded to Montague Colliery, Bell's Close, Newcastle, between 1875 and 1929 (Davison, 63). This sample has only a partial stamp but is almost certainly by this maker and is likely to be from the Bell's Close works, though similarly-stamped brick survives at the Fourstones site (<https://www.scottishbrickhistory.co.uk>).

GARDNER [1174 x 3], [1142 x 1]. A Newcastle maker. Several members of the Gardner family seem to have been firebrick makers. The earliest was A. Gardner at Seaham Street in 1858, then J. Gardner at Lime Street, Ouseburn, noted in 1871, followed by T. Gardner, again at Seaham Street from 1879-90, and finally T. Gardner & Sons, at Douglas Terrace, between 1893 and 1915 (Davison, 64).

ROBSON [1173 x 1]. Based in Scotswood, the history of this manufacturer is confused. Operation of the firebrick and enamel works are dated 1840-70 (Davison, 63), and the firm of Clasper and Robson, firebrick makers, is noted in 1865 (*ibid.*), William Robson was apparently working the High Yard (Listers) in the 1860s, which was taken over by Colville-Gibson in 1872 (*ibid.* 84).

VGC [1142 x 3], [1212 x 1], [1213 x 1]. The firebrick works at Victoria Garesfield Colliery, near Rowland's Gill, was apparently worked by Priestman and Piele between 1875 and 1914, producing hand-moulded bricks with this mark. The end dates for the works are given variously as 1926 and 1928 (Davison, 170 -1; 174).

Discussion.

The samples came from structures on the site of Wright and Brown's Iron Foundry (Area 2). None of the material is identifiably earlier than the mid-19th century. Most would appear to date from the last quarter of that century, extending into the first quarter of the 20th century.

The suggested date range is supported by the provisional site phasing supplied for this assessment. More refined dating of the material is not possible.

A number of firebrick samples showed slag residues indicative of subjection to high temperatures, and were associated with a furnace structure. Other samples, perhaps less directly exposed to heat, were discoloured or sooted.

Although firebrick was exclusive to the furnace structures, common brick was used in the stove bays, presumably because the heat intensity was less there.

Recommendations (retention/disposal)

None of the common brick or un-marked firebrick samples are worth retention. Of the stamped firebrick, if a record photograph showing the stamp and dimensional data are included in the report and/or site archive there is little justification for retaining the actual bricks, when most are by well-known makers. An example of the 'Gardner' brick stamp could however be offered to a regional museum collection (e.g. Beamish).

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APPENDIX 8: Specification