OMG Works, Openshaw West, Clayton,

Manchester

Archaeological Excavation

Oxford Archaeology North

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SUMMARY

In August 2011, Oxford Archaeology North (OA North) was commissioned by Buckingham Group Contracting Ltd, acting on behalf of Manchester City Football Club, to carry out a programme of archaeological investigation at the site of the former OMG Works in the Clayton area of Manchester (centred on NGR SJ 87417 98277). The archaeological investigation was required as part of a wider scheme of works intended to remediate and make safe the site in advance of the ultimate redevelopment of the area.

In the first instance, the programme of archaeological investigation of the OMG Works was intended to comprise the excavation of eight evaluation trenches. The initial trenches were intended to identify and characterise the surviving evidence for a range of heritage assets recognised on historical mapping of the site, and allow an informed decision to be reached regarding the need for further excavation to record buried remains that would be destroyed during the course of development groundworks.

Excavation of the trial trenches demonstrated clearly that well-preserved structural remains survived *in-situ* across parts of the site. Following consultation with the Greater Manchester Archaeology Advisory Service (GMAAS), which provides archaeological advice to Manchester City Council, it was recommended that further archaeological investigation was merited in order to mitigate their ultimate loss during development work. In September 2011, OA North was commission to carry out detailed excavation of three discrete parts of the site: a rectangular building range adjacent to a canal arm depicted on mid-nineteenth-century mapping; elements of the former Clayton Chemical Works depicted on mid-nineteenth-century mapping; and a firebrick works shown on late nineteenth-century mapping.

The excavation was carried out in two stages between September 2011 and November 2012. Much of the area, however, was contaminated with petrochemicals and other industrial waste derived from the historical use of the site as a centre for chemical manufacturing, which limited the amount of detailed archaeological excavation that could be carried out. Nevertheless, the remains of the boiler house, chimney and several ancillary structures of the former Clayton Chemical Works were exposed and recorded, and demonstrated that the mid-nineteenth-century fabric of the chemical works had been largely replaced. The original chimney was superseded by a new structure after the 1870s, and the boiler house was rebuilt in the twentieth century, with elements probably dating to the 1920s. Excavated remains of the former firebrick works in the north-western part of the site included the foundations for a steam-powered winding engine and the floor of a probable drying kiln, although the remains of the actual brick kilns had been largely destroyed.

The complete results obtained from the archaeological investigation are incorporated in this final excavation report. In addition, a summary of the excavation and research carried out as part of the archaeological investigation is being synthesised currently for publication as a booklet in the *Greater Manchester's Past Revealed* series.

ACKNOWLEDGEMENTS

Oxford Archaeology North (OA North) would like to thank Buckingham Group Contracting for funding and supporting the project, with especial thanks to Andrew Munslow, Stephen Foster, Gary Owen and Umo Antia. OA North is also grateful to Kirsten Holland of WYG Environment for logistical support. Thanks are also expressed to Norman Redhead, the Heritage Management Director with the Greater Manchester Archaeological Advisory Service (GMAAS), for his support and advice. OA North is also grateful to the staff of the Local Studies Unit at Manchester Central Library and Lancashire County Record Office for assistance with the documentary research.

The desk-based research was carried out by Ian Miller. The programme of archaeological investigation was directed by Graham Mottershead, assisted by Phil Cooke, Lewis Stitt and Caroline Raynor. The report was compiled by Lewis Stitt and Ian Miller, and the illustrations were produced by Graham Mottershead and Mark Tidmarsh. The report was edited by Ian Miller, who was also responsible for project management.

1. INTRODUCTION

1.1 CIRCUMSTANCES OF PROJECT

1.1.1 Manchester City Football Club has proposed to carry out a major programme of remediation to land at Openshaw West in the Clayton area of Manchester. The scheme of remediation will necessitate considerable earth-moving works, and will inevitably have a major negative impact on any buried archaeological remains across the site. In the first instance, the remediation works were focused on the site of the former Clayton Aniline Works, a huge chemical plant that expanded during the twentieth century to become one of the largest works of its kind in the world. The work was preceded by a programme of archaeological investigation, which targeted the buried remains of several post-medieval farmsteads, a late eighteenth-century canal, a textile mill, and the historic core of the Clayton Aniline Works; this work was carried out between September 2010 and January 2011 (OA North 2011a). A second stage of remediation was proposed for the adjacent site, which was occupied until recently by a modern chemical plant operated by OMG (UK) Ltd.

1.1.2 The area occupied until recently by the OMG Works is of some archaeological interest, as it emerged as an important centre of industrial activity during the nineteenth century. In particular, the area became one of the pioneering centres for the chemical industry, and also contained the site of a firebrick manufactory.

1.1.3 In order to secure archaeological interests, the Heritage Management Director with the Greater Manchester Archaeological Advisory Service (GMAAS), who provides archaeological planning advice to Manchester City Council, recommended that a programme of archaeological investigation was carried out to support the application for the development of the site. In the first instance, the specified programme of work allowed for the excavation of a series of targeted evaluation trenches, which were intended to establish the presence or absence of buried remains of archaeological interest, and assess the impact of the proposed remediation scheme upon these remains.

1.1.4 In August 2011, Oxford Archaeology North (OA North) was commissioned by Buckingham Group Contracting Ltd, acting on behalf of Manchester City Football Club, to carry out the specified programme of archaeological evaluation on the site of the OMG Works. The evaluation demonstrated that buried structural remains of archaeological interest survived *in-situ* across parts of the site. Following consultation with GMAAS, it was recommended that further excavation of four targeted areas was carried out in advance of the proposed remediation works. The targeted structures included a rectangular building range situated adjacent to a former arm of the Ashton Canal, several elements of the former Clayton Chemical Works, and a firebrick works. The excavations were intended to provide a detailed record of significant buried remains to mitigate their ultimate loss during the course of the remediation groundworks. The excavation of the Clayton Chemical Works was carried out by OA North between September and November 2011, whilst the excavation of the firebrick works in November 2012.

1.2 LOCATION, TOPOGRAPHY AND GEOLOGY

1.2.1 The study area (centred on NGR SJ 87417 98277) is situated in the Clayton area of Manchester, which lies some 2km to the east of the city centre (Fig 1). The site is bounded to the north by Ashton New Road, to west by Corbett Street and Alan Turing Way, and to the south and east by the Openshaw West Phase 1 (Clayton Aniline) site (Plate 1).

Plate 1: Aerial view of the study area prior to the archaeological investigation. The present study area (OMG Works) is outlined in red, with the green boundary marking the Phase 1 works

1.2.2 Topographically, the Manchester Conurbation as a region is within an undulating lowland basin, which is bounded by the Pennine uplands to the east and to the north. The region as a whole comprises the Mersey river valley, whilst the rivers Irwell, Medlock, and Irk represent the principal watercourses in Manchester (Countryside Commission 1998, 125). The study area lies at a height of approximately 60m above Ordnance Datum (aOD) and, in broad terms, is fairly level.

1.2.3 The solid geology of the area comprises Carboniferous sedimentary material and a series of Permo-Triassic rocks, consisting mainly of New Red Sandstone. The overlying drift incorporates Pleistocene boulder clays of glacial origin, and sands, gravels, and clays of fluviatile/lacustrine origin (Hall *et al* 1995, 8).

1.3 EVALUATION TRENCHING

1.3.1 Prior to the archaeological excavations carried out on the site as part of the Phase 1 works (OA North 2011a), the study area had not been subject to any archaeological investigations previously. The initial stage of the present project comprised the excavation of eight trial trenches (Fig 2), which were targeted on sites of archaeological interest that were highlighted in the desk-based assessment. Buried remains of archaeological significance were encountered in several these trenches, leading on to further excavation. In other instances, however, the results obtained from the evaluation trenches demonstrated that all buried remains had been destroyed entirely, or that ground contamination was too dangerous to continue with the excavation.

1.3.2 ***Trench 8:*** this trench was placed across the line of a short north/south-aligned branch of the Ashton Canal, known as the Clayton Arm, in the south-eastern part of the site (Fig 3). The trench measured 13 x 2m, and was excavated to a maximum depth of 2.9m (Plate 2). The results obtained from the trench demonstrated that the area had been subject to considerable modern disturbance, which appeared to have destroyed all structural elements of the former canal.

Plate 2: View across Trench 8 looking south-east, showing modern deposits and interventions in the former canal

1.3.3 The earliest deposit exposed in the trench was a very dark grey layer mixed silt and rubble (***07***), which had clearly been disturbed by modern interventions (Plate 2). It seems likely that layer ***07*** derived originally from silting within the canal, although no physical remains of the canal walls survived *in-situ*. Layer ***07*** was overlain by 0.45m thick deposit of compacted rubble, containing fragments of bricks, slate and stone (***06***), which had almost certainly been laid as levelling material following the abandonment and infilling of the canal arm.

1.3.4 Layer ***07*** had been cut by two modern intrusions (***04*** and ***05***), neither of which were excavated fully during the evaluation due to their significant depths. Feature ***04*** was exposed at the western end of the trench, and comprised a vertically sided, north/south-aligned cut that contained a ceramic pipe set in a deposit of gravel. Feature ***05*** was exposed in the central part of the trench, and similarly comprised a vertically sided cut filed with gravel and limestone chippings. The cut also contained several electricity cables and a 6" diameter concrete pipe. Features ***04*** and ***05*** were sealed by a 0.15m thick lens of crushed brick and gravel (***03***). This provided bedding for a slab of reinforced concrete (***01***) that formed the modern ground surface across much of the trench.

1.3.5 ***Trench 11:*** this trench was similarly targeted on the route of the former canal arm in the central part of the study area, but was also extended across the footprint of a rectangular building depicted on nineteenth- and early twentieth-century mapping (Fig 3). The trench was aligned east/west, and excavated initially to a length of 30m. The eastern part of the trench was placed across the route of the former canal, but revealed considerable modern disturbance (***08***), which had resulted in the complete destruction of all physical remains of the former canal, including a 0.93m diameter circular concrete manhole (***09***). Excavation of the western part of the trench, however, exposed the remains of brick-built foundations that seemingly corresponded to the building depicted on historical mapping (Fig 4). The western end of the trench was expanded subsequently by 11m to the north in an attempt to establish the full extent of the brick foundations.

*Plate 3: General view of Trench 11, showing wall **12***

1.3.6 The principal element of the foundations was an east/west-aligned wall (***12***) composed of hand-made bricks set in lime-based mortar, indicative of an early/mid-nineteenth-century construction date (Plate 3). Wall ***12*** incorporated three short brick-built piers or buttresses on its northern side, which had probably abutted the northern wall of the building (Fig 4). Two detached brick-built structures (***13*** and ***14***) were also exposed to the north of wall ***12***. These were both rectangular, and incorporated vertically set cast-iron bolts, which had almost certainly been intended for securing an item of machinery. Structures ***13*** and ***14*** had seemingly been placed on the bank of the canal arm, and may have formed part of a small crane used for loading and unloading cargoes from boats.

1.3.7 No other physical remains of the building survived *in-situ*, and excavation failed to encounter the south wall of the building or internal partitions depicted on historical mapping. Further excavation within the footprint of the building exposed a thick deposit of black silt (***15***). However, this material was saturated with a black, oily liquid that had an overpowering aroma of petrochemicals. Further investigation of this area was thus precluded for Health and Safety considerations.

*Plate 4: General view of Trench 11, showing wall **12**, and a sondage excavated in the interior of the building that rapidly filled with water contaminated with petrochemicals*

1.3.8 The building depicted on historical mapping was thought initially to represent a short terrace of workers' housing. However, the absence of any domestic features within the footprint of the building, such as fireplaces, suggests that it may have had a commercial or industrial function. The discovery of the putative crane bases (structures ***13*** and ***14***) raise the possibility that the building may have be a small canalside warehouse.

1.3.9 ***Trenches 12 and 13:*** these trenches were targeted on the site of the former firebrick works. Trench 13 was aligned east/west along the northern boundary of the site, and was targeted on the footprint of one of the circular kilns depicted on historical mapping, together with adjacent ancillary buildings situated to the east. It was proposed that Trench 13 was aligned north-west/south-east across the site of the second kiln, and the steam-power plant associated with the shaft situated to the south of the kilns. Trench 13 was excavated in November 2011 and revealed structural elements of the ancillary buildings, although remains the actual kilns were not encountered (Plate 4).

Plate 4: Trench 13 fully excavated

1.3.10 Trench 12 was not available for investigation until November 2012. At that time, this part of the site was stripped completely of the modern ground surface for logistical reasons, and buried archaeological remains across the whole area were subject to recording. The results obtained from this work are presented below (Area D; *Section 4.5*).

1.3.11 ***Trench 19:*** this trench was targeted on the footprint of a former size works depicted on the Ordnance Survey map of 1893. The trench measured 30 x 2m, and was excavated to a maximum depth of 3m (Plate 5). A deposit of black silty clay (***18***) was encountered at the base of the trench. However, this material was saturated with a black, oily liquid that had an overpowering aroma of petrochemicals. Further investigation of this area was thus precluded for Health and Safety considerations.

1.3.12 Several structural elements were set within layer ***18***, including three rectangular-shaped pads (***19***, ***21*** and ***22***) composed of refractory bricks. These all appeared to abut a wall (***25***) composed of hand-made bricks set in a lime-based mortar, consistent with a mid-nineteenth-century construction date. Against the northern side of the trench was another pad composed of refractory bricks (***20***), abutted by two ceramic half-pipes set into layer ***18***. These lay with the open side upwards, as if to form run-off channels.

1.3.13 Layer ***18*** was cut by a modern electric cable (***24***), and was sealed beneath a thick deposit of brick rubble (***16***). The rubble was seemingly intended to provide a levelled base for the modern reinforced concrete raft that formed the existing ground surface.

Plate 5: Trench 19, looking east

1.3.14 ***Clayton Chemical Works:*** the footprint of the mid-nineteenth-century chemical works that occupied the southern part of the OMG Works site was investigated via three targeted evaluation trenches (trenches 20, 21 and 22). This work revealed well-preserved structural remains, which seemed to span the early to late nineteenth century. Historical mapping shows this site to have comprised two large buildings. Trenches placed across the western building have exposed well-preserved remains that included power features of clear archaeological interest. These remains included the foundations of a detached chimney.

1.3.15 Buried remains of the eastern building of the chemical works were similarly exposed in the Trenches 20 and 22. These trenches were aligned north/south, and were targeted on the footprint of a chemical works shown on the Ordnance Survey maps of 1848 and 1893. Trench 20 contained structural remains of the mid-nineteenth-century building (Plate 6), whilst excavation of the northern part of Trench 22 revealed a basement. These areas were subject to further excavation (Area B; *Section 4.3 below*), whilst the southern part of the Trench 22 contained a large rectangular tank (***27***) of reinforced concrete (Plate 7). This clearly associated the latest phase of industrial activity on the site, dating to the late twentieth century. It was backfilled with demolition material (***29***), which was composed largely of crushed bricks.

Plate 6: Structural remains exposed in Trench 20

*Plate 7: Concrete tank **27** exposed in the southern part of Trench 22, looking east*

2. METHODOLOGY

2.1 INTRODUCTION

2.1.1 The fieldwork undertaken followed the method statement detailed in the approved Written Scheme of Investigation (*Appendix 1*), and was consistent with the relevant standards and procedures provided by the Institute for Archaeologists (IfA), and their code of conduct.

2.2 AIMS AND OBJECTIVES

2.2.1 The principal aim of the archaeological investigation was to expose and record the buried remains of archaeological interest within the specified areas, and generate a complete record of the remains to mitigate their ultimate loss as part of the proposed remediation works.

2.2.2 It was envisaged at the commencement of the archaeological works that the results obtained from the excavations could also help address a series of research objectives. These were drawn from the initiatives for archaeological research of the industrial and modern periods stated in the current *Archaeological Research Framework for North West England* (Newman and McNeil 2007; McNeil and Newman 2007), and included:

- *Initiative 7.6:* 'A study of the development of workers' housing in Greater Manchester should be undertaken to examine the development of different housing types…' (McNeil and Newman 2007, 139);
- *Initiative 7.7:* 'Study the material culture of industrial workers' households…' (*ibid*);
- *Initiative 7.25:* 'Where threatened with possible redevelopment excavations are required of now undeveloped and cleared former working class areas regarded as slums' (*op cit*, 147);

2.2.3 In addition, a series of research objectives were drawn up for each of the areas targeted for excavation:

- establish the plan form, chronology, and dating for a group of rural workers cottages;
- establish the character of the late eighteenth-century land use;
- establish the nature of the steam-power plant for the chemical works, and evidence for its development through the nineteenth century;
- establish the plan form of the early nineteenth-century chemical works.

2.3 EXCAVATION

2.3.1 The uppermost levels were excavated by a machine fitted with a toothless ditching bucket. The same machine was then used to define carefully the extent of any surviving walls, foundations and other remains, after which all excavations were undertaken manually.

2.3.2 All information was recorded stratigraphically with accompanying documentation (plans, sections and both colour slide and black and white print photographs, both of individual contexts and overall site shots from standard view points). Photography was undertaken with 35mm cameras on archivable black-and-white print film as well as digital images. Photographic records were also maintained on special photographic *pro-forma* sheets.

2.4 FINDS

2.4.1 All finds recovered during the excavations were lifted, cleaned, bagged and boxed in accordance with the United Kingdom Institute for Conservation (UKIC) *First Aid For Finds* (1998). Recovery and sampling programmes were in accordance with best practice (current IfA guidelines) and subject to expert advice.

2.5 ARCHIVE

2.5.1 A full professional archive has been compiled in accordance with the Updated Project Design (*Appendix 1*), and in accordance with current IfA and English Heritage guidelines (English Heritage 1991). The paper and digital archive will be deposited with the Museum of Science and Industry in Manchester on completion of the project, with a synthesis (in the form of an index to the archive and the report) deposited with the Greater Manchester Historic Environment Record.

3. BACKGROUND

3.1 INTRODUCTION

3.1.1 An understanding of the archaeological and historical background of a site provides the local context within which the extant structures and buried remains can be assessed archaeologically. The following section outlines the historical development of Clayton and the present study area, and has been compiled largely from primary sources and the sequence of available historic maps.

3.2 THE DEVELOPMENT OF CLAYTON

3.2.1 The study area lies within the manor of Clayton, which forms the western part of the historic township of Droylsden. This township comprised an area of some 656 hectares on the southern side of the river Medlock. Droylsden proper formed the eastern part of the township, and is separated from Clayton by Edge Lane. Clayton was the only manor in Droylsden township, and through the late medieval and post-medieval periods was the seat of the Byron family, who took Clayton Hall as their principal residence (Plate 8). Between 1194 and 1212, Robert Grelley granted 14 oxgangs of his demesne of Manchester to Robert de Byron, which was to be held by the service of half a knight (*Lancs Inq and Extents*, i, 56). This grant was of Clayton and Barnetby. Richard Byron's name occurs in connection with Clayton in documents as early as 1203, and several grants by and to him are known (Farrer and Brownbill 1911, 282-3). Throughout the latter thirteenth century, the manor of Clayton was held by John de Byron. He was succeeded by his son John, whose son Richard obtained a grant of free warren for his demesne lands of Clayton and other manors in 1308 (*ibid*).

Plate 8: An undated engraving of Clayton Hall, probably drawn in the early nineteenth century

3.2.2 Clayton remained in the hands of the de Byrons until 1621, when Sir John Byron decided to sell his Lancashire estates to settle numerous debts (*ibid*). Clayton was purchased subsequently by George and Humphrey Chetham.

3.2.3 The land in Droylsden township remained largely agricultural, and divided into small farm holdings, throughout the post-medieval period, with the population engaged in a combination of trade and agriculture. This is implicit on the earliest accurate survey of the area, provided by William Yates' '*Map of the County Palatine of Lancaster*' of 1786, which shows the study area to have been entirely undeveloped (Plate 9). The onset of the rapid industrialisation centred on Manchester during the nineteenth century, however, resulted in considerable elements of the local population abandoning their agricultural lifestyle (Higson 1859, 71). The principal crop at this time was grass or hay, although other crops included wheat, oats, potatoes and turnips. The cultivation of cereal crops was formerly more extensive; oat cakes once representing the staple article of diet, and in 1793 it was reported that 100 acres of wheat were sown in Clayton, reduced to none by the 1850s (*ibid*).

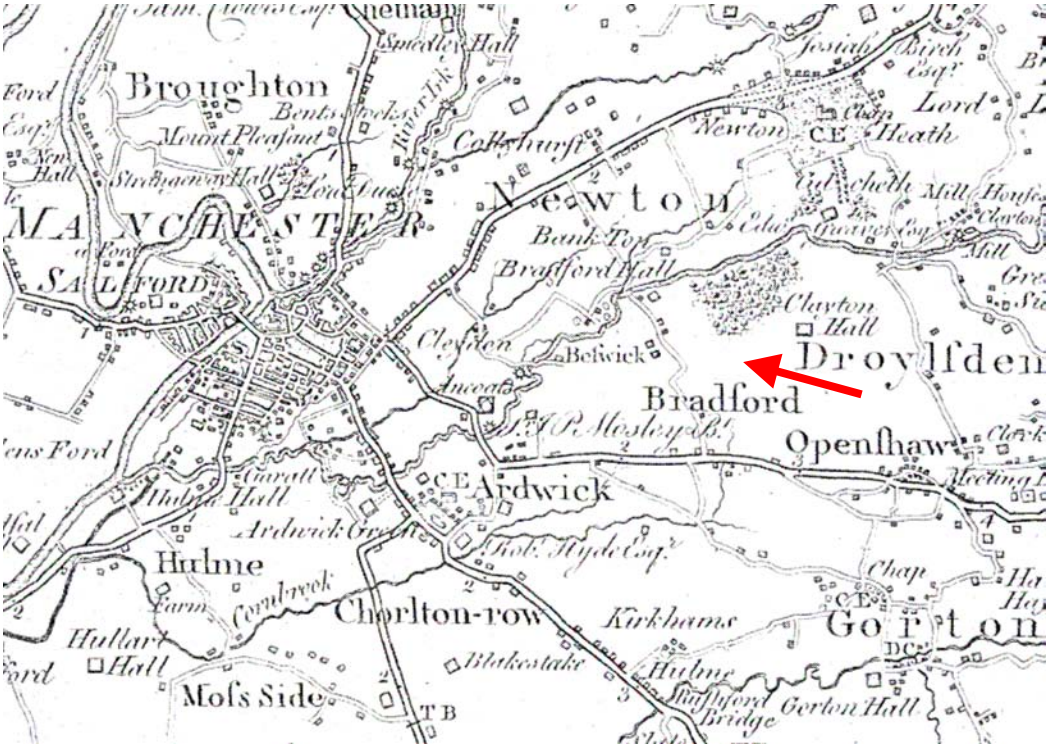

Plate 9: Extract from Yates' Map of the County Palatine of Lancaster' *of 1786, with arrow marking the approximate position of the later Clayton Chemical Works*

3.2.4 Aside from agriculture, one of the earliest industries to develop in Clayton was coal mining. The largest nineteenth-century coal mine in the manor was Clayton Colliery, which was established in *c* 1790 (Higson 1859, 101), although very little is known of its early history. An early source of some information is provided by a notebook entitled *Remarks and Observations on the Future Working of the Clayton Colliery*, written by a colliery employee, John Bradbury, in 1828 (LRO U190/Z1). The opening comments in this notebook state:

> 'We are much lower with our workings than our neighbours the Bradford Colliery, which calls for a degree of prudent care in getting out our coal, so as to leave no more than are sufficient, and yet a sufficiency to protect us against any mischief they might do to us, by allowing their water to come down into our workings, which I endeavour to protect by leaving about nine foot of solid coal along the boundary fence, and up to this coal about four yards of gobbed floor clay which I believe will swell so as to be impervious to water, when any eight is thrown upon it from the Bradford side by getting coal near or by allowing water to come from it. We have most coal in the two foot mine some up to the canal or north boundary of the estate and a considerable quantity on the deep side of the Engine Pit. The first of these coal, I mean on the crop or north end, I think it will be better to get with a jigger brow out of No 3 pit than sink down No 4 pit first by saving the expense of sinking. Next I think it will cost a great deal of money to make a wharf and conveniences for landing and loading at No 4 pit and will take another banksman, and I would rather have them all sent at one pit if possible within our premises which are now fenced off from the road, etc.'

3.2.5 The account also mentions that 'the coal to yield a great quantity of water', and notes that the 'floor of the coal is so shelly'. In the concluding remarks, Bradbury says 'our coal not being first rate quality it behoves us to keep all the customers which are satisfied with them'. On 30th March 1842, a Mr Barnett gave up the lease and papers of the colliery to John Bradbury and Silas Leigh (LRO U190/Z1).

3.2.6 The colliery is referred to in several newspaper articles subsequently up to 1878 (*eg Manchester Times* 23 February 1878), but was closed shortly afterwards; the colliery is not listed in the Mines Inspectors list of mines for 1880, and John Ridings is recorded in the 1881 Census Returns as an unemployed coal miner (RG11/4042 Folio 102). The colliery does not appear on the Ordnance Survey map of 1893, implying that the surface buildings had been demolished by that date.

3.2.7 New industries were attracted to Clayton during the late nineteenth and early twentieth centuries. Amongst these was the bicycle factory of the Manchester Cycle Manufacturing Company. The firm was established as the Claviger Cycle Company Ltd, changing its name to the Manchester Cycle Manufacturing Company in December 1889. In 1890, the company increased its nominal capital from £21,000 to £50,000 to finance the construction of the Belsize Works, where it proceeded to develop a reputation for producing fine bicycles (*The Penny Illustrated Paper* 26 November 1892), which were exported throughout Britain (*Aberdeen Weekly Journal* 25 July 1896).

3.2.8 Despite a boom in bicycle sales in 1895-6, the company went into receivership in 1897, with debts in excess of £12,200 (*Freeman's Journal* 23 July 1897). The Belsize Works was purchased subsequently by Marshall & Co, who commenced business in the manufacture of motor vehicles. The first motor car to be produced at the Belsize Works was completed in 1897, and was the earliest known car to have been manufactured in Manchester (Wyatt 1917).

3.3 BACKGROUND TO THE CLAYTON CHEMICAL WORKS

3.3.1 There are no documentary records available to elucidate the date at which the Clayton Chemical Works was constructed, although it is absent from early nineteenth-century mapping of the area, such as Johnson's *Map of the Parish of Manchester*, which was published in 1820. However, references in trade directories for the early 1820s include John Ryder, who is described as a bleacher in Bradford (Pigot & Dean 1821, 139; Pigot & Co 1828, 367), indicating that the textile-finishing trades were becoming establish in the area by that date.

3.3.2 It seems possible that Joshua Ronchetti may have been an early occupant of the Clayton Chemical Works. Ronchetti is listed as a manufacturing chemist on Ashton New Road, Clayton, in a trade directory for 1838, although the precise address is not given (Pigot & Son 1838, 10). Ronchetti is also listed in a trade directory for 1841, which identifies him as the owner of a naphtha works in Clayton (Pigot and Slater 1841, 293). Naphtha was obtained through the initial fractional distillation of coal tar, and it seems likely that this was one of the products manufactured at the Clayton Chemical Works.

3.3.3 The first detailed map to show the works is the Ordnance Survey 6": 1 mile map, which was surveyed in 1845 and published in 1848 (Plate 10). This depicts the works to have comprised two large buildings and several small ancillary structures occupying a plot of land on the western bank of the Clayton Arm of the Ashton Canal.

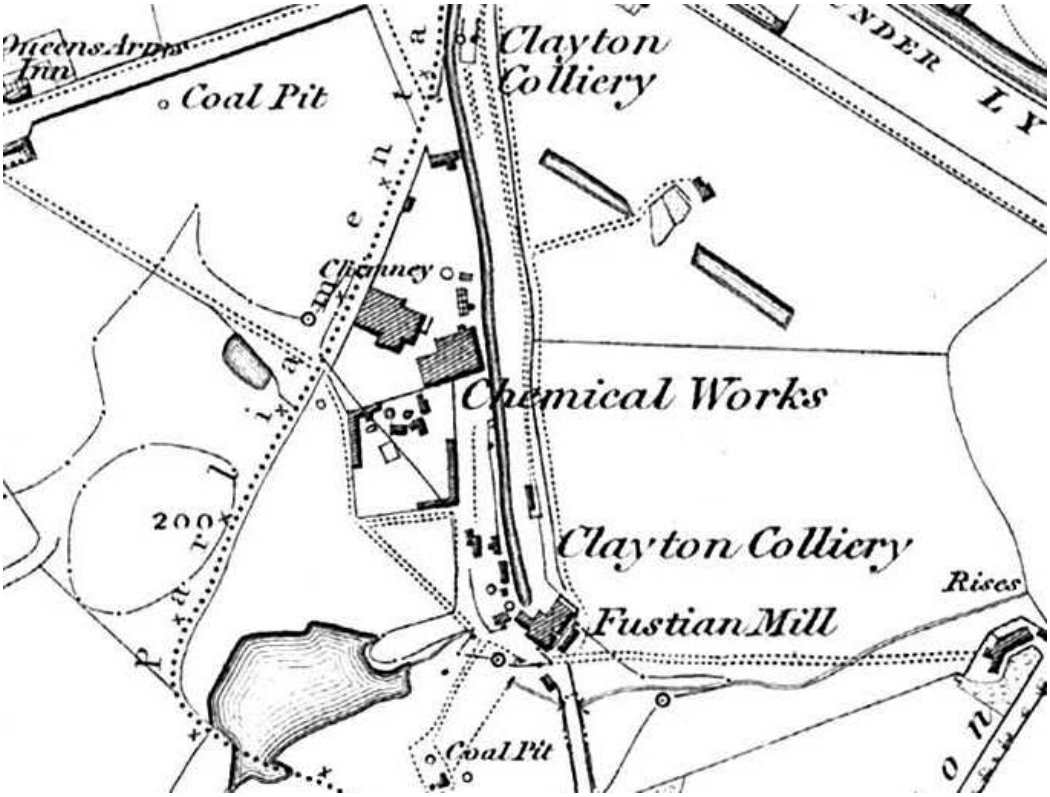

Plate 10: Extract from the Ordnance Survey 6": 1 mile map of 1848 (surveyed 1845)

3.3.4 Charles Joshua Ronchetti, probably the son of Joshua Ronchetti, is the only manufacturing chemist in Clayton listed in a trade directory for 1848, although the location of his works is again not given (Slater 1848, 64). A trade directory for 1853 similarly lists CJ Ronchetti as a manufacturing chemist in Clayton, although the location of his works is still not given (Collinson 1853, 228).

3.3.5 By 1863, the Clayton Chemical Works was owned by John Bethell, who employed George Lodwidge as the works manager (Slater 1863, 30). The firm of John Bethell & Co is similarly entered in a trade directory for 1876, which also provides a list of some of the products that they produced at Clayton. These included cake alum, Epsom salts and naphtha (Slater 1876), although it is probably that they were also manufacturing varnish.

3.3.6 Epsom salts, also known as magnesium sulphate, salt is a naturally-occurring mineral which usually forms as encrustations on limestone cavern walls. It was used traditionally as a component of bath salts, but is also used as a drying agent and medically as a saline laxative. Cake alum, also known as aluminium sulphate, was produced by reacting aluminium hydroxide with sulphuric acid. Taking the form of a white crystalline solid, cake alum was used in water purification and as a mordant in dyeing and printing textiles. Varnish is a solution of oil and natural or synthetic resin in an organic solvent. The manufacture of varnish involved cooking these components to render them more compatible and to increase solubility in the solvent. This would have been done in portable kettles, where the proto-varnish mix would be heated to about 316°C over a furnace. During the cooking process, the kettles would be covered with refractory exhaust hoods. After cooking, the kettles would be moved to rooms where they were cooled quickly, often by water spray. Thinners and driers would then be added to the mix, before it was filtered to create the final varnish.

3.3.7 John Bethell is listed as the owner of the Clayton Chemical Works in trade directories for the 1880s, although the last reference occurs in a directory for 1887 (Slater 1887, 54). The works is not listed in trade directories for 1888, whilst Hardman & Holden Ltd, manufacturing chemists and coal tar distillers, are given as the occupants of the works in 1889 (Slater 1889, 53). This firm is listed at Clayton Chemical Works in trade directories into the 1930s (*eg* Slater 1910, 1570; Slater 1919, 1558; Slater 1929, 1671; Slater 1931, 1687).

3.3.8 The 1893 Ordnance Survey map, surveyed in 1889, shows the two large buildings depicted on earlier mapping to have been demolished, and the site to have been expanded northward. The north-west corner, as well as the west and south sides, of the earlier compound still existed at this time. The centre of the site is dominated by three rows of north/south-aligned tanks, both circular and rectangular. The east side contained a walled yard with a large circular structure or tank in its south-west corner. The southern and western portions of the site contained more isolated tanks, with perhaps a small square building or chimney located toward the south-west side of the area. Most of the buildings associated with the plant were located to the south of the area.

3.3.9 John Bethell & Co is listed at the Clayton Chemical Works in trade directories until 1903, by which date the works had been taken over by Hardman & Holden Ltd, manufacturing chemists and coal tar distillers (Slater 1903, 583).

3.4 BACKGROUND TO THE FIREBRICK INDUSTRY

3.4.1 During the late eighteenth and nineteenth centuries, the ever-higher temperatures involved in industrial processes led to an increasing demand for refractory materials capable of withstanding and containing intense heat. Until the 1750s, sandstone blocks were largely relied upon for lining the newly developed coke-burning iron-smelting furnaces, but demand for higher quality furnace linings grew shortly after this date. This demand was met initially by firebricks manufactured in the Stourbridge area of the West Midlands (Sanderson 1990).

3.4.2 Further stimulus to a demand for refractory materials was again derived from the iron industry in 1828, when the introduction of Neilson's hot-blast process of iron smelting induced higher temperatures (Gale 1969). Subsequent industrial innovations included the regenerative hot-blast stoves that were pioneered by EA Cowper in 1857, and Siemens' open-hearth furnaces of the 1860s.

3.4.3 Refractory materials were made from fireclay. The composition of fireclay differed from bed to bed, although those which contained the highest proportion of alumina were considered to be the best (Davis 1936, 232). The production process commences with the winning of fireclay, which was often extracted from a mine either close to or within the works. In addition to refractory products for high-temperature industrial process, the fireclay industry also produced 'sanitary wares'. Entries in a Manchester trade directory for 1841 indicate that the manufacture of firebricks was a fairly specialised trade, as only four such manufacturers are listed: W & J Brocklehurst at Ancoats Bridge and Ashton Road; John Derbyshire & Co at Collyhurst; Samuel Hall at Openshaw; and Henry King on Great Ancoats Street (Pigot and Slater 1841, 65).

3.4.4 There are no documentary records available to elucidate the precise date at which the firebrick works in the study area was constructed, although the firm of Williams & Co is listed as firebrick manufacturers in Bradford in a trade directory for 1850 (Slater 1850, 379). A subsequent directory for 1863 lists Robert Williams & Co as a firebrick manufacturer Ashton New Road in Bradford. The firm also produced terra cotta, chimney tops, sanitary tubes and drain pipes. (Slater 1863, 47). Robert Williams and Frear Ward are also listed individually as firebrick manufacturers at Robert Williams & Co's works (*op cit*, 500; 522). The firm was sufficiently established at this time to purchase advertising space in the directory (Plate 11).

Plate 11: Advertisement printed in Slater's directory for 1863

3.4.5 A directory for 1879 lists Edward Williams as a firebrick, terra cotta and sanitary drainpipe manufacturer, with a works situated at the corner of Corbett Street and Ashton New Road in Bradford (Slater 1879, 88). The same entry appears in a directory for 1886. (Slater 1886, 97). These entries suggest that Edward Williams had taken the business over from Robert Williams by the late 1870s.

3.4.6 The earliest survey of the works is provided by the Ordnance Survey, which carried out a survey of the area in 1889. The resultant map was published at a scale of 1:500 in 1891, and 1:2500 in 1893. The former map only covers the western part of the site, but annotates two circular structures as kilns occupying a plot of land bounded by Ashton New Road Corbett Street to the north and west respectively. The kilns appear to be associated with a large range of buildings situated to the east of the kilns, and a smaller block of buildings to the south. A smaller circular feature is also shown near the southern boundary of the plot. Whilst this small circular feature and the building range to the east of the kilns is not covered by the 1891 map, the smaller block of buildings to the south is shown to have formed an L-shaped range, with a chimney situated in the south-western corner. The presence of a chimney suggests that the building may have housed a steam engine and associated boilers.

3.4.7 The next available plan of the works is provided by the Ordnance Survey's second edition 25": 1 mile map, published in 1908. This annotates the site as a firebrick works, although the footprint of the component buildings is shown as unchanged. The map also marks the small circular feature close to the southern boundary of the site as a shaft. This raises the possibility that this was the fireclay required to manufacture the bricks was extracted from the coal seams beneath the site. This may suggest that the small range of buildings situated a short distance to the north-west, shown on the Ordnance Survey map of 1891 to have incorporated a chimney, may have housed a steam-powered winding engine. This would also explain the orientation of the building.

3.4.8 Edward Williams is listed as a brick maker on Corbett Street in Bradford in a trade directory for 1903 (Slater 1903, 1330), but is not entered in a directory for 1909, suggesting that he had ceased manufacturing bricks by that date. This is confirmed to some degree by a plan of 'Williams' Fireclay Mine at Bradford, Manchester', which was produced in July 1905, and indicates the underground fireclay workings to have been abandoned (GB124.A.MIN/7).

3.4.9 Another unpublished plan of the area, dating to *c* 1921 (GB127.M9/60/10/2), shows that the firebrick works had been demolished, with a 'picture house' having been erected over the footprint of the northern kiln with the remainder of the site occupied by an iron merchant. The Ordnance Survey map of 1922 annotates the picture house as a billiard hall, but shows the site of the southern kiln and the range of buildings to the south as undeveloped. The same layout is shown on the Ordnance Survey 1:2500 map of 1952. By 1960, the billiard hall was occupied by the firm of J Kay & Co Ltd, rainwear manufacturers. The building had been demolished by the time of the Ordnance Survey map of 1981.

3.5 BACKGROUND TO THE CANALSIDE BUILDING

3.5.1 The footprint of a rectangular canalside building depicted clearly on the Ordnance Survey map of 1848 was investigated in Trench 11. There are no documentary records available to elucidate the precise date at which the building was constructed, although a structure is shown in approximately the same position on Johnson's map of 1820 (Plate 12); it is not shown on Greenwood's *Map of Lancashire* that was produced in 1818, although this may be a reflection of the small-scale at which the map was produced rather than providing evidence for the building not having existed at that date. Johnson's map shows a detached building situated close to the boundary of the Bradford township.

Plate 12: Extract from Johnson's Plan of the Parish of Manchester, *1820*

3.5.2 The building is shown clearly on the Ordnance Survey 6": 1 mile map of 1848, which was surveyed in 1845. This depicts a rectangular block, aligned east/west on the western bank of the Colliery Arm of the Ashton Canal, seemingly with a square-shaped projection close to the south-eastern corner. The building appears to have been accessed via an unnamed lane from Ashton New Road, and seemingly lay within the boundary of the Clayton Chemical Works.

3.5.3 The building is also shown on the Ordnance Survey first edition 25": 1 mile map of 1893 (surveyed 1889), which shows it to have comprised a row of three contiguous blocks (Plate 13). The footprint of the building appears to be slightly smaller than that shown on the map of 1848, suggesting that the western end had been demolished, of the entire block had been rebuilt. The size and layout of the building shown on the 1893 map is reminiscent to a row of domestic cottages, although excavation has concluded that the building may have been a canalside warehouse (*Section 1.3.8 above*). The track that was unnamed on the earlier mapping is annotated on the 1893 map as Colliery Street, with a smaller track provided access to the building.

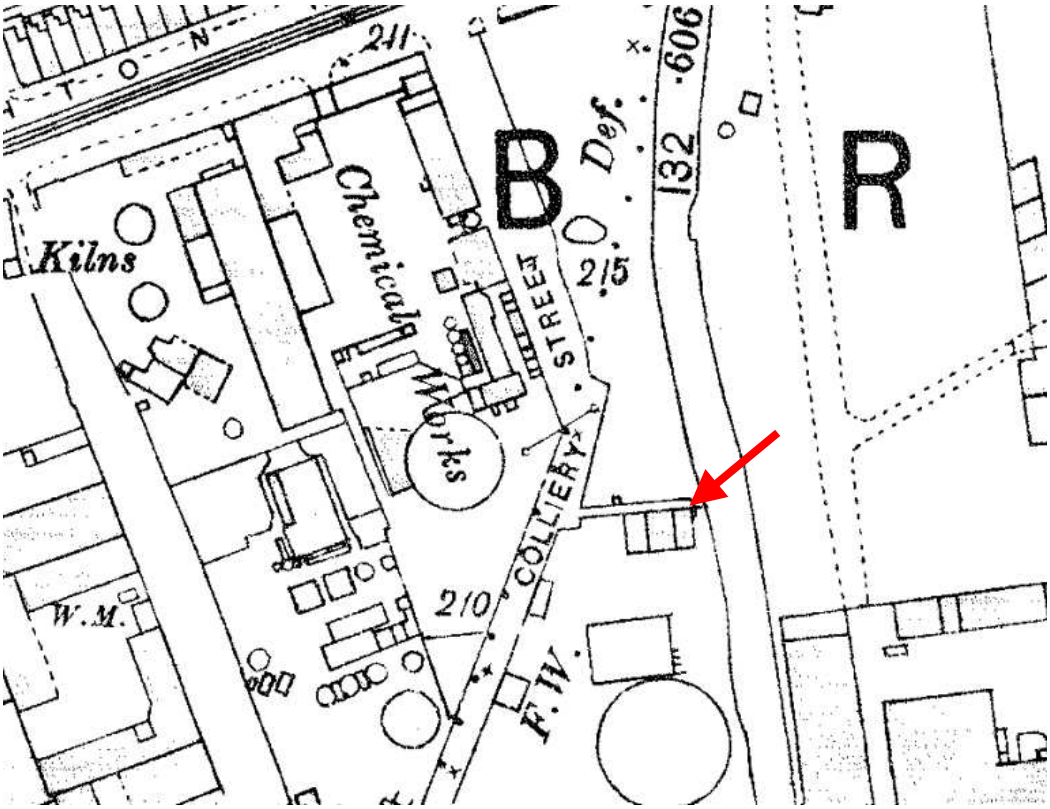

Plate 13: Extract from the Ordnance Survey 25": 1 mile map of 1893 (surveyed 1889)

3.5.4 The next edition of Ordnance Survey mapping, published in 1908, shows the building to have been demolished. The footprint of the building is instead occupied by two small structures, which may represent the vestiges of the demolished building, or new structures. The subsequent edition of Ordnance Survey mapping, published in 1922, similarly shows the site to be occupied by two small structures. Notably, however, Colliery Street had been abandoned by that date, with a new boundary wall seemingly having been erected across the junction of the former street with Ashton New Road.

4. EXCAVATION RESULTS

4.1 INTRODUCTION

4.1.1 Following on from the results obtained from the initial evaluation trenches that were excavated across the site, four discrete parts of the site (Areas A-D) were targeted for further excavation. Areas A and B was targeted on elements of the Clayton Chemical Works (Fig 5), and were intended to expand on the results obtained from evaluation trenches 20, 21 and 22. Area C was also placed within the footprint of the Clayton Chemical Works (Plate 14), and was intended to investigate the remains of the works' chimney depicted on historical mapping. Area D was placed in the north part of the site, and was targeted on the firebrick works shown on late nineteenth- and early twentieth-century mapping of the area. The following section presents the results obtained from the excavation of the site.

Plate 14: Area view of excavation areas A, B and C, although the western part of Area A and the south-western part of Area B were backfilled at an early stage (prior to the photograph above) due to severe ground contamination

4.2 AREA A: CLAYTON CHEMICAL WORKS

4.2.1 The Clayton Chemical Works is shown on the Ordnance Survey map of 1848 to have comprised two principal buildings, and several ancillary structures, situated on the western side of the Clayton Arm of the Ashton Canal (Plate 10). Area A was targeted on the north-western part of the former works, incorporating the footprint of one of the buildings depicted on the Ordnance Survey map of 1848. However, much of the area was only excavated to reveal the upper surface of structural walls due to the presence of cyanide and other dangerous chemical contamination covering the whole area. In particular, the south-eastern and western parts of the excavated area contained high levels of ground contamination, and were thus not excavated below the upper level of buried structures.

4.2.2 Excavation of the northern part of Area A revealed the well-preserved remains of a boiler house, which contained the bays (***1071*** and ***1072***) for two Lancashire boilers (Plate 15). The boiler seating walls each measured 10.4m long, and comprised a combination of refractory and machine-made bricks, with a lining of refractory bricks on their inner faces. The seating walls survived to a height of 0.46m, equivalent to five brick courses, above the 1.1m wide flame bed (Plate 16). The flame beds were of refractory bricks, laid with the stretchers aligned north/south. Some of the bricks forming the flame bed of the western boiler bay (***1071***) had 'HAMMOND' stamped on them, indicating a post-1890 construction date (*Section 4.6.8 below*). However, the eastern boiler bay (1072) incorporated 'NETTLE' firebricks, which probably post-date 1930 (*Section 4.6.4 below*).

Plate 15: Looking west across the excavated remains of the boiler house

*Plate 16: Looking south along the flame bed in the eastern boiler bay **(1072)***

4.2.3 Both boiler bays retained elements of the brick-built housing for the blow-down valves at their northern end, although that in the western bay ***(1071)*** was better preserved (Plate 17). The location of the blow-down valves indicated that the charging area for the boilers had been at the northern end. The blow-down housing in bay ***1071*** comprised machine-made bricks, and survived to a maximum height of 0.6m, equivalent to seven courses of bricks.

*Plate 17: Housing for the blow-down valve in the western boiler bay **(1071)***

4.2.4 Situated on either side of the blow-down housing in both boiler bays was a cast-iron plate. Each of these measured 0.5 x 0.5x 0.05m (19.7" x 19.7" x 2"), and had a steel handle puddle welded to their exterior face (Plate 18). These unusual fittings were probably intended to provide some additional control of the air draft through the flame bed and side flues, and will also have enabled limited access to the flame bed to occasionally rake out soot and other waste materials. The remains of structures forming side flues alongside the boilers were visible on top of the seating walls.

*Plate 18: Housing for the blow-down valve in the eastern boiler bay **(1072)***

4.2.5 A section was excavated across the eastern boiler bay ***(1072)***. This concluded that the flame bed was two-brick courses thick, and had been placed on a concrete foundation ***(1081)***. The exterior elevations of the boiler seating walls had been insulated with a 0.5m thick deposit of sand (Plate 19), which had partially solidified through prolonged exposure to high temperatures.

4.2.6 The remains of the main flue from the boilers to the works chimney survived at the southern end of the boilers. Each boiler bay had the remains of housings for two butterfly control valves, situated between the side flues of the boiler and the main flue to the rear. The fabric of the flue incorporated several bricks bearing the Bradford Colliery 'BC' stamp.

4.2.7 The main flue was aligned east/west across the rear of the boiler bays, although part of it had been destroyed by the installation of a steel pipe ***(1059)***, which cut diagonally across the western boiler bay (Fig 6). The flue passed into the remains of a rectangular-shaped structure that was composed of refractory bricks (Plate 20) and was situated against the south-eastern corner of boiler bay ***1072***. It is likely to have been an economiser, also known as a feed water heater, which would utilise the waste heat in the gases passing from the boiler.

Plate 19: Section excavation across the flame bed of the eastern boiler bay ***(1072)***

Plate 20: The remains of the main flue and the putative economiser to the rear of the boilers

4.2.8 Excavation immediately to the south of the flue from the boilers revealed the remains of a small rectangular structure, formed by north/south-aligned wall ***1051*** and east/west-aligned wall ***1049*** (Fig 6). Wall ***1051*** was constructed of machine-made bricks and bonded with a dark grey/black ash mortar, and was two-courses wide. At its southern end it abutted wall ***1049***, which comprised hand-made bricks and bonded with lime-based mortar, suggesting that this component of the structure may have derived from an earlier phase of construction. Wall ***1049*** survived to a length of 4m, and was two courses wide. The area enclosed by the two walls contained a deposited saturated with petrochemicals, and was thus not excavated.

4.2.9 The southern elevation of wall ***1049*** was abutted by a small surface ***(1048)*** composed of hand-made bricks. This covered an area measuring 3.7 x 0.65m, and appeared to be associated with a large foundation block ***(1044)*** situated immediately to the south (Fig 6). This measured 3 x 2m, and contained a series of six steel bolts that had almost certainly been intended to secure a large item of machinery. The foundation bed comprised a combination of concrete and hand-made bricks, and appeared to have been laid on timber planks, which were presumably intended to reduce the level of vibration from the machine. Another foundation block ***(1047)*** was exposed immediately to the north-west of ***1044***. This measured 1.5 x 0.95m, and similarly comprised a combination of concrete and bricks, although all of the bricks had been machine made. This block also contained steel bolts (Plate 21) that had probably been intended to secure a large item of machinery. It seems likely that foundation blocks ***1044*** and ***1047*** may have housed a small horizontal steam engine that furnished the motive power requirements in the chemical works.

*Plate 21: View looking east across engine foundation blocks **1044** and **1047***

4.2.10 Excavation to the south of engine foundation block ***1044*** exposed the remains of a large basement, which had maximum dimensions of 11 x 11.8m, and was at least 2.2m deep, although the base was not exposed as it was inundated with contaminated water (Plate 22). The northern and eastern walls ***(1036)*** of this basement comprised machine-made bricks, and were three-courses wide. The south-facing elevation of wall ***1036*** was abutted by a brick surface ***(1041)***, situated at a level some 2m lower than the top of wall ***1036***. Surface ***1041*** was aligned east/west, was 1.3m wide, and comprised machine-made bricks.

4.2.11 The western wall ***(1038)*** of the basement was similarly three-courses wide, and survived to a length of 3m (Fig 6). This wall appeared to abut wall ***1036***, suggesting that it may have been added as a slightly later phase of construction. Another brick wall ***(1039)*** continued east for 1.6m from the southern end of wall ***1038***.

4.2.12 Two structures were identified within the interior of the basement. Structure ***1040*** abutted the eastern end of wall ***1039***, and measured 1.1 x 1.1m (Fig 8). It comprised hand-made bricks, and a metal capping to which were attached two short wooden planks. These had perhaps been intended as a foundation for a small item of machinery, such as a pump. The removal of the metal excavation demonstrated that the underlying structure was composed entirely of brick.

4.2.13 The second structure within the basement was a large block of concrete ***(1042)***, which measured 4.1m at its longest point, and 3.8m at its widest point. This may also have housed an item of machinery, although there was no evidence for restraining bolts.

Plate 22: The remains of the basement exposed in the southern part of Area A

4.2.14 The area to the south of the basement contained the fragmentary remains of several walls ***(1028***, ***1029*** and ***1030)*** constructed from refractory bricks, suggesting that they had been intended as flues (Plate 23). All of the flue walls were two-courses wide, and survived to a height of at least 0.65m, although their bases were not exposed due to contaminated ground. A thick deposit of clinker ***(1031)*** was noted between the various sections of walls.

4.2.15 The flues may have been associated with two other walls ***(1026*** and ***1027)*** exposed in this part of the site. Wall ***(1026)*** was aligned north/south and was constructed with hand-made brick. It measured 4m long, and was a single course wide. It was excavated to a depth of 0.65m, but the foundations were not exposed. Wall ***1027*** was situated to the east of wall ***1026***. It was aligned north-west/south-east, and comprised hand-made bricks bonded in a lime-based mortar, consistent with a mid-nineteenth-century construction date. It was measured 3m long, 0.6m wide, and was excavated to a depth of 0.55m although the foundations were not exposed.

4.2.16 The vestiges of two brick surfaces ***(1032*** and ***1033)*** may also have been associated with the flues and walls ***1026*** and ***1027***. These comprised a combination of machine-made and refractory bricks, but had been largely destroyed when several manholes ***(1023***, ***1024*** and ***1025)*** were constructed for the modern drainage pipes that have cut through this part of the area. These manholes were comprised machine-made bricks, which had typical measurements of 0.23 x 0.11 x 0.075m (9.05” x 4.3”x 3”), and were bonded with cement mortar.

Plate 23: The fragmentary remains of the flues exposed in the southern part of Area A

4.2.17 The removal of modern concrete in the central part of Area A revealed the well-preserved remains of an historic surface ***(1078)*** composed of rectangular granite setts (Plate 24). The surface was 4.2m wide, and was excavated to a length of 25.4m. The eastern edge of the surface had brick-built kerb ***(1079)***, composed of hand-made bricks that were bonded with lime-based mortar, consistent with a mid-nineteenth-century construction date.

*Plate 24: The well-preserved remains of surface **1078***

4.2.18 Initial excavation in the south-eastern part of Area A revealed the remains of several brick-built walls. However, further excavation in this area was precluded by high levels of ground contamination (Plate 25). Nevertheless, it was clear that most of the walls in this part of the site were constructed from hand-made bricks, and appeared to have been bonded with lime-based mortar, suggesting that the walls pertained to mid-nineteenth-century construction.

4.2.19 Wall (***1005***) was aligned north/south, was 3m long and two-courses wide. At the south end of it turned at right angles heading west for 1.2m, and then returned north for 1.4m. A short distance to the north of wall 1005 were the remains of a brick surface ***(1006)***, which measured 2.2 x 1m, and was composed of hand-made bricks. This surface appeared to abut the eastern wall ***(1036)*** of the basement (Fig 6). Wall ***1036*** was also abutted by an east/west-aligned wall (***1036***), which was two-courses wide and survived to a total length of 2.2m.

4.2.20 An 'H' shaped brick structure ***(1008)*** was exposed 0.7m east of surface ***1006***. It was 4.8m long and 1.7m wide. Both ends of this structure were covered with concrete. A short section of brick-built wall ***(1011)*** was exposed some 0.9m to the east of structure ***1008***.

Plate 25: The limited depth of excavation in the south-eastern part of Area A, where significant concentrations of cyanide were encountered

4.2.21 Initial excavation in the western part of Area A also revealed some structural remains. However, further investigation in this area was again precluded by high levels of ground contamination (Plate 26).

Plate 26: Excavation in the western part of Area A encountered significant ground contamination

4.3 AREA B: CLAYTON CHEMICAL WORKS BASEMENT

4.3.1 This area was excavated to further investigate the structural remains exposed in Trenches 20 and 22, placed across the eastern part of the Clayton Chemical Works. The exposed remains comprised several brick walls, brick surfaces, and a brick-built basement. All of the component bricks were machine-made with an average size of 0.22 x 0.11 x 0.07m (8.6" x 4.3" x 2.75"), bonded with a hard black mortar, consistent with a construction date in the second half of the nineteenth century.

4.3.2 The basement ***(1500)*** and measured 13.8m long, 9.6m wide and was 2.6m deep (Plate 27). Each of the component walls were 0.66m wide, equivalent to six courses of bricks. The basement incorporated a brick floor ***(1501)*** at the base, constructed from machine-made bricks. However, the floor could not be cleaned manually due to the high level of contamination. No interior fixtures or fittings were identified to provide an indication of the intended function of the tank, although it seems possible that it was used for the storage of liquids as part of the chemical manufacturing process. The basement had probably fallen into disuse by the late 1880s, as it is not shown on the Ordnance Survey map of 1893.

*Plate 27: The west-facing elevation of basement **1500***

4.3.3 The southern side of the basement was abutted by a later concrete tank (***27***) that was exposed in the initial evaluation trench (Plate 7). The position of tank ***27*** does not correspond with any structures shown on the Ordnance Survey map of 1922, although a structure is depicted in this position on the edition for 1952.

4.3.4 Excavation to the south-west of basement ***1500*** revealed a series of brick-built walls (Fig 7). Wall ***1504*** was 4.7m long and two-courses wide, and wall ***1512*** was 7m long and three-courses wide. These walls lay parallel to each other, and probably represented elements of a narrow rectangular structure depicted on the Ordnance Survey map of 1909 (Fig 3). However, no interior features or surfaces were encountered.

4.3.5 Walls ***1505***, ***1506***, ***1507*** and ***1514*** formed another group that had formed elements of a single structure (Fig 7). Wall ***1505*** was 10.6m long and two-courses wide, and wall ***1506*** was 4.6m long and three-courses wide. These two parallel walls were aligned north/south, and were set 3.7m apart. Wall ***1507*** was also three-courses wide, and survived to a length of 4.4m. Wall ***1514*** was 2.9m long, and was two-courses wide. These two walls were aligned east/west, and were set *c* 10m apart. The four walls seemingly all formed elements of a narrow rectangular building depicted on the Ordnance Survey map of 1893. The interior of the structure bounded by walls ***1505***, ***1506***, ***1507*** and ***1514*** contained a concrete raft, which was devoid of any evidence for fixtures or fittings.

4.3.6 Two brick surfaces were also exposed in the south-western part of the excavated area (Fig 7). Surface ***1509*** measured 8.4 x 2.1m, and comprised machine-made bricks laid on their side. Surface ***1510*** measured 11.2 x 5.5m, and comprised a combination of hand-made and machine-made bricks (Plate 28). Some of the machine-made bricks had a 'BC' stamp within the frog, indicating that they had been manufactured at the Bradford Colliery brickworks, which was in operation from 1874 until the early 1900s (Miller 2011). Surface ***1510*** also contained several 'HAMMOND' refractory bricks, which were manufactured post-1890 (*Section 4.6.8 below*).

*Plate 28: Brick surface **1010***

4.4 AREA C: CLAYTON CHEMICAL WORKS CHIMNEY

4.4.1 Area C was targeted specifically on the site of the chimney for the chemical works, which is first depicted on the Ordnance Survey map of 1848. The excavation revealed the well-preserved foundations of the chimney stack, together with brick and stone sett surfaces (Plate 29).

Plate 29: Area C fully excavated, showing the foundations of the chimney stack

4.4.2 The base of the chimney stack was octagonal, and measured 5.7m across (Fig 8). The structure incorporated an outer wall ***(2007)*** that was 0.9m thick, and comprised machine-made bricks bonded with lime-based mortar. Some of the component bricks had 'BC' stamped in their frog, indicating that they derived from the Bradford Colliery brickworks and therefore had a construction date no earlier than the 1870s (*Section 4.6.3 below*). Two steel plates were attached to the outer face of the chimney on its north-eastern side, and had perhaps been intended to protect the structure from accidental damage from road vehicles.

4.4.3 The inner face of the chimney stack was lined with a skin of refractory bricks ***(2008)***, which was a single-brick thick and survived to a height of seven courses (Plate 30). The component refractory bricks were machine made, with an average measurement of 0.235 x 0.11 x 0.075m (9.2" x 4.3" x 3"), and were bonded with cement-based mortar.

4.4.4 The chimney stack had been built on a concrete foundation slab ***(2012)***, which was exposed at a depth of 1.1m below the upper surviving course of the chimney stack (Plate 31). This comprised an aggregate of crushed bricks, indicative of a late nineteenth-century construction date. A second concrete surface ***(2011)*** was exposed in the interior of the chimney stack, and appeared to represent a later addition. Surface ***2011*** was 0.04m thick, abutted the interior skin of refractory bricks, and had been laid on a levelling deposit of crushed bricks and clinker.

Plate 30: The excavated foundation of the chimney stack

*Plate 31: Concrete foundation **2012** exposed around the exterior of the stack*

4.4.5 The foundations of the chimney stack had been cut across its centre by the foundation trench ***(2009)*** for a modern drainpipe, which passed north/south across the centre of the chimney, and then turned through a right angle and continued eastwards (Plate 32). It seems possible that the foundation trench for this drainpipe utilised the existing flue aperture into the chimney stack, as there was no surviving physical evidence to demonstrate firmly where the flue had entered the stack. The foundation trench for a second modern drain ***(2010)***, aligned east/west, cut the south-eastern corner of the chimney stack (Plate 32).

*Plate 32: Drain **2010** continuing eastwards from the foundations of the chimney stack*

4.4.6 The excavated remains did not retain any firm physical evidence for the precise point at which the flue from the boiler entered the chimney stack. However, excavation of the area immediately beyond the foundations of the chimney did reveal some evidence for a series of flues. Flue ***2014*** was revealed in the east-facing section of the excavated trench (Fig 7). The structure two parallel walls, set 0.84m apart, and composed of hand-made bricks, with average measurements of 0.215 x 0.115 x 0.07m (8.4" x 4.5" x 2.75"). The base of the flue comprised a single course of bricks. It is tempting to suggest that this may have been the vestiges of a flue associated with the chimney depicted on the Ordnance Survey map of 1848, although firm evidence is lacking.

4.4.7 The remains of a second flue ***(2005)*** were revealed in the south-western corner of the excavated area (Fig 8). This flue was aligned east/west, and comprised machine-made bricks, each measuring 0.23 x 0.115 x 0.07m (9.05" x 4.5" x 2.75") and bonded with a black cement-based mortar, indicative a late nineteenth-century construction date. The walls of the flue were two-courses thick, and survived to a height of 1m (Plate 33). The base of the flue was also formed from bricks, creating a surface that was a single-course deep. The internal elevations of the flue were degraded and discoloured, indicating that they had been subject to high temperatures.

*Plate 33: The remains of flue **2005** exposed in the south-west corner of the excavated area*

4.4.8 The remains of a third flue ***(2006)*** were also revealed in the excavated area. This flue was aligned north-east/south-west, and comprised machine-made bricks. The route of this flue clearly cut through flue ***2005***, demonstrating that it represented a later modification.

4.4.9 The area surrounding the chimney stack was characterised by two historic surfaces (Plates 34 and 35). The earliest of these appeared to be a brick surface ***(2000)***, which was exposed in the south-west corner of the excavated area. The surface comprised hand-made bricks laid on their side, with an average measurement of 0.2 x 0.11 x 0.075m (7.9" x 4.3" x 3"). This surface was abutted by a substantial surface ***(2001)*** composed of square granite setts that were bonded with tar. Surface ***2001*** curved around the chimney (Plate 34), leading into the north-western corner of the excavated area. The surface was flanked on both sides by walls that survived to a maximum height of 0.5m. Both walls were four-courses thick, and comprised machine-made bricks bonded with cement-based mortar, consistent with a twentieth-century construction date. The position of these walls corresponds with features shown on the Ordnance Survey map of 1922, but are absent from the previous edition of 1909.

4.4.10 Excavation to the east of surface ***2001*** revealed a thick deposit of galligu. Composed of calcium sulphide, this industrial waste derived as a by-product from the Leblanc process of manufacturing soda ash, but had no economic value and was thus usually piled in heaps near soda works and allowed to weather naturally.

*Plate 34: The excavated remains of surface **2001**, looking south-east*

*Plate 35: The excavated remains of surface **2000** and surface **2001***

4.5 AREA D: FIREBRICK WORKS

4.5.1 The footprint of the firebrick works depicted on late nineteenth- and early twentieth-century historical mapping was investigated initially in Trenches 12 and 13. Well-preserved buried structural remains of the works were exposed (*Section 1.3.9 above*), leading to a more detailed excavation. This entailed the excavation of two trenches across the footprint of the works as shown on the Ordnance Survey maps of 1893 and 1909 (Fig 3).

4.5.2 ***Northern Part:*** the first area investigated the northern part of the site, and specifically the northern end of a long rectangular range depicted on historical mapping (Fig 9). The excavation of this area exposed the foundations of a large building, which measured at least 19.5m long and 12m wide, and survived to a height of 14 courses of bricks. The exterior wall ***(3000)*** of the structure was substantial, incorporating five courses of bricks at its foundation. The bottom three courses were constructed from hand-made bricks, bonded with lime-based mortar, with the component bricks having an average dimension of 0.22 x 0.105 x 0.07m (8.6" x 4.1" x 2.75"). All the overlying courses, however, comprised machine-made bricks, bonded with a hard black mortar, with the component bricks having an average dimension of 0.22 x 0.11 x 0.075m(8.6" x 4.5" x 3"). This suggested that the building had been rebuilt above its foundations in the late nineteenth or twentieth century.

4.5.3 A series of brick-built partitions survived within the footprint of the building, which seemed to collectively form a series of six parallel flues (Plate 36). This may have been for the steam heating of the overlying floor to facilitate the drying of 'green' bricks prior to being fired in the kiln.

4.5.4 Partition walls ***3001***, ***3003*** and ***3007*** were all aligned north-east/south-west along the length of the building, and were all a single-brick course wide. Partition walls ***3002***, ***3005***, ***3006*** and ***3017*** were similarly all aligned north-east/south-west along the length of the building, but were two-brick courses wide, suggesting that these walls may have been intended to support a floor. None of the walls were bonded to the end wall (***3000***) of the building. All of the partition walls survived to a maximum height of 13 courses. The bottom two courses of all the partitions were constructed from hand-made bricks, and bonded with lime-based mortar. The overlying courses comprised machine-made bricks bonded with a dark grey, ash mortar. The partitions ***3001***, ***3002***, ***3003*** and ***3006*** were laid on a foundation course of refractory tiles (Plate 37).

4.5.5 In each wall there were several gaps, set at a regular spacing of 2.2m, and perhaps represented vents between the flues. Partitions ***3005*** and ***3006*** were separated by a gap of 0.75m, which was possibly intended as a doorway.

4.5.6 Between each of the probable flues were short cross walls, which divided each of the six flues into two sections. The cross walls formed a single alignment across all of the flues (Fig 9), and comprised hand-made bricks bonded with lime-based mortar. They were all a single-course wide, and survived to a maximum height of ten courses.

Plate 36: View looking north-west across the excavated remains in the northern part of Area D

*Plate 37: Refractory tiles forming a foundation course for partition wall **3001***

4.5.7 ***Southern Part:*** the southern part of the firebrick works was investigated as a subsequent stage of excavation, which was carried out in November 2012. This part of the site contained severely contaminated ground, and thus the archaeological excavation was limited to recording the upper surface of exposed structural remains. Mechanical stripping across much of the area was monitored archaeologically, although the manual cleaning and detailed recording of exposed structural remains was necessarily limited.

4.5.8 Excavation in the south-western corner of the former firebrick works site exposed the fragmentary remains of three adjoining buildings that formed an L-shaped range depicted on the Ordnance Survey map of 1893 (Fig 9). A structure ***(09)*** comprising three walls (***04***, ***05*** and ***06***) was revealed in the southern corner of the building's footprint (Plate 38). The walls all comprised hand-made bricks, each measuring 230mm x 110mm x 70mm (9.1" x 4.3" x 2.75"), and bonded with a lime-based mortar, consistent with a mid-nineteenth-century construction date. Walls ***05*** and ***06*** were all two-courses wide, and survived to a height of six courses. Wall ***04*** was more substantial, being eight-courses wide at its foundation. Wall ***06***, forming the south-western wall of the building depicted on historical mapping, retained the remains of two metal rods that had probably been used for securing an item of machinery to the wall (Plate 39).

4.5.9 The area enclosed by the walls contained mixed rubble in a dark grey sandy clay matrix. This material also contained a significant level of ground contamination, precluding detailed excavation. However, mechanical excavation revealed that wall ***04*** survived to a height in excess of 1.5m, although no floor surfaces were encountered at depth.

*Plate 38: The remains of walls **04**, **05** and **06**, partially excavated*

*Plate 39: The remains of restraining bars set in wall **06**, with wall **07** to the rear*

4.5.10 The south-western side of wall ***06*** was abutted by the remains of another wall (***07***). This was similarly two-courses wide, and comprised hand-made bricks, although they were slightly darker in colour (Plate 39), suggesting that they may have been subject to high temperatures. The location of this wall corresponds with the position of the south-eastern wall of a square-section chimney depicted on the Ordnance Survey 1:500 Plan of 1891.

4.5.11 Wall ***04*** was overlain partly by a substantial machine bed ***(03)***, which comprised two stone slabs, each measuring 2.2 x 0.9 x 0.9m (Plate 40). Both of the stone stabs housed four vertical steel rods, which had clearly been used to restrain a large item of machinery. This is likely to have been a horizontal steam engine, which may have been employed as a winding engine associated with the shaft situated to the south-east. Machine bed ***(03)*** was aligned north-west/south-east along the centre of the building depicted on historical mapping, suggesting that this may have been the position of the engine cylinder. It is possible that structure ***09***, situated immediately to the south-west, represented the remains of a pit for a winding drum for the shaft, although firm evidence is lacking.

4.5.12 Excavation of the area to the east of the engine house revealed the remains of a brick surface ***(11)***, which sloped down to the north. The surface largely comprised hand-made bricks, laid to a single-course deep, and covered an area measuring some 12.2 x 7m (Plate 41). It also contained several refractory tiles, each measuring 250 x 250 x 40mm (9.8” x 9.8” x 1.6”), which seemingly represented some localised repair. Surface ***11*** had been laid on a levelling deposit of cinders which, in turn, sealed the natural clay geology ***(35)***. The remains of the yard surface, and the building range in the south-western corner of the site, were sealed beneath modern levelling material ***(02)*** and a concrete slab ***(01)*** that formed the existing ground surface.

*Plate 40: Stone-built machine bed **03***

*Plate 41: Cleaning surface **11***

4.5.13 The eastern part of the excavation area investigated part of a long rectangular building depicted on historical mapping (Fig 9). An area measuring some 14.4 x 6.6m within the footprint of the building was excavated. The remains of the western wall ***(20)*** of the building were two-courses wide, and survived to a maximum height of six courses. The wall comprised hand-made bricks, which were bonded with a lime-based mortar. The position of the eastern wall of the building lay beyond the excavated area (Fig 9).

4.5.14 A floor ***(21)*** composed almost entirely of refractory tiles was revealed in the interior of the building (Plate 42). Each of the tiles measured 230 x 230 x 50mm (9.1" x 9.1"x 2"), and appeared to have been bonded with a lime-based mortar. The floor had been repaired several times using refractory bricks of standard dimensions. The removal of floor ***21*** demonstrated that it had been laid on a deposit of cinders, similar to that exposed beneath yard ***(11)***, which directly overlay the natural clay geology.

*Plate 42: Floor **21***

4.5.15 Two parallel brick-lined channels ***(31*** and ***32)***, aligned north-west/south-east, were exposed immediately to the east of floor ***21***. These channels comprised hand-made brick, and were capped with refractory tiles. The tiles, each measuring 230 x 230 x 40 (9.1" x 9.1"x 1.6"), were specially moulded, incorporated recessed edges allowing adjacent tiles to interlock. The nature of these channels suggested that they may have been flues, providing a conduit for hot gases or steam through the building at floor level.

4.5.16 The central part of the firebrick works site contained particularly high levels of chemical contamination, which precluded any close inspection of buried remains. However, archaeological monitoring was maintained during the mechanical excavation of the area, which was carried out using a toothless ditching bucket. This part of the site covered *c* 30 x 10m, and was excavated to the level of the natural clay geology, which was exposed at a depth of 1.8m below the existing ground level.

4.5.17 This area incorporated the site of one of the circular kilns depicted on historical mapping. However, became clear during the course of the archaeological monitoring that the kiln had been almost entirely demolished during previous development of the site, leaving only very fragmentary remains *in-situ*. These remains included part of the kiln floor, which seemingly comprised two courses of hand-made bricks. A short section of a curving wall was also noted, which probably represented the vestiges of the kiln hovel. This similarly comprised hand-made bricks, and was two courses wide.

4.5.18 Another brick wall ***(206)*** was noted close to the north-eastern limit of excavation. This comprised hand-made bricks, and was aligned north-west/south-east. It seemed to be a continuation of the putative flue ***31/32*** that was excavated in the southern part of the site (*Section 4.5.15 above*).

4.6 FINDS

4.6.1 The artefactual assemblage recovered during the course of the investigation comprised almost exclusively of ceramic building material. A sample of refractory bricks was collected as single examples of each type of manufacturer's stamp recovered from the excavation. All of the sampled refractory bricks were examined visually. Most of the bricks were relatively standard-sized refractory bricks, although each represented a different type.

4.6.2 ***Williams & Co:*** refractory bricks were manufactured within the excavation area by Robert Williams & Co from *c* 1850 and, from the late 1870s, by Edward Williams (*Section 3.4 above*). Two different types of stamps were recognised, which can be attributed to slightly different date ranges.

Plate 43: Refractory brick produced by Williams & Co, probably before the late 1870s

Plate 44: Refractory brick produced by Edward Williams, probably post-dating the late 1870s

4.6.3 ***BC:*** this example derived from the Bradford Colliery Brickworks, which was in production from the early 1870s until *c* 1903. It was one of the largest brickworks in the Manchester area during the late nineteenth-century, and was operated by Edward Williams (Miller 2011). One example (Plate X) differs in colour from the other refractory brick, being orangey-red in colour. It represents a cheaply available type with some fireproof qualities, but less so than those with a high alumina content.

4.6.4 Such bricks were used in huge quantities within the inner parts of structural walls where the more heat-resistant refractory brick need only be used as a facing skin. This was most typically the case with boiler beds, for instance, where a large quantity of slightly heat-resistant brick was required to form a solid structure to support the weight of a boiler, but where only the facing brick need be of true refractory-type (Miller and Wild 2007).

Plate 45: Example of a brick produced at the Bradford Colliery Brickworks

4.6.5 ***Nettle:*** this example of a 'Nettle' refractory brick was recovered from the boiler seating in boiler bay ***1072*** (Area A). It is a typical style of yellowish refractory brick, comprising fireclay, often with a high alumina content, and usually associated with colliery seams. The brick bears the stamp 'Nettle', denoting that it derived from the Nettle seam of fireclay, discovered on Christmas Day 1923 in Muiravonside, Stirlingshire (urbexforums.co.uk). Nettle brick were produced in newly designed tunnel kilns, at the Manuel Works from April 1930 (*ibid*). The brick probably dates from around this period.

Plate 46: Example of a 'Nettle' refractory brick

4.6.6 ***Thistle:*** this example was almost certainly manufactured in Scotland by JG Stein, who operated brickworks at High Bonnybridge and Allandale, near Falkirk, which was established in 1904. JG Stein amalgamated with General Refractories of Sheffield in 1967, and was taken over subsequently by Hepworth Ceramic Holdings. The 'Thistle' brand had a 38% alumina content.

Plate 47: Example of a 'Thistle' refractory brick

4.6.7 ***Glenboig:*** the brickworks of the Glenboig Union Fireclay Company in Lanarkshire, Scotland, became one of the largest producers of refractory bricks in the world. The firm earned a reputation for producing high-quality refractory bricks, which was enabled by the unusually high alumina content of the local fireclays (Worral 1975, 62).

4.6.8 The production of refractory bricks at Glenboig commenced in the 1830s, although the local industry expanded dramatically from the 1860s under the management of James Dunnachie. In 1865, he formed the Glenboig Fireclay Company in partnership with John Hurll and John Young. This partnership was dissolved in 1872, and Dunnachie established the Star Works. The bricks produced at the Star Works were stamped 'Star Works, Glenboig', or just 'Glenboig' with a star impressed beneath. The Star Works remained in production as an independent factory until 1882, when the company amalgamated with the Glenboig Fireclay Company to form the Glenboig Union Fireclay Company Ltd. It is likely that the example recovered from the excavation was manufactured by the Glenboig Union Fireclay Company Ltd, and was thus produced after 1882. This company remained in production until 1936, when the company was taken over by General Refractories Ltd (Sanderson 1985).

4.6.9 Refractory bricks bearing the 'Glenboig' stamp have been recovered from several archaeological excavations in Manchester. These include an excavation of the late nineteenth-century boiler house at Murrays' Mills in Ancoats (Miller and Wild 2007), and the late nineteenth-century boiler house at Bradford Colliery (OA North 2011b).

Plate 48: Example of a 'Glenboig' refractory brick

4.6.10 ***Hammond:*** these examples, both measuring 0.23 x 0.115x 0.075m (9.05" x 4.5" x 3"), were recovered from surface ***1510*** (Area B). They probably derive from the brickworks of William Hammond at Pott Shrigley in the Poynton Coalfield of East Cheshire. The brickworks was established in *c* 1802 by George Lambert and Abraham Bury, and was taken over by Hammond in 1886. The output of the works at that date was limited to white-glazed bricks, and refractory bricks were not produced until the 1890s. Thereafter, William Hammond concentrated production entirely on refractory bricks, fire backs and fire-clay tiles (GMRO/342). The company ceased making refractory bricks in 1968.

Plate 49: Example of a 'Hammond' refractory brick

Plate 50: Another example of a 'Hammond' refractory brick

4.6.11 ***Rake FBCo:*** there is little documentary evidence for the Rake Fire Brick Co Ltd, although the firm is listed in Manchester trade directories for the early 1860s (Slater 1863, 401). By the late 1870s, the firm had premises on Lees Street in Ancoats (Slater 1879, 313). The last reference to the company in trade directories, however, is in 1883, suggesting that they may have ceased trading by the mid-1880s (Slater 1883, 311).

Plate 51: Example of a refractory brick produced by the Rake Fire Brick Co Ltd of Manchester

5. DISCUSSION

5.1 DISCUSSION

5.1.1 The archaeological investigation of the former OMG Works has provided a rare opportunity to excavate the site of an early nineteenth-century chemical works in an area that emerged as an important centre for the manufacture of chemicals for the textile industries, and especially chemicals derived from coal tar. As is often the case with nineteenth-century industries, the early development of chemical manufacturing from coal tar at a local level is poorly documented, which increases the potential importance of any physical remains that can inform a better understanding of the trade. However, the excavation of the OMG site was fraught with limitations that arose from significant levels of ground contamination that characterised large areas of the site. The contamination derived as a direct result of the site's use for chemical manufacturing, and precluded the manual excavation of many of the exposed remains. Nevertheless, the excavation demonstrated that the mid-nineteenth-century fabric of the Clayton Chemical Works had been largely replaced during the late nineteenth and twentieth centuries which, to some extent, perhaps reflects technological advances in the manufacturing processes that were adopted in the twentieth century. The nature of the surviving buried structures, moreover, implies that most of the manufacturing processes were carried out in apparatus that was raised above the ground level, as the excavation revealed little physical indication of the production process, with the exception of the deep brick-lined and concrete tanks.

5.1.2 The most intact remains of the chemical works pertained to the steam-raising plant that were exposed in the central part of the site, and included the foundations for two Lancashire boilers, a possible economiser, and a chimney. The boiler house was seemingly built in the twentieth century, with some of the component refractory bricks probably dating to the 1920s. It is likely that the boilers had been intended to raise the steam required by a small engine, which presumably furnished the power requirements in the works. It is notable, however, that the boiler house only contained two boilers, suggesting that the engine was comparatively small, reflecting the limited requirements for motive power in the works.

5.1.3 Other well-preserved remains included surface ***1078***, which was exposed along the western side of the Area A. This is likely to have been a private road that branched off Colliery Street to the Clayton Chemical Works. It is not shown on any of the published Ordnance Survey maps of the area, and it is thus difficult to provide even a broad date for the inception of this road. However, it is likely to have been laid following the demolition of the original chemical works prior to the late 1880s, as the road takes a route across the footprint of one of the principal buildings shown on the Ordnance Survey map of 1850 (Fig 5).

5.1.4 The original chimney for the works had been erected by the middle of the nineteenth century. However, this was replaced by a new chimney in the later nineteenth century, which was erected immediately to the west of the original, which was removed entirely and its site redeveloped as surface ***2001***.

5.1.5 The replacement chimney is likely to have provided a vent for the waste gases generated by the manufacturing processes in addition to the exhaust from the steam-raising boilers. It was clearly a substantial structure, as can be seen in the background of a photograph taken along the disused Clayton Arm of the Ashton Canal in 1960 (Plate 52).

Plate 52: View along the disused Clayton Arm in 1960, showing premises occupied by the Clayton Aniline Company, and the chimney of the Clayton Chemical Works in the background

5.1.6 The canalside building in the north-eastern part of the site was possibly one of the earliest buildings to have been erected in the study area. The available documentary evidence for this building, which has been derived almost entirely from historical mapping, suggests that it may have been remodelled several times during the nineteenth century. Whilst the size and layout of the building shown on historical mapping is reminiscent of a row of domestic cottages, the excavation has concluded that the building may have been a canalside warehouse. The absence of any reference to the buildings in nineteenth-century Census Returns adds weight to the suggestion that it was not housing.

5.1.7 The firebrick works in the north-western part of the site was established by Robert Williams in *c* 1850, and appears from cartographic evidence to have comprised two circular kilns, together with ancillary buildings that will have housed the preparatory processes of forming the bricks and initial drying prior to firing. The footprint of one of the kilns lay beyond the boundary of the present study area, whilst excavation of the second kiln demonstrated that it had been almost entirely destroyed, presumably when the site was redeveloped in the early twentieth century (Plate 53).

5.1.8 It seems likely that the kilns were of a circular, multi-flued type, a typical nineteenth-century design. These usually comprised evenly-spaced fire-mouths around the firing chamber, with a single porthole, or 'wicket', through which the brick-maker accessed the firing chamber. The kiln is likely to have been encased by a hovel, which will have helped to conserve heat loss from the firing chamber whilst simultaneously assisting an upward draught through the chimney (Barker 1991).

5.1.9 The excavated remains exposed in the north-eastern part of the site are likely to have represented part of the under-floor heating system in the preparatory building that occupied the eastern boundary of the firebrick works. This may have been used as a drying room, where freshly moulded 'green' bricks were gently dried prior to being fired in the kiln. The network of channels excavated in the northern part of this building may have formed a series of conduits for steam or hot air channelled from the kilns. Curiously, these channels extended beyond the footprint of the building shown on Ordnance Survey mapping.

Plate 53: The site of the firebrick works in c 1964, following redevelopment

6. CURATION AND CONSERVATION

6.1 RECIPIENT MUSEUM

6.1.1 The Museum of Science and Industry in Manchester has been nominated as the ultimate repository for the finds:

Museum of Science and Industry in Manchester,
Liverpool Road,
Manchester

6.1.2 Arrangements were made with the Museum prior to the commencement of the excavations for the deposition of the complete site archive, and the Museum Curator has acknowledged her willingness to accept the archive.

6.2 CONSERVATION

6.2.1 There are no conservation requirements.

6.3 STORAGE

6.3.1 The complete project archive, which will include written records, plans, black and white and colour photographs, and artefacts, will be prepared for long-term storage following the guidelines set out in *Environmental standards for the permanent storage of excavated material from archaeological sites* (UKIC 1984, Conservation Guidelines 3), and *Guidelines for the preparation of excavation archives for long-term storage* (Walker 1990).

6.4 DISSEMINATION

6.4.1 The complete results obtained from the archaeological investigation are incorporated in this final excavation report. In addition to Buckingham Group Contracting, copies of the report will be forwarded to the Museum of Science and Industry in Manchester, Manchester City Council Planning Department, and the Greater Manchester Historic Environment Record.

6.4.2 The issue of the publication of archaeological reports and public accessibility to data has been stressed in the North West Region Archaeological Research Framework (Brennand 2007). Whilst this is a problem for the entire archaeological community, the visual nature of industrial period remains, and its link to the present population, increases the significance of prompt publication of studies of this nature.

6.4.3 In order to disseminate the results obtained from the archaeological work to a national audience, a summary of the excavation and research carried out as part of the project will be synthesised for publication as a booklet in the *Greater Manchester's Past Revealed* series. This will incorporate the results obtained from the Phase 1 excavation works on the site.

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APPENDIX 1: WRITTEN SCHEME OF INVESTIGATION

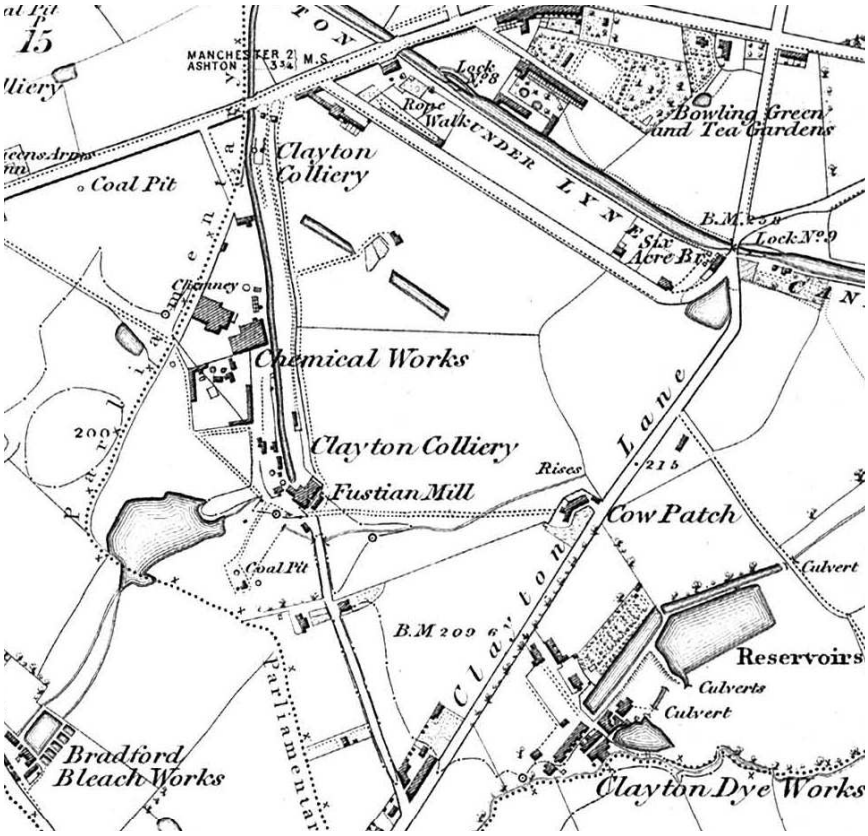
August 2011

Oxford Archaeology North

OPENSHAW WEST,

CLAYTON,

MANCHESTER



Extract from the Ordnance Survey map of Clayton, 1848

ARCHAEOLOGICAL INVESTIGATION PROJECT DESIGN

Proposals

This Project Design is offered in response to a request from Mr S Foster, of Buckingham Group Contracting Ltd, for a programme of archaeological investigation in advance of the proposed remediation of land bounded by Ashton New Road, Score Street, Clayton Lane, Wilson Street and Alan Turing Way, in the Clayton area of Manchester.

1 BACKGROUND

1.1 CIRCUMSTANCES OF PROJECT

1.1.1 In August 2010, Oxford Archaeology North (OA North) was commissioned by Buckingham Group Contracting Ltd to carry out a programme of archaeological investigation at Openshaw West, Manchester (centred on NGR SJ 87460 98052). The archaeological work was required as part of a wider scheme intended to remediate and make safe the site in advance of the ultimate redevelopment of the area.

1.1.2 The site is of considerable archaeological interest, as it developed rapidly from a sparsely populated agricultural area to an important centre of industrial activity from the mid-nineteenth century onwards. In particular: the sites of a former firebrick works; an early nineteenth-century chemical works; a canal arm; and a row of buildings that probably represent workers' cottages. Any below-ground remains of these sites would be of considerable industrial and social archaeological interest if they survive.

1.1.3 In order to secure archaeological interests, the County Archaeologist for Greater Manchester, who provides archaeological planning advice to Manchester City Council, recommended that a programme of archaeological investigation was carried out to support the application for the remediation of the site. In the first instance, the scope of the archaeological works required was specified in a brief devised by WYG Environment in consultation with the County Archaeologist, which allowed for the excavation of a series of trenches across the sites of archaeological interest. The trenches were are to identify and characterise the surviving evidence for buried archaeological remains, and allow an informed decision to be reached regarding the need for further excavation to record buried remains that may be destroyed during the course of development groundworks.

1.2 OXFORD ARCHAEOLOGY

1.2.1 Oxford Archaeology (OA), which is an educational charity under the guidance of a board of trustees, has over 30 years of experience in professional archaeology, and can provide a professional and cost-effective service. We are the largest employer of archaeologists in the country (we currently have more than 200 members of staff), and can thus deploy considerable resources with extensive experience to deal with any archaeological obligations you or your clients may have. We have offices in Lancaster, Oxford and Cambridge, trading as Oxford Archaeology North (OA North), Oxford Archaeology South (OA South) and Oxford Archaeology East (OA East) respectively, enabling us to provide a truly nationwide service. OA is an Institute for Archaeologists Registered Organisation (No 17). All work on the project will be undertaken in accordance with relevant professional standards, including:

- IfA's *Code of Conduct*, (1999); *Code of Approved Practice for the Regulation of Contractual Arrangements in Field Archaeology*, (1999); *Standard and Guidance for Archaeological Evaluations*, (1999); *Standard and Guidance for Archaeological Watching Briefs*, (1999);
- English Heritage's *Management of Archaeological Projects (MAP2)*, 1991.
- *The European Association of Archaeologists Principles of Conduct for Archaeologists Involved in Contract Archaeological Work* (1998).

1.2.2 Given the geographical location of Manchester, it is intended to co-ordinate the project from our northern office in Lancaster, which has unrivalled experience of working on post-medieval sites, and is recognised as one of the leading archaeological units in the country with regard to dealing with Industrial Period archaeological projects. In recent years, OA North has undertaken numerous desk-based assessments, evaluations and excavations of former industrial sites and workers' housing in Manchester and Salford, providing us with specialist expertise in dealing with this type of site. Most recently, OA North carried out a programme of archaeological evaluation and excavation on the site of the former Clayton Aniline Works, which forms part of the present study area.

2 AIMS AND OBJECTIVES

2.1 ACADEMIC AIMS

2.1.1 The main research aim of the investigation, given the commercial nature of the proposed scheme, will be expose and record the buried remains of archaeological interest within the specified areas, and generate a complete record of the remains to mitigate their ultimate loss as part of the proposed remediation works.

2.2 OBJECTIVES

2.2.1 The following programme has been designed to preserve by record any archaeological deposits or features that may be present that will be impacted on by the proposed scheme of remediation. The information will be finally disseminated through the deposition of the archive at The Museum of Science and Industry in Manchester, a final report at the Greater Manchester Historic Environment Record, and at publication level. The work will be carried out in line with current IfA guidelines, and in line with the IfA Code of Conduct. The principal objectives of the project may be achieved via the following stages:

- ***Archaeological Evaluation:*** to excavate eight trenches across the site to establish the presence or absence of buried archaeological remains (Figure 1);
- ***Archaeological Excavation:*** pending the results obtained from the initial trenches, to open up excavation areas, which will be targeted on the buried remains of archaeological interest that were exposed in the evaluation trenches;
- ***Historical research:*** a programme of historical research will be carry out to supplement the information gathered during a desk-based assessment for the site;
- ***Post-excavation and Report Production:*** the site records, finds and any samples from the excavation programme outlined below will form a checked and ordered site archive as outlined in the English Heritage guideline document *Management of Archaeological Projects* (2nd edition, 1991). Following compilation of the project archive a report will be produced;
- ***Archive Deposition:*** the results of the excavation will form the basis of a full archive to professional standards, in accordance with current English Heritage guidelines and the *Guidelines for the Preparation of Excavation Archives for Long Term Storage* (UKIC 1990). The project archive represents the collation and indexing of all the data and material gathered during the course of the project;
- ***Dissemination:*** the results obtained from the excavation will be disseminated to the wider public via publication as a dedicated booklet in the *Greater Manchester's Past Revealed* series.

2.2.2 It is anticipated that the archaeological investigation will address several of the initiatives for archaeological research of the industrial and modern periods stated in the current *Archaeological Research Framework for North West England* (Newman and McNeil 2007; McNeil and Newman 2007). In particular:

- *Initiative 6.10:* 'Sample appropriate deposits for palaeo-environmental evidence wherever possible to gain information on the exploitation of plants and animals…' (Newman and McNeil 2007, 119);
- *Initiative 7.6:* 'A study of the development of workers' housing in Greater Manchester should be undertaken to examine the development of different housing types…' (McNeil and Newman 2007, 139);
- *Initiative 7.7:* 'Study the material culture of industrial workers' households…' (*ibid*);
- *Initiative 7.12:* 'Study the development of the agrarian landscape in those parts of the region that have previously attracted little attention' (*op cit*, 142);
- *Initiative 7.25:* 'Where threatened with possible redevelopment excavations are required of now undeveloped and cleared former working class areas regarded as slums' (*op cit*, 147);
- *Initiative 7.41:* 'The retention of later period artefacts and their routine analysis as part of all archaeological excavation projects' (*op cit*, 156).

2.2.3 In addition, the investigation may address the following research objectives:

- Establish the plan form, chronology, and dating for a group of rural workers cottages;
- Examine the material culture associated with rural workers cottages;
- Establish the character of the late eighteenth-century land use;
- of the late eighteenth-century rural land use of the area;
- establish the nature of the steam-power plant for the mill, and evidence for its development through the nineteenth century
- establish the form of the late eighteenth-century canal arm;
- establish the plan form of the early nineteenth-century chemical works;
- establish the nature of the steam-power plant within the chemical works.

3 METHOD STATEMENT

3.1 SITE SET-UP

3.1.1 The following work programme is submitted in line with the aims and objectives summarised above. As an initial stage in the programme of works, the targeted for excavation will be marked out, and CAT-Scan will be carried out to locate any services present within the excavation areas.

- Trench 8 will measure approximately 15 x 5m, and will investigate the route of the Clayton Colliery arm of the Ashton Canal;
- Trench 11 will measure approximately 30 x 5m, and will investigate a row of possible workers' cottages depicted on the Ordnance Survey map of 1848. The eastern part of the trench will also investigate the route of the Clayton Colliery arm of the Ashton Canal;
- Trench 12 will measure approximately 30 x 5m, and will investigate the firebrick woks and associated kilns depicted on late nineteenth-century mapping. The position of this trench, however, lies beneath a building that is presently occupied. It is anticipated that the excavation of this trench will be carried out as a second phase of investigation, scheduled to commence in May/June 2012;
- Trench 13 will measure approximately 30 x 10m, and will investigate the firebrick woks and associated kilns depicted on late nineteenth-century mapping;
- Trench 19 will measure approximately 30 x 5m, and will investigate building associated with an industrial complex depicted on the Ordnance Survey map of 1848;
- Trench 20 will measure approximately 20 x 5m, and will investigate the chemical works depicted on the Ordnance Survey map of 1848;
- Trench 21 will measure approximately 30 x 5m, and will investigate the chemical works depicted on the Ordnance Survey map of 1848;
- Trench 22 will measure approximately 30 x 5m, and will investigate the chemical works depicted on the Ordnance Survey map of 1848.

3.1.2 It should be noted that the trench locations shown in Figure 1 are indicative, and precise locations and dimensions may be subject to revision based on ground conditions and Health & Safety considerations.

3.1.3 In the event of significant remains being identified, it is anticipated that a programme of further investigation will be carried out immediately, pending the advice of the County Archaeologist for Greater Manchester. For this reason, it is proposed that large trenches are excavated in the first instance.

3.2 FIELDWORK

3.2.1 Excavation of the uppermost levels of modern overburden/demolition material will be undertaken by a machine fitted with a toothless ditching bucket to the top of the first significant archaeological level. It is envisaged that a *c* 20-tonne tracked excavator will be employed for this purpose. The work will be supervised closely by a suitably experienced archaeologist. Spoil from the excavation will stored in a stockpile, and then returned to the excavation area upon completion of the archaeological works.

3.2.2 Machine excavation will then be used to define carefully the extent of any surviving structures and other remains. Thereafter, structural remains will be cleaned manually to define their extent, nature, form and function.

3.2.3 All information identified in the course of the site works will be recorded stratigraphically, using a system adapted from that used by the Centre for Archaeology Service of English Heritage. Results of the excavation will be recorded on *pro-forma* context sheets, and will be accompanied with sufficient pictorial record (plans, sections and both black and white and colour photographs) to identify and illustrate individual features. Primary records will be available for inspection at all times.

3.2.4 A full and detailed photographic record of individual contexts will be maintained and similarly general views from standard view points of the overall site at all stages of the evaluation will be generated. Photography will be undertaken using 35mm cameras on archivable black and white print film, and all frames will include a visible, graduated metric scale. Extensive use of digital photography will also be undertaken throughout the course of the fieldwork for presentation purposes. Photographs records will be maintained on special photographic *pro-forma* sheets.

3.2.5 The precise location of the excavation trenches, and the position of all archaeological structures encountered, will be surveyed by EDM tacheometry using a total station linked to a pen computer data logger. This process will generate scaled plans within AutoCAD software, which will then be subject to manual survey enhancement, as appropriate. The drawings will be generated at an accuracy appropriate for 1:20 scale, but can be output at any scale required. Sections will be manually drafted as appropriate at a scale of 1:10. All information will be tied in to Ordnance Datum.

3.2.6 Human remains are not expected to be present, but if they are found they will, if possible, be left *in-situ* covered and protected. If removal is necessary, then the relevant Home Office permission will be sought, and the removal of such remains will be carried out with due care and sensitivity as required by the *Burials Act 1857*.

3.2.7 Any gold and silver artefacts recovered during the course of the excavation will be removed to a safe place and reported to the local Coroner according to the procedures relating to the Treasure Act, 1996.

3.2.8 ***Finds policy:*** finds recovery and sampling programmes will be in accordance with best practice (following current Institute for Archaeologists guidelines) and subject to expert advice in order to minimise deterioration. OA has close contact with Ancient Monuments Laboratory staff at the University of Durham and, in addition, employs in-house artefact and palaeoecology specialists, with considerable expertise in the investigation, excavation, and finds management of sites of all periods and types, who are readily available for consultation. Finds storage during fieldwork and any site archive preparation will follow professional guidelines (UKIC). Emergency access to conservation facilities is maintained by OA North with the Department of Archaeology, the University of Durham. Samples will also be collected for technological, pedological and chronological analysis as appropriate.

3.2.9 ***Environmental Sampling:*** the strategy for palaeo-environmental sampling will be developed on site, in consultation with appropriate specialists, as necessary. The environmental sampling strategy will therefore evolve from as discussion between those specialists and the field team and will be in accordance with current best practice.

3.2.10 In broad terms, however, the sampling strategy will be aimed at recovering palaeo-botanical, palaeo-zoological and pedological evidence. It is anticipated that environmental samples (bulk samples of 30 litres volume, to be sub-sampled at a later stage) will be collected from stratified undisturbed deposits and will particularly target negative features.

3.3 POST-EXCAVATION

3.3.1 Post-excavation work will comprise the following:

- checking of drawn and written records during and on completion of fieldwork;
- production of a stratigraphic matrix of the archaeological deposits and features present on the site, if appropriate;
- cataloguing of photographic material, which will be mounted appropriately
- cleaning, bagging and labelling of finds according to the individual deposits from which they were recovered. Any finds requiring specialist treatment and conservation will be sent to an appropriate Conservation Laboratory. Finds will be identified and dated by appropriate specialists;
- assessment of all artefacts, biological samples and soils recovered from the site, providing recommendations for further analysis. In particular, more detailed analysis of any palaeo-environmental material recovered from agricultural horizons associated with Cow Patch or Ivy Cottage, together with some application of scientific dating techniques, such as radio-carbon assay;
- assessment of any technological residues recovered will be undertaken, providing recommendations for further analysis.

3.4 ARCHIVE/REPORT

3.4.1 ***Archive:*** the results of all archaeological work carried out will form the basis for a full archive to professional standards, in accordance with current English Heritage guidelines (*Management of Archaeological Projects*, 2nd edition, 1991), and in accordance with the *Guidelines for the Preparation of Excavation Archives for Long-Term Storage* (Walker 1990). The project archive represents the collation and indexing of all the data and material gathered during the course of the project. This archive will be provided in the English Heritage Centre for Archaeology format and a synthesis will be submitted to the CSMR (the index to the archive and a copy of the report).

3.4.2 The Arts and Humanities Data Service (AHDS) online database project *Online Access to index of Archaeological Investigations* (OASIS) will be completed as part of the archiving phase of the project.

3.4.3 ***Report:*** a draft copy of a written synthetic report will be submitted for comment to the archaeological curator (GMAU) for comment within eight weeks of completion of the fieldwork. The report will include:

- a title page detailing site address, NGR, author/originating body, client's name and address;
- full content's listing;
- a non-technical summary of the findings of the fieldwork;
- a description of the archaeological background;
- a detailed account of the historical development of the site, accompanied with map regression analysis;
- a description of the topography and geology of the study area;
- a description of the methodologies used during the fieldwork;
- a description of the findings of the fieldwork;
- detailed plans of the excavated trenches, showing the archaeological features exposed;
- an overall phased plan with sections of the excavated archaeological features;
- interpretation of the archaeological features exposed and their context within the surrounding landscape;
- specialist analysis reports on the artefactual/ecofactual/industrial remains from the site;
- appropriate photographs of specific archaeological features;
- a consideration of the importance of the archaeological remains present on the site in local, regional and national terms.

3.5 PUBLICATION

3.5.1 The results obtained from the programme of archaeological excavation will be of considerable local and regional interest, and will merit formal publication. The most appropriate format of this publication will be as a local booklet in the '*Greater Manchester's Past Revealed*' series. The booklet will incorporate the results obtained from the archaeological works carried out on the main site in 2010/11, together with the present study area.

3.6 OTHER MATTERS

3.6.1 ***Health and Safety:*** full regard will be given to all constraints during the course of the project. OA North provides a Health and Safety Statement for all projects and maintains a Safety Policy. All site procedures are in accordance with the guidance set out in the Health and Safety Manual compiled by the Standing Conference of Archaeological Unit Managers.

3.6.2 OA North undertakes to safeguard, so far as is reasonably practicable, the health, safety and welfare of its staff and of others who may be affected by our work. This applies in particular to providing and maintaining suitable premises, ensuring the safety of all equipment supplied by the Company, and providing all reasonable safeguards and precautions against accidents. OA North will also take all reasonable steps to ensure the health and safety of all persons not in their employment, such as volunteers, students, visitors, and members of the public (this includes trespassers). OA North will ensure, as far as is reasonably practicable, that no one suffers injury because of dangers arising from the state of the premises, or things done, or omitted to be done, on the premises.

3.6.3 OA North is fully familiar with and will comply with all current and relevant legislation, including, but not limited to:

- The Health and Safety at Work Act (1974);
- Management of Health and Safety at Work Regulations (1999);
- Manual Handling Operations Regulations 1992 (as amended in 2002);
- The Construction (Design and Management) Regulations (2007);
- The Control of Asbestos Regulations (2006);
- Confined Spaces Regulations (1997);
- Construction (Health, Safety and Welfare) Regulations (1996);
- The Work at Height Regulations (2005);
- The Control of Substances Hazardous to Health Regulations (2002);
- The Health and Safety (First-Aid) Regulations (1981);
- The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (1995);
- The Provision and Use of Work Equipment Regulations (1998);
- Lifting Operations and Lifting Equipment Regulations (1998).

4 WORK TIMETABLE

4.1 A two-week period has been allowed to carry out the excavation of the initial trenches. Pending the discovery of buried archaeological remains that merit further investigation, a five-week period has been allocated for further investigation.

4.2 A draft report will be submitted for comment within eight weeks of the completion of all element of the fieldwork.

4.3 OA North can execute projects at very short notice once an agreement has been signed with the Client.

5 STAFFING PROPOSALS

5.1 The project will be under the overall charge of **Ian Miller BA FSA** (OA North Senior Project Manager) to whom all correspondence should be addressed. Ian has considerable experience and particular research interests in Industrial Archaeology and, amongst numerous other projects, was involved in the survey, excavation recording, analysis and publication of the Netherhall blast furnace site in Maryport, Cumbria, the excavation, recording and publication of work at Carlton Bank alum works in North Yorkshire, and the excavation of Macintosh Mill in Manchester. Ian also managed the archaeological fieldwork, analysis and ultimate publication at Murrays' Mills (Miller and Wild 2007) and the Jersey Street Flint Glass Works (Miller 2007), both in Manchester. More recently, he has carried out the desk-based research of workers housing in various parts of central Manchester, and has managed excavation projects on George Leigh Street, Bengal Street, and New Islington Wharf, in the Ancoats area of the city, and the series of excavations at Sportcity in the Bradford area of Manchester.

5.2 The excavation will be directed by **Graham Mottershead** (OA North Project Officer). Graham has developed considerable expertise of industrial buildings and excavating historic industrial sites, particularly in Manchester. Most recently, Graham directed the programme of archaeological excavations at Sportcity.

5.3 It is not possible to provide details of specific technicians that will be involved with the fieldwork at this stage, but all shall be suitably qualified archaeologists with proven relevant experience. It is anticipated that in addition to the Site Director, the project will require the input of a Project Supervisor and up to four technicians during the course of the fieldwork.

5.4 Assessment of any finds recovered from the excavation will be undertaken by OA North's in-house finds specialist **Christine Howard-Davis BA** (OA North Finds Manager). Christine has extensive knowledge of all finds of all periods from archaeological sites in northern England, and is a recognised expert in the analysis of post-medieval artefacts.

5.5 Assessment of any palaeo-environmental samples which may be taken will be undertaken by **Elizabeth Huckerby MSc MIFA** (OA North Environmental Manager). Elizabeth has extensive knowledge of the palaeo-ecology of the North West through her work on the English Heritage-funded North West Wetlands Survey.

6 MONITORING

6.1 Monitoring meetings will be established with the Client and the archaeological curator at the outset of the project. The aims of monitoring are to ensure that the archaeological works are undertaken within the limits set by the Project Design, and to the satisfaction of the curatorial archaeologist at the Greater Manchester Archaeological Unit (GMAU). The curatorial archaeologist will be given at least five days' notice of when work is due to commence, and will be free to visit the site by prior arrangement with the project director.

ILLUSTRATIONS

FIGURES

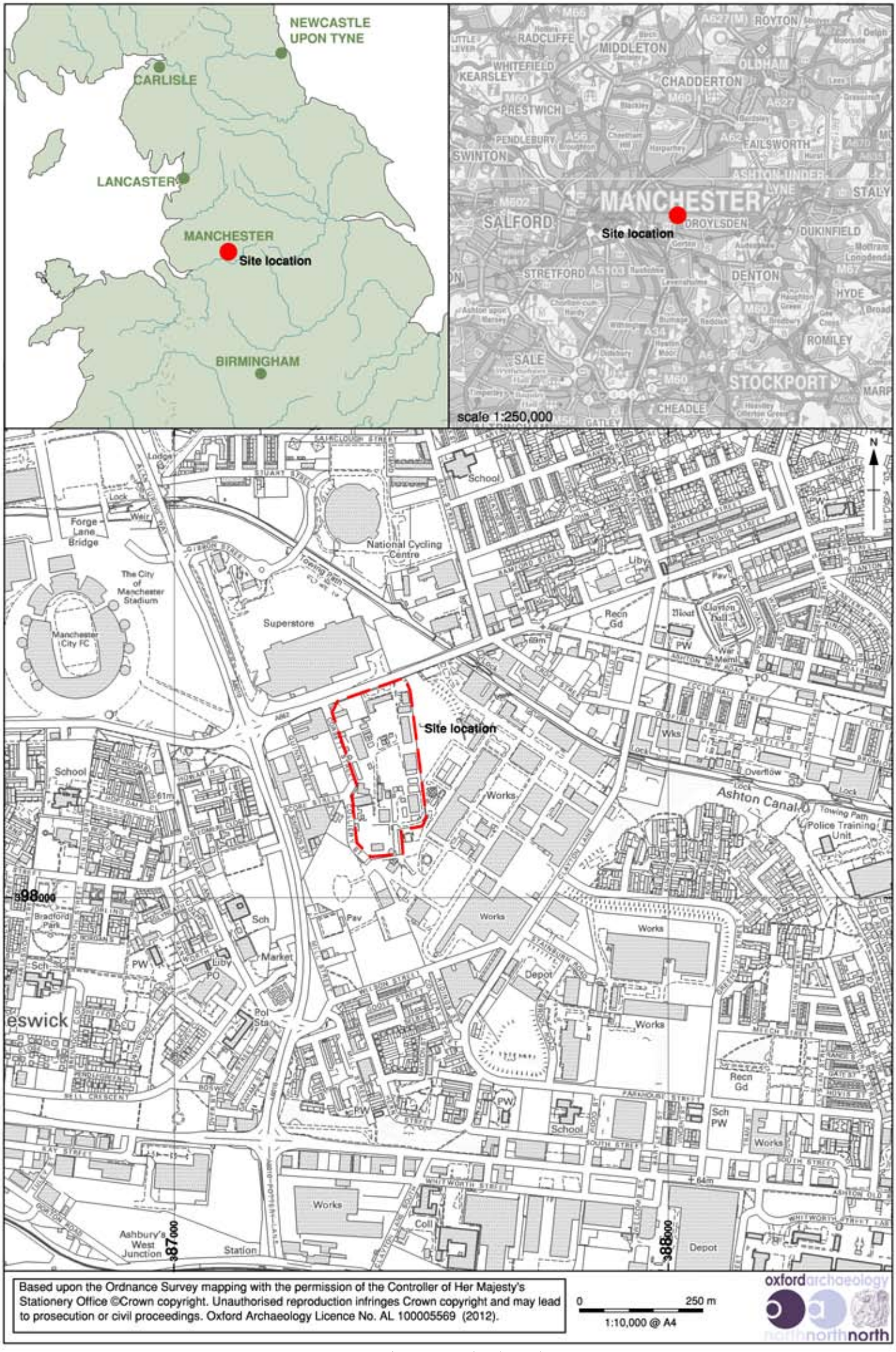


Figure 1: Site location

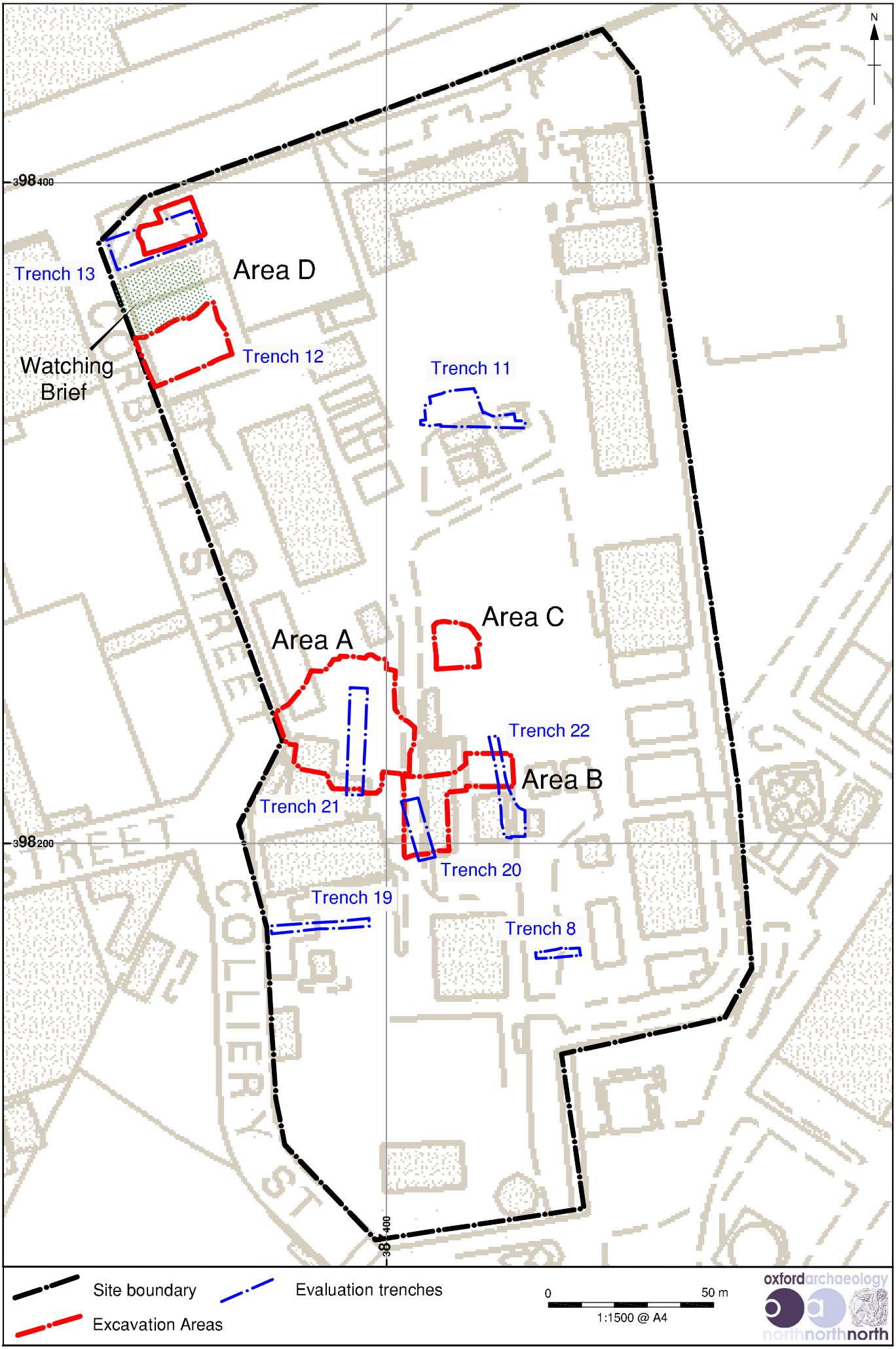


Figure 2: Location of evaluation and excavation trenches

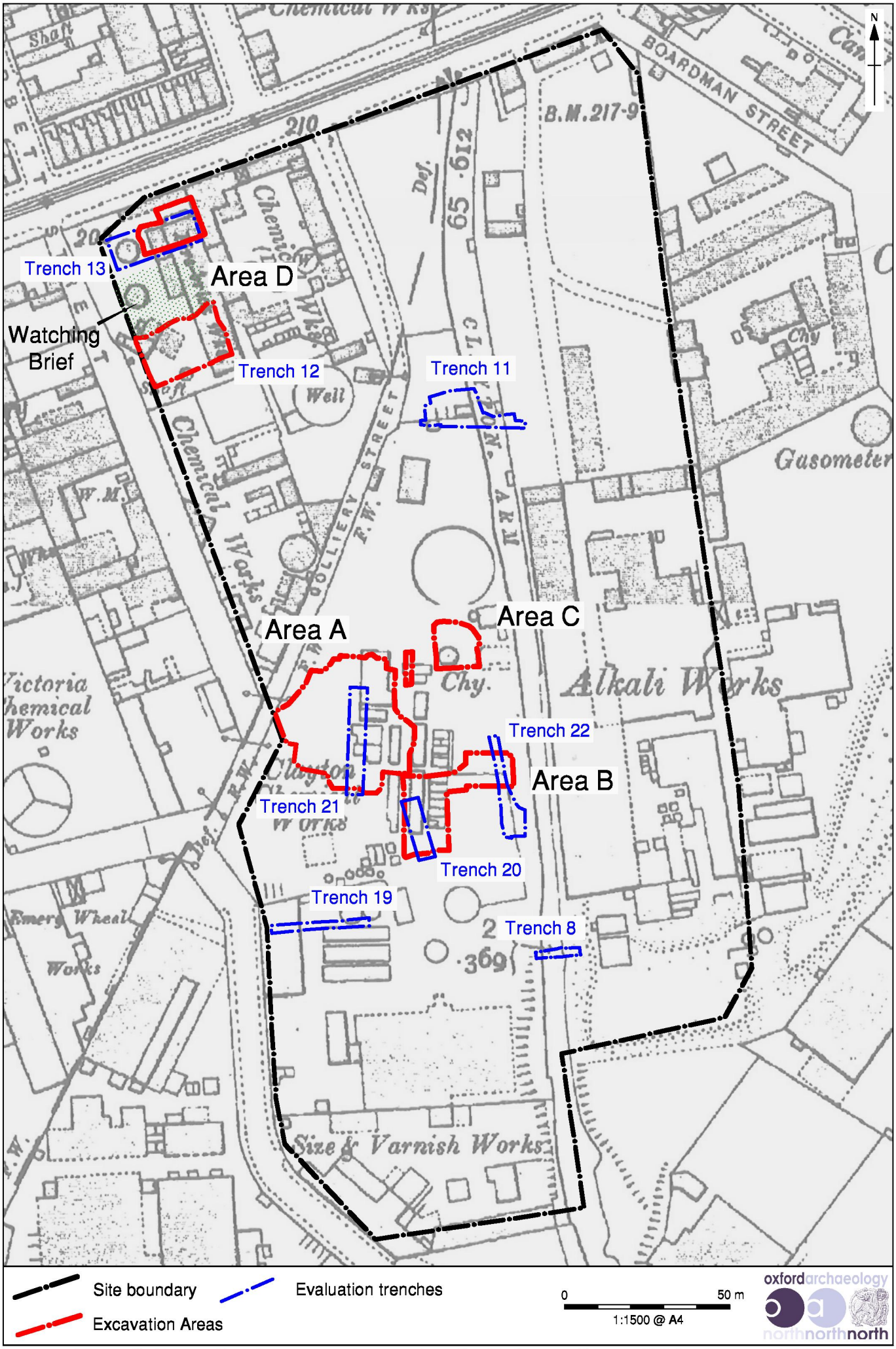


Figure 3: Excavation Areas superimposed on the Ordnance Survey 25":1 mile map, 1909

Figure 4: Plan of Trench 11, superimposed on the Ordnance Survey map of 1893

Figure 5: The excavated remains of Clayton Chemical Works

N

Boiler 1
Boiler 2
1071
1072
1078
398250
1059
Flue
Heavy contamination
(petrochemical)
Flue
Economiser base
1051
1049
1047
1048
1044
1079
1036
1015
1041
Heavy contamination
(Cyanide)
1038
Early basement
1036
1012
1008
1040
1039
398230
1042
1006
1011
1010
1005
1030
1023
1024
1029
1025
1033
flue
1028
1026
Heavy contamination
(petrochemical)
1027
1032
387380
387400

limit of excavation
iron
concrete
services
brick
refractory brick
brick surface

0 3 m
1:120 @ A3

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northnorthnorth

Figure 6: Plan of the excavated remains in Area A

N

Basement
1500

1512
1504
1507
1505
1506
1510
1509
1514

398225
398200
387425

limit of excavation
iron
concrete
services
brick
refractory brick
brick surface

0 3 m
1:120 @ A3

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Figure 7: Plan of the excavated remains in Area B

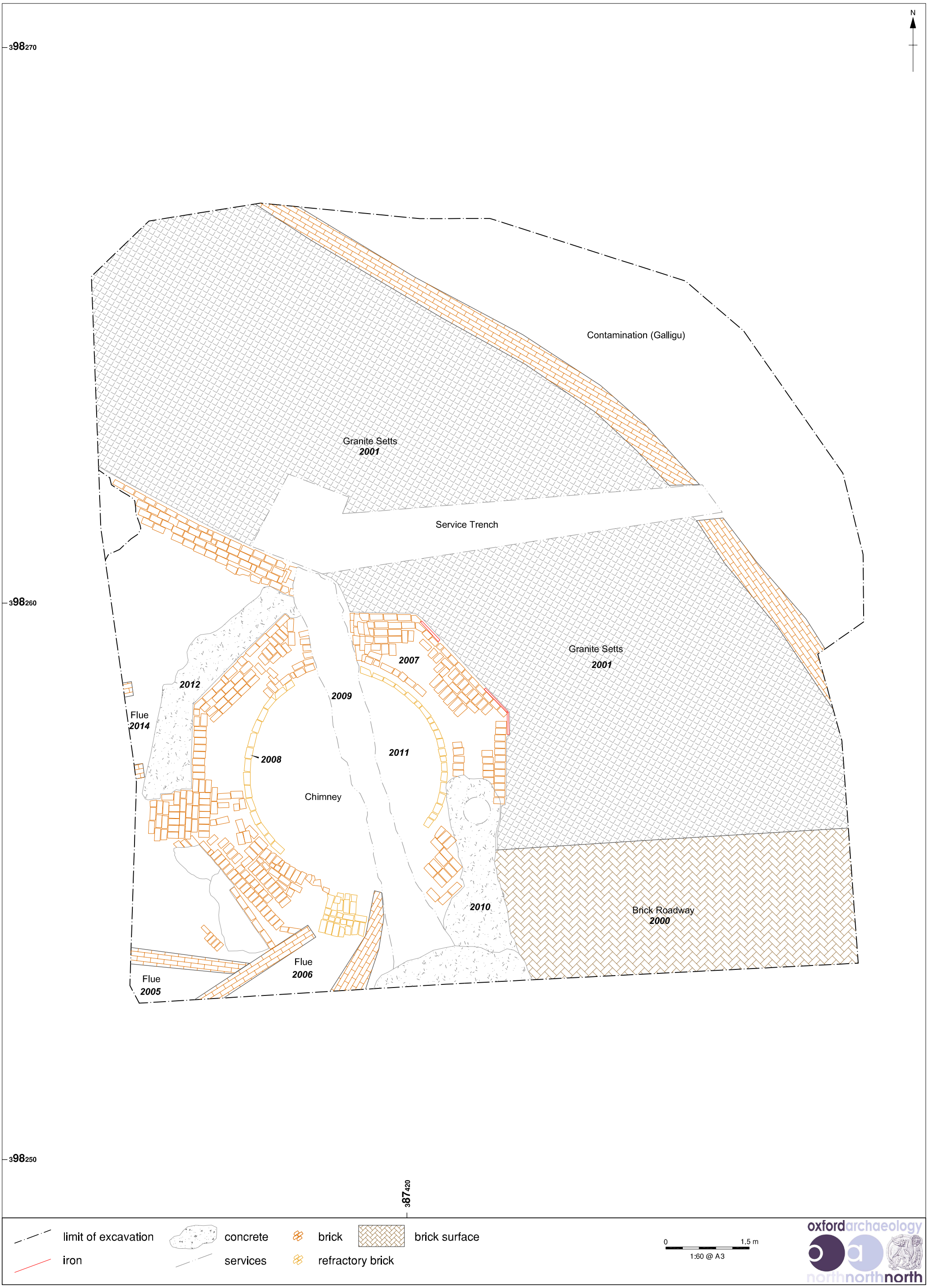

Figure 8: Plan of the excavated remains of Area C

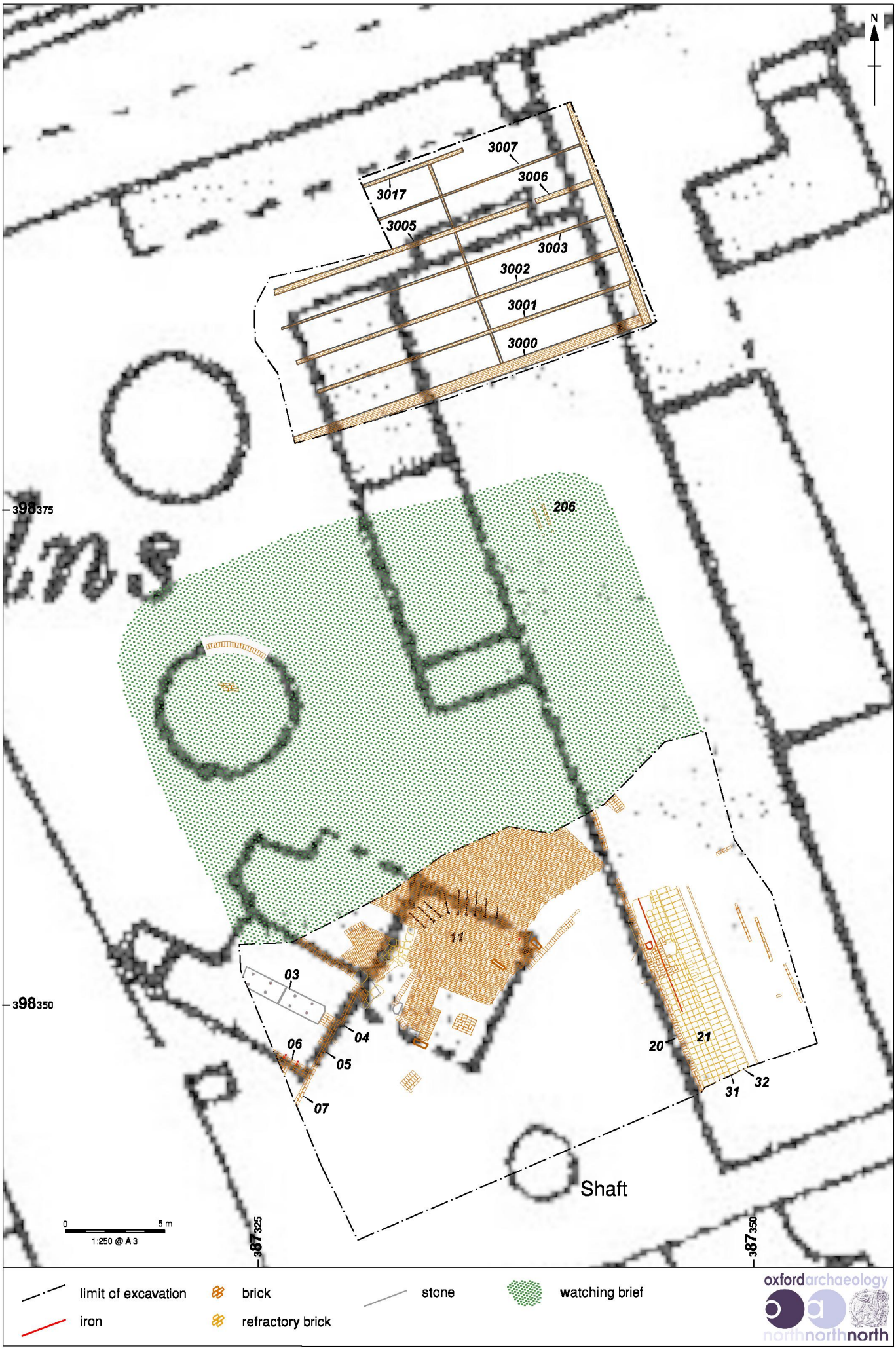

Figure 9: Plan of the excavated remains in Area D, superimposed on the Ordnance Survey map of 1893