

Redisher Works, Holcombe Brook, Bury, Greater Manchester Archaeological Investigation

December 2018

Client: CgMs Heritage

Issue No: 2018/19 1968

OA Reference No: L11161

NGR: SD 7778 1542



Client Name: CgMs Heritage
Document Title: Redisher Mill, Bury
Document Type: Archaeological Investigation Final Report
Grid Reference: SD 7778 1542
Planning Reference: 59715
Site Code: RSM18
Invoice Code: L11161

OA Document File Location: X:\Fraser\L11161_Redisher_Holcombe_Brook\Report
OA Graphics File Location: X:\Fraser\L11161_Redisher_Holcombe_Brook\OAN_CAD

Issue No:
Date: 5/12/2018
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Redisher Works, Holcombe Brook, Bury, Greater Manchester

Archaeological Investigation

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Summary

Oxford Archaeology (OA) North was commissioned by CgMs Heritage (Part of RPS), on behalf of Morris Homes, to undertake a programme of archaeological investigation at Redisher Works, Holcombe Brook, Bury, Greater Manchester, prior to redevelopment. The work was informed by earlier desk-based assessments, which indicate that the redevelopment area formed the site of a nineteenth- and twentieth-century textile works. Moreover, these assessments suggested that this industrial-period site was established in the early nineteenth century, perhaps originally as a cotton spinning mill, which had been converted into a bleach works by the early 1840s, and that from 1898 until 1961 it functioned as both a bleach and dye works. In addition, it is also evident that the redevelopment area contained the site of a short-lived later nineteenth-century brick works.

The current programme of work has been undertaken in order to fulfil an archaeological planning condition (planning ref: 59715, condition 17) placed on the redevelopment, and comprised a building survey and an archaeological evaluation, which, on the basis of the results obtained from three of the trial trenches, was immediately followed by a larger open-area excavation. This latter excavation focused on an area at the eastern end of the site and covered a portion of the footprint of the earlier nineteenth-century mill/bleach works. This area also covered that part of the bleach/dye works that was in operation in the earlier half of the twentieth century. The building survey focused on two parts of the site that contained extant structures of early-mid-twentieth century date.

The combined programme of work recorded significant remains relating to the power systems of the nineteenth- and twentieth-century works. Specifically, the open-area excavation exposed a possible setting for an early/mid-nineteenth-century waterwheel and a mill race. Other remains in this area included the base of a small horizontal steam engine that had been inserted into the backfilled mill race at the end of the nineteenth or early part of the twentieth century. The building survey also recorded the upstanding remains of an early twentieth-century engine house, originally positioned to the south of the main works building, that may well have housed a steam turbine and electrical generator.

Aside from the power systems, other significant remains relating to the process undertaken within the twentieth-century bleach and dye works were recorded. In the northern half of the open-area excavation trench, these included a series of dyeing vats that were in use between the end of the nineteenth and the early-mid-twentieth centuries, and several associated machine bases. Together, these remains indicated that this part of the site lay within a dye house that formed an integral element of the later bleach and dye works. Similarly, at the far north-eastern corner of the redevelopment area, the building survey recorded several tanks and vats, which appear to be of contemporary date. These, however, seem to relate to bleaching, suggesting that this part of the site formed part of a bleach croft, that lay within the early-mid-twentieth-century works.

Acknowledgements

Oxford Archaeology would like to thank CgMs Heritage for commissioning this project. Thanks are also extended to Norman Redhead, who monitored the work on behalf of Greater Manchester Archaeological Advisory Service (GMAAS), for his advice and guidance throughout all stages of the project. The project was managed for Oxford Archaeology by Fraser Brown, and the archaeological excavations were directed by Becky Wegiel and Andy McGuire, who were supported by Mike Birtles and Emma Fishwick. Mike Birtles also undertook the drone survey. Building recording was completed by Andy Phelps. This report was written by Richard Gregory and Andy Phelps, with illustrations prepared by Mark Tidmarsh.

1 INTRODUCTION

1.1 Circumstances of the project

- 1.1.1 Oxford Archaeology (OA) North was commissioned by CgMs Heritage (Part of RPS), on behalf of Morris Homes, to undertake a programme of archaeological investigation at Redisher Works, Holcombe Brook, Bury, Greater Manchester. This area is scheduled for residential redevelopment, and the archaeological investigations have been undertaken in order to fulfil an archaeological planning condition (planning ref: 59715, condition 17) placed on this redevelopment.
- 1.1.2 The site contains the remains of a nineteenth- and twentieth-century textile finishing works and the archaeological investigation comprised intrusive and non-intrusive elements, designed to mitigate the archaeological impact of the proposed redevelopment on these remains. The intrusive elements included a programme of archaeological trial trenching, involving the excavation of eight evaluation trenches; based on the results of this trenching, a more extensive open-area excavation was then completed across one part of the site. The non-intrusive elements of the investigation comprised a building survey of extant early-mid-twentieth-century buildings associated with the former finishing works.

1.2 Site location, topography, and geology

- 1.2.1 Redisher Works is situated on the northern bank of Holcombe Brook (at NGR: SD 7788 1542), sandwiched between Redisher Wood Nature Reserve and Hazelhurst, which forms an area of residential housing located between the villages of Holcombe Brook to the south and Holcombe to the north (Fig 1). The site lies at the base of the Holcombe river valley, lying on relatively flat ground at a height of c 165m above Ordnance Datum (aOD). On its northern side the slopes of river valley are fairly steep, rising some 65m (to c 230m aOD), over a distance of some 200m, whilst on the southern side of the brook the land is more gently sloping, forming areas of pasture.
- 1.2.2 The underlying solid geology of the site, as mapped by the British Geological Survey, comprises Holcombe Brook Grit sandstone. This is overlain by superficial deposits of Devensian Till (Crofts 2010).

1.3 Previous archaeological investigations

- 1.3.1 Prior to the archaeological evaluation and building survey, the site had previously been subjected to two archaeological desk-based assessments (Matrix Archaeology 2008; CgMs Consulting 2016), which considered the pertinent archaeological, cartographic, and documentary evidence. Although these studies suggested that there was little potential for pre-industrial remains at the site, they did conclude that significant archaeological remains would probably be present, along with some upstanding buildings, which formed elements of a former textile-finishing works that was in operation across the nineteenth and twentieth centuries. The assessments also indicated that a short-lived brickworks existed at the site during the latter part of the nineteenth-century.

1.4 Historical background: the development of the Redisher Works

1.4.1 As concluded by the archaeological desk-based assessments (*Section 1.3.1 above*), and confirmed by the archaeological excavations (*see Section 3 below*), the main site of archaeological significance in the redevelopment area is the Redisher Works, that represent a textile-finishing works dating to the nineteenth and twentieth centuries (GMHER 3944.1.0). Importantly, this forms one of a group of industrial-period textile-finishing works (principally bleaching and printing works) within the Bury area, which were situated along the River Irwell and its tributaries, the Holcombe Brook and Kirklees Brook (Miller 2012, 6-7). These riverside localities were attractive for these types of industrial sites, as they provided easy access to the large volumes of water required for textile finishing and, initially, also acted as a source of motive power for machinery that was driven by waterwheels (*ibid*). Indeed, although the adoption of steam power at the end of the late eighteenth century lessened the importance of water power, it is noteworthy that many of the finishing works in the Bury area continued to use waterwheels well into the mid-nineteenth century (*ibid*). Significantly, some of these sites, such as the Tottington Print Works, on the Kirklees Brook to the south of Redisher, have extended histories and provide valuable insights into the development of the textile-finishing industry in the Bury area. Regarding the historical development of the Redisher Works, fortunately, this was considered in some detail by the 2008 archaeological assessment, which examined the documentary evidence for the site (Matrix Archaeology 2008). Hence, the following section presents a summary of this element of the assessment, together with a detailed analysis of the pertinent cartographic sources.

1.4.2 ***The early nineteenth-century 'mill'***: it seems that an industrial site was established in Redisher Wood in the early part of the nineteenth century, perhaps in the first decade of that century. There is, for instance, no mention of an industrial site at Redisher in a survey of Tottington Lower End that was compiled in 1794 (Smith *et al* 1794), whilst the first mention to a 'mill' seemingly relates to the account of a woman, born in 1800, who worked at Redisher (Edishaw) Wood as a young girl (Coupe 1977, 99). This account may imply that the mill was in existence prior to 1810 (Matrix Archaeology 2008). Although the function of the 'mill' at this date is unclear, there is a possibility that it represented a cotton-spinning mill. For example, such mills were certainly in existence in the Redisher area, with one such mill being recorded in 1811, in Samuel Compton's Spinning List, to the west of the site at Higher Redisher (Plate 1). This small mill was owned by Joseph Wood and had 584 spindles (*cf* Matrix Archaeology 2008). Moreover, another early nineteenth-century cotton mill also lay on Holcombe Brook, further to the west, that was known as Ridge Cotton Mill, which is depicted on the First Edition Ordnance Survey (OS) map of 1850. Significantly, the early nineteenth-century cartographic evidence also suggests the presence of a mill/works at Redisher Wood during this period. For instance, Greenwood's map of 1818 depicts a reservoir at the site that formed an element of the later bleach works (*see Section 1.4.3 below*). Another reservoir is also depicted at the eastern end of the site, though at this date this was associated with a corn mill that lay further to the east, close to Lumb Carr Road.

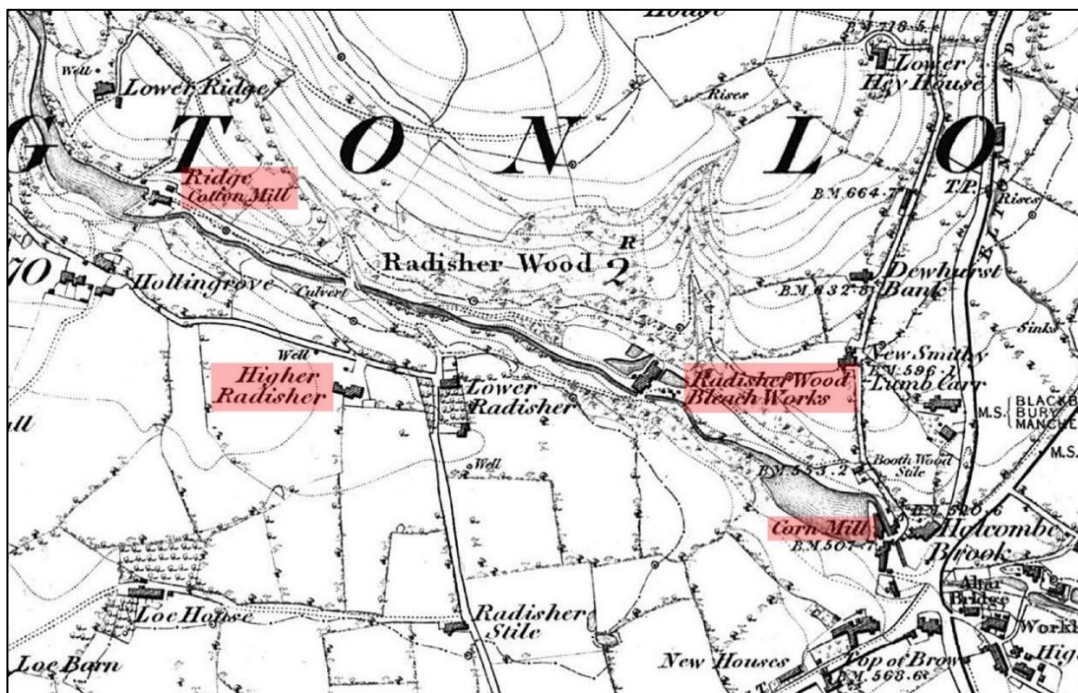


Plate 1: An extract from the OS map of 1850, with the Redisher Wood Works, High Redisher, Ridge Cotton Mill, and Holcombe Brook corn mill highlighted

- 1.4.3 **The mid-nineteenth-century bleach works:** a trade directory dating to 1841 indicates that by this date the site contained the Redisher Bleach Works, which was occupied by Ambrose F Wilkinson (a shopkeeper and bleacher), from Radisher [sic] Wood (Pigot and Slater 1841). Further details regarding occupation/ownership can also be determined from the 1842 tithe award for Tottington Lower, which lists Mr Wilkinson as the occupier, with 1 acre, 2 rods and 37 perches, whilst the owner was Martha Ramsbottom (LRO DRM 1/98). Based on the documentary evidence, it seems possible then that an early nineteenth century cotton-spinning mill was converted into a bleach works in the early/mid nineteenth century. The conversion of a spinning mill into a finishing works is not, however, unusual, as many spinning mills in remote rural settings became economically redundant following the growth of steam-powered spinning factories in the burgeoning industrialised urban centres of Lancashire. Indeed, the same type of conversion also occurred at nearby Tottington, where a late eighteenth-century cotton spinning mill was converted into the Tottington Print Works in 1820 (Miller 2012, 32).
- 1.4.4 The form of the 1840s bleach works at Redisher can be determined from contemporary cartographic sources, specifically the tithe map of Tottington Lower of 1842 (LRO DRM 1/98) and the First Edition OS 6 inch:1 mile map of 1850, that was surveyed in 1844-7 (Plate 2). Both of these maps depict a north/south-aligned rectangular building, the southern end of which lay adjacent to Holcombe Brook. It is evident, that this building had two bays, the northern of which was slightly offset from the southern, whilst the OS map depicts two projecting features, one positioned on the northern gable end of the building, the other on the eastern side wall of the southern bay. The OS map also names the site as 'Radisher [sic] Wood Bleach Works'.

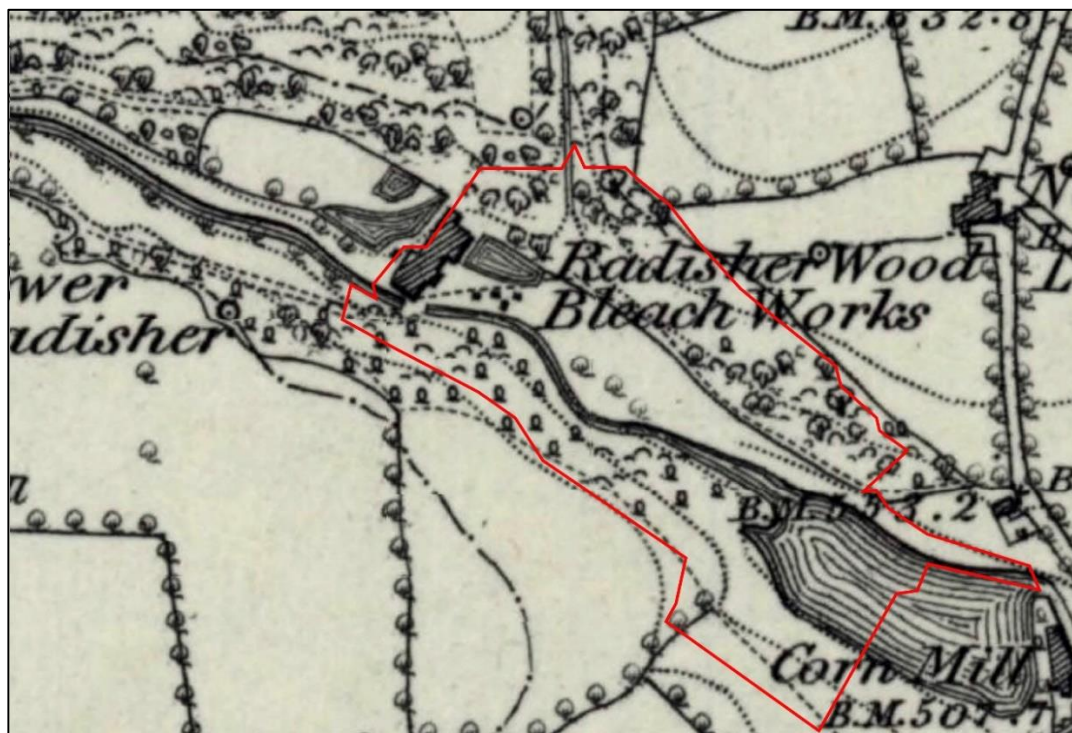


Plate 2: An extract from the OS map of 1850, with the development area outlined

- 1.4.5 In addition to the building, the mid-nineteenth-century maps also depict three adjacent reservoirs, which would have supplied the works with water. Two of these were positioned on the western side of the building, comprising a large irregular-shaped reservoir, which ran up to the western side of the northern bay, and behind this a smaller square-shaped reservoir. The tithe map of 1842 also indicates that water ran into the larger reservoir via a channel running from a weir positioned on Holcombe Brook. The weir is extant and was examined during the 2008 assessment of the site, when it was noted that it is c 6m high and is formed of rusticated blocks of millstone grit (Matrix Archaeology 2008). The remaining reservoir lay on the eastern side of the works, directly adjacent to the eastern side of the northern bay. The positions of these reservoirs, and presence of a channel, indicate that the bleach works (and presumably the earlier 'mill'; see Section 1.4.2 above) was water powered, with the large reservoir on the western side, being fed by a head race, and providing the headwater to drive a small waterwheel, whilst that on the eastern side probably acted as a tail pond. This latter feature would have prevented water from backing up onto the waterwheel (*ibid*). Another large reservoir also lay to the south-west of the bleach works, which formed that reservoir plotted on Greenwood's map of 1818 that was associated with the nearby corn mill (see Section 1.4.2 above).
- 1.4.6 The documentary sources provide details of the works and occupancy across the mid-nineteenth century (*cf* Matrix Archaeology 2008). For instance, it is clear from trade directories that by 1850 Ambrose Wilkinson solely worked as a bleacher and he also had a probable warehouse in Manchester, at 13 Watling Street, though by 1853 he no longer occupied this premises, but instead used another warehouse in Manchester, at 56 George Street (Heap 1850; Whellan 1853).

- 1.4.7 In 1864 the bleach works had new occupiers, William Warburton and William Brauman, and was known as the 'Old Bleach Works' (BA PUB/8/21, 100). A description of the works (*ibid*) indicates that the rectangular building that was present in the 1840s (*see Section 1.4.4 above*) was two storeyed, with an area of 192 yards; significantly, this size equates with the dimensions of the building plotted on the OS map of 1850. It was also water powered, though it gained additional power from a steam engine, and had two chimneys, and it is possible that one of the projecting features depicted on the OS map of 1850 might denote the position of an engine house (*see Section 1.4.4 above*). By this date an additional building had also been constructed, which functioned as a 'chemical works' (though this was empty in 1864). This had a ground floor of 197 square yards and a floor above covering 215 square yards.
- 1.4.8 **Late nineteenth-century bleach works:** Warburton and Brauman's occupancy of the Redisher Bleach Works was very short-lived, as on the 30th May 1866 the site was put up for auction, with Arthur Kay being resident at the time of the auction (Bury Times 12th May 1866). At the auction, the works were probably acquired by Samuel Knowles & Co, who are listed as owner and occupier in a valuation list dating to 1870 (BA PUB/8/25). Samuel Knowles was a significant figure in the textile-finishing industry of the area, and he also owned the Tottington and Kirklees print works, both to the south, on the Kirkless Brook (Miller 2012, 33). He was the step-brother of Joshua Knowles, another influential figure in the textile finishing industry (who died in 1853), under whom he served his apprenticeship. Samuel Knowles greatly enhanced his reputation in textile finishing, following his use of chlorate of potash to oxidise and precipitate colours used for printing (*ibid*).
- 1.4.9 Importantly, the 1870 valuation list also provides details of the form of the Redisher Bleach Works indicating that it comprised: a two-storey warehouse (179 square yards); a two-storey store (314 square yards); a single storey bleaching croft (457 square yards); a single-storey engine house (31 square yards); a single-storey boiler house (38 square yards); an unloading place (85 square yards); as well as 'water privileges'. Valuation lists dating to 1876 and 1882 indicating that the layout of the works was comparable to that outlined in 1870, though they also note a single chimney that was 20 yards high (BA PUB/8/44; BA PUB/8/66).
- 1.4.10 The OS 1:2500 map of 1893, surveyed in 1891, also provides details of the form and extent of the late nineteenth-century bleach works (Plate 3). This indicates that, by this date, the southern bay of the rectangular works building depicted on the OS map of 1850 (*see Section 1.4.4 above*) had been demolished, though the map does suggest that elements of its western, southern, and part of its eastern walls were still extant, perhaps standing as low foundations. The map also indicates that a large easterly extension had been added to the northern bay, which had been built across the reservoir that formerly lay in this area, which may have originally functioned as a tail pond (*see Section 1.4.5 above*). Together, the earlier building and the extensions formed a large L-shaped building that was aligned east/west, with the projecting southern portion representing the southern side of the northern bay of the earlier works building. Abutting the northern side of the L-shaped building were two adjoining linear structures, that seem to mark the position of an external engine/boiler house, probably that which is seemingly depicted on the OS map of 1850 (*see Section*

1.4.7 above). The south-western corner of the building also possessed a projecting element, which appears to have been linked to a channel running to the reservoirs to the west, which presumably supplied the reconfigured works with water, whilst two small projecting structures are depicted abutting the south-eastern corner of the projecting part of the L-shaped building.

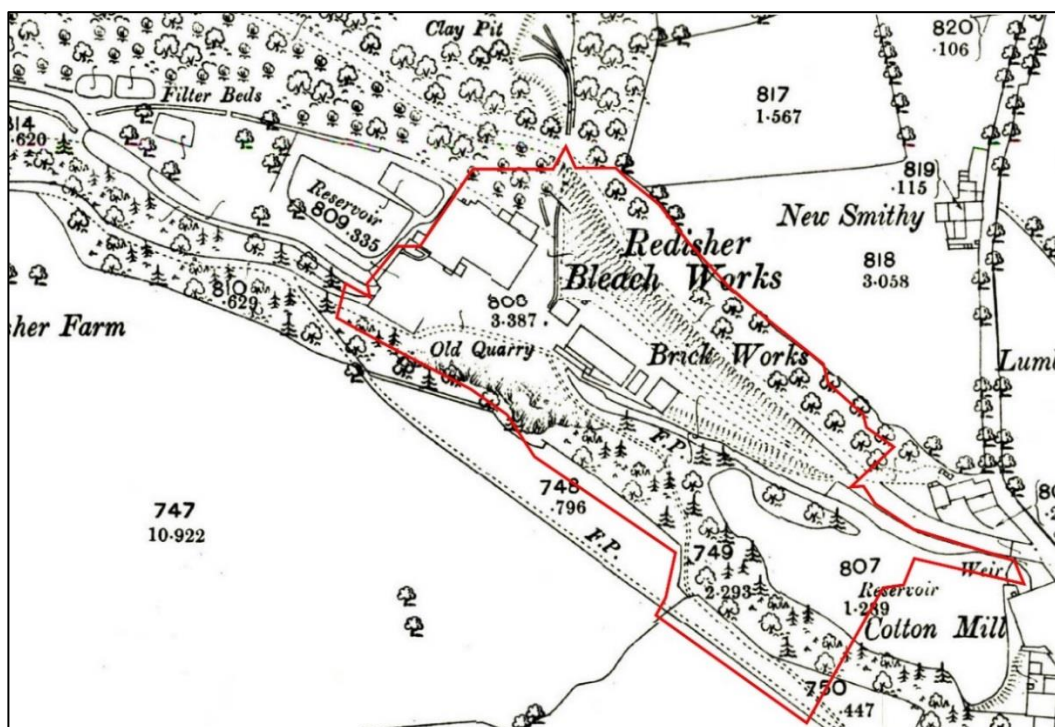


Plate 3: An extract from the OS map of 1893, with the development area outlined

1.4.11 Regarding the western reservoirs, it is evident from the 1893 map that their form had been reconfigured, along with the former headrace channel, which had been moved further north. This latter channel is still extant, as is the smaller of the reservoirs, whilst the larger reservoir is visible as a silted depression (Matrix Archaeology 2008). Close to this reconfigured channel, and also the weir on Holcombe Brook, three filter beds are also plotted. The map also indicates that by this date Holcombe Brook in the vicinity of the works flowed through a culverted tunnel.

1.4.12 Although not found directly within the redevelopment area, one further feature of note, that was associated with the bleach works, was a railway, the Tottington Branch Line, which branched off the Lancashire & Yorkshire Railway at Bury and terminated at Holcombe Brook, some 300m south-east of the bleach works. The line opened in 1882, was operated by the Bury & Tottington District Railway Company, and was part funded by Samuel Knowles, as a means of connecting his textile-finishing works on Holcombe Brook and Kirkless Brook to Bury, and ultimately Manchester (Wells 1995; Miller 2012).

1.4.13 **Late nineteenth-century brick works:** the OS map of 1893 indicates that by 1891 a brick works had also been established immediately east of the bleach works, which lay within the redevelopment area (Plate 3). This works comprised three rectangular buildings, and a small square building. This latter building was also associated with a tramway that ran north from the brick works, for a short distance, to an area providing raw materials that is denoted as 'Clay Pit'. In one short section, this tramway also ran

through a tunnel, that lay beneath a track skirting the site. Immediately, to the south-east of the brickworks lay an 'Old Quarry' and presumably this formed an earlier source of clay for the brick works. The valuation list of 1870 (BA PUB/8/25) notes that, as well as the bleach works, Samuel Knowles & Co also owned a 'colliery' at Redisher; presumably, as the Redisher area does not contain coal seams, this 'colliery' represented the brick works.

1.4.14 **The early twentieth-century bleach and dye works:** in 1898 Samuel Knowles & Co sold Redisher Bleach Works to Charles Ainsworth, whose family had established a bleach works in Bolton, at Halliwell (Matrix Archaeology 2008). As with Samuel Knowles, Ainsworth was also an influential local figure, who was Conservative MP for Bury between 1918 and 1935 (*ibid*). Following Ainsworth's acquisition, the bleach works incorporated dyeing and was accordingly renamed as the 'Redisher Bleach and Dye Works', and is also listed under 'dyers' in trade directories dating to 1913 and 1924 (Trades Directories Ltd 1913; Kelly 1924).

1.4.15 In 1900 the Bleachers' Association were formed and their records contain selected plans of their members' bleach works. However, there is no evidence that Ainsworth joined the association (*cf* Matrix Archaeology 2008) and hence it is only through twentieth-century OS mapping that the form and layout of the Redisher Works can be discerned. The earliest of these maps is the OS 1:2500 map of 1910, surveyed in 1908 (Plate 4). This indicates that, at this date, the large rectangular building, associated with the late nineteenth-century bleach works (*see Section 1.4.10 above*) was extant, forming the main bleach/dye works building, although its northern side had been extended across earlier structures that may have formed an engine/boiler house (*see Section 1.4.10 above*). A small building had also been abutted on to the southern side of the large rectangular building.

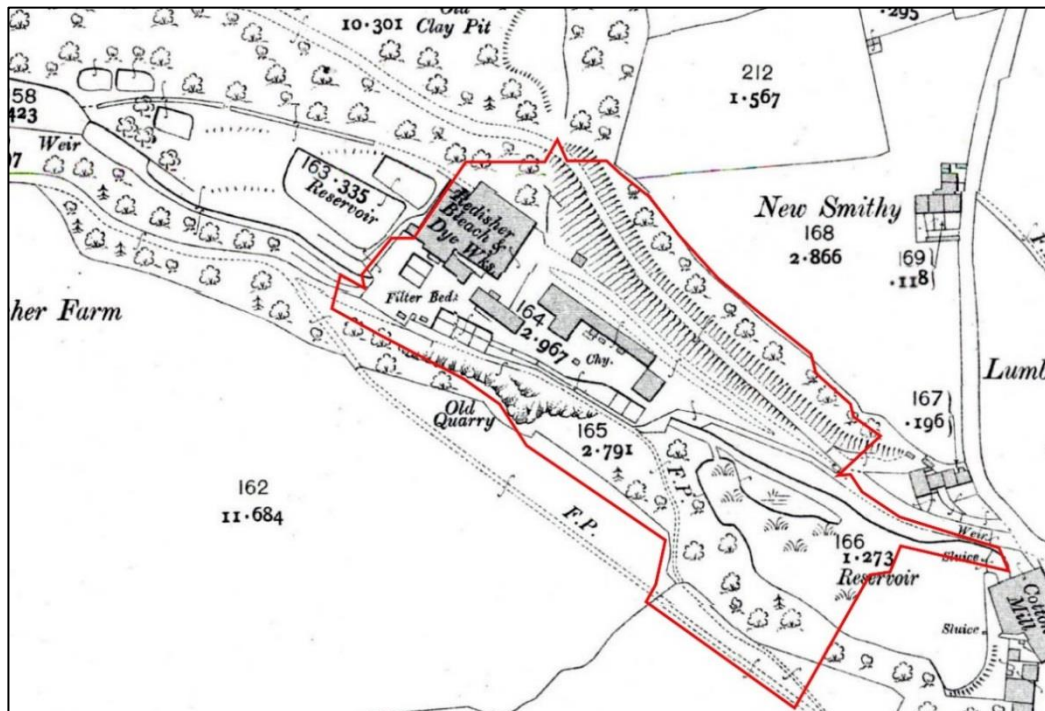


Plate 4: An extract from the OS map of 1910, with the development area outlined

- 1.4.16 To the south of the main bleach/dye works building the 1910 OS map also indicates that several filter beds had been established, by this date, whilst to the east three ancillary buildings were also present. The more easterly of these appears to represent one of the buildings that was previously associated with the brick works (see Section 1.4.13 above). The other two ancillary buildings had, however, been built across the site of the three earlier brick works' buildings, and these comprised a T-shaped range and a smaller linear range. It is, however, possible that the western end of the T-shaped range, actually incorporated one of the earlier brick works' buildings into its design, that being the small square building that was associated with the tramway.
- 1.4.17 The OS 1:2500 map of 1929, surveyed in 1927, indicates that by the mid-twentieth century the main bleach works' building had been substantially extended to the east and south (Plate 5). It is also evident from this map that a smaller extension was added to the northern-eastern corner of the works. Significantly, within this extended area several tanks and vats were noted during the 2008 assessment (Matrix Archaeology 2008), being described as a 'bleach croft', and hence these extant structures were recorded as part of the archaeological building survey (see Section 4 below).

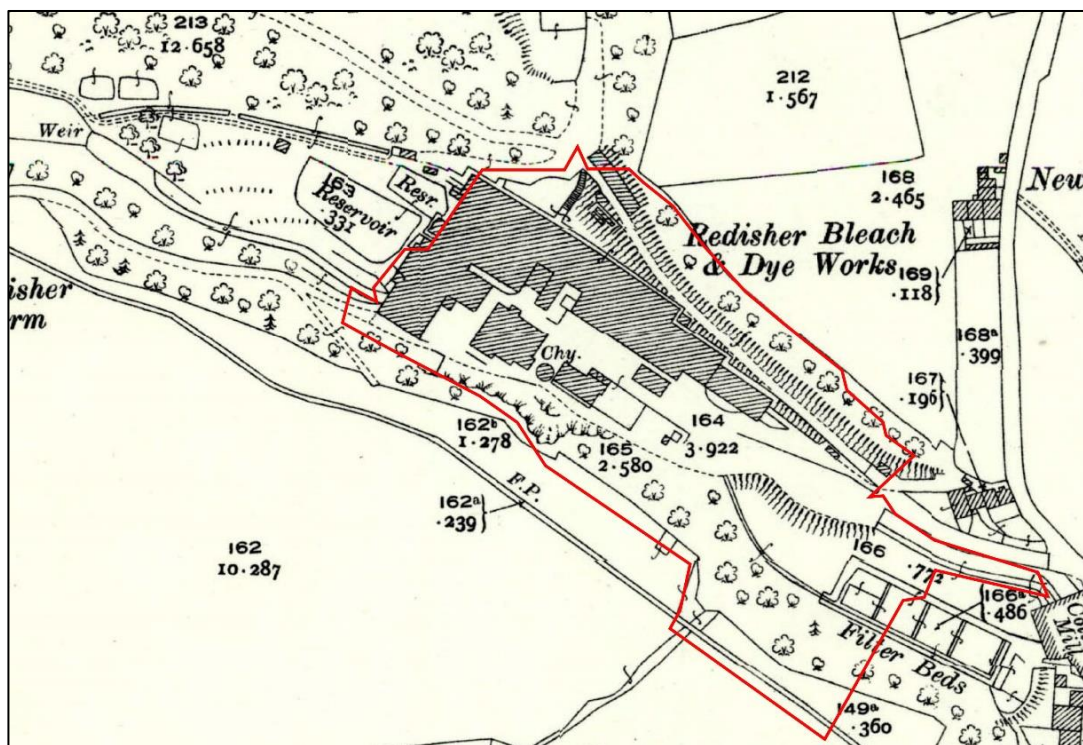


Plate 5: An extract from the OS map of 1929, with the development area outlined

- 1.4.18 In addition, by 1927 all of the ancillary buildings depicted on the 1910 OS map had been demolished. Three ancillary buildings had, however, been constructed in this area. One of these buildings represented a fairly sizeable square-shaped building, associated with a chimney, suggesting that it formed a boiler house. Immediately to the east, was a smaller building. This building was extant at the beginning of the archaeological investigation, though it had been incorporated into the fabric of a later extension (see Section 1.4.19 below), and formed the subject of the building survey (see Section 4 below); it seems to have originally functioned as an engine house. The third ancillary building lay to the north-east and formed a small linear range. Further

to the east, the reservoir associated with the corn mill (which functioned as a cotton mill in the late nineteenth century) had been infilled and filter beds had been constructed, which formed another element of the expanded bleach/dye works. The 1929 map also plots several small structures on the northern side of the main works building.

1.4.19 Although the configuration of buildings plotted on the OS 1:2500 map of 1939, surveyed in 1937-8, is similar to that depicted on the 1929 OS map, it is evident that the southern side of the early twentieth-century eastern extension of the works had been extended further (Plate 6). This extension also subsumed the smaller of the ancillary buildings located in this part of the works (see Section 1.4.18 above).

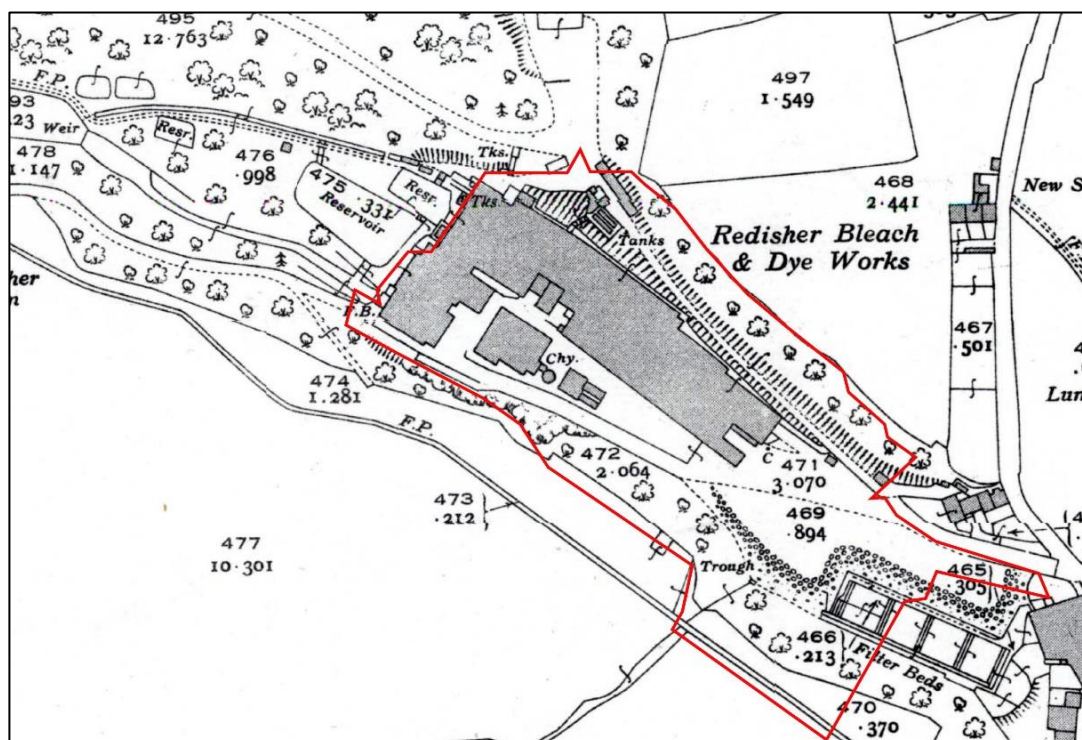


Plate 6: An extract from the OS map of 1939, with the development area outlined

1.4.20 **Mid-twentieth-century expansion and late twentieth-century demise:** the bleach and dye works eventually closed in 1961, under the Cotton Re-organisation Scheme, resulting in the loss of 80 jobs (cf Matrix Archaeology 2008), and the OS maps of 1963/4 reveal the form of the works at the time of its closure (cf CgMs 2016). These indicate that at some stage between 1937/8 and 1963/4 the works had been subjected to an additional scheme of extension. This involved extending the southern side and eastern end of the mid-twentieth extension that defined the eastern side of the works (see Section 1.4.18 above); various sections of walling relating to this side of the works were recently extant and these were recorded during both the 2008 and 2016 archaeological assessments.

1.4.21 After its closure the bleach works became derelict, although unsuccessful redevelopment schemes were proposed in the 1970s and early part of the twenty-first century (cf Matrix Archaeology 2008). Late twentieth-century OS mapping indicates that by 1992 most of the earliest parts of the works had been demolished (ie those

elements that lay at the north-western end of the site), along with the twentieth-century southern extension, and only the twentieth-century eastern extension of the works was extant. This part of the works was also extant immediately prior to the archaeological investigation.

2 METHODOLOGY

2.1 Introduction

2.1.1 The general methodology for the archaeological investigation was outlined in a Written Scheme of Investigation (WSI) prepared by CgMs Heritage, which had been formulated in consultation with Norman Redhead of the Greater Manchester Archaeology Advisory Service (GMAAS). This WSI specifically related to two stages of investigation, one being an archaeological evaluation, the other the recording of two extant structures forming elements of the twentieth-century bleach and dye works (CgMs Heritage 2017). Following the archaeological evaluation, and based on the results obtained from three of the evaluation trenches, Norman Redhead recommended that an open-area excavation should be completed across one portion of the site. This accordingly formed a rolling programme of work, that was undertaken immediately following the completion of the archaeological evaluation.

2.1.2 The overriding aims and objectives of the archaeological investigation were to:

- ensure the recording of identified extant heritage assets;
- establish the degree of preservation of below-ground remains and conditions of survival;
- ensure that any below-ground archaeological deposits exposed are promptly identified;
- inform any further necessary mitigation strategy;
- Place the recorded archaeological remains within their local/regional/national context and to make this record available.

2.2 Excavation methodology

2.2.1 The programme of archaeological evaluation involved the excavation of eight trial trenches (Trenches 1-8; Fig 2), of varying lengths and widths, at a series of predetermined locations that were set out in the WSI (*ibid*). Hence, Trenches 1-3 targeted the footprint of the early-mid-nineteenth-century mill/bleach works building, as depicted on the 1842 tithe map and the OS map of 1850 (*see Section 1.4.4 above*). Trenches 2 and 3 also crossed that part of the bleach/dye works that had constructed in the early twentieth century (*see Section 1.4.17 above*), as part of the expansion of the main bleach works building that existed in the late nineteenth century (*see Section 1.4.10 above*). Trenches 4 and 5 targeted a suspected boiler house and its associated chimney, forming elements of the earlier twentieth century bleach/dye works (*see Section 1.4.17 above*). Both trenches also lay across the site of earlier filter beds depicted on the OS map of 1910 (*see Section 1.4.16 above*). Trenches 6-8 targeted buildings associated with the late nineteenth-century brick works (*see Section 1.4.13 above*). Trench 6 also crossed the site of late nineteenth/early twentieth-century filter beds, associated with the bleach works (*see Section 1.4.16 above*), Trench 7 crossed an ancillary building associated with the early twentieth-century bleach/dye works (*see Section 1.4.16 above*), whilst Trench 8 also targeted the culverted course of the

Holcombe Brook, as depicted on late nineteenth-century mapping (*see Section 1.4.11 above*).

- 2.2.2 Of the evaluation trenches, Trenches 1-3 contained significant remains and hence these were subsumed within the open-area excavation that lay in the north-western corner of the site (Fig 2). This larger trench (Area 1), measured c 25 x 12m, and it covered a portion of the footprint of the earlier nineteenth-century mill/bleach works. Indeed, the primary aim for excavating this open-area was to record any remains present that might be associated with the earliest phases of industrial activity at the site.
- 2.2.3 During both the evaluation trenching and open-area excavation, the modern surface was machine excavated, with reinforced concrete being removed using a breaker attachment. Subsequent overburden beneath was then machine-excavated using a flat toothless ditching bucket. Mechanical excavation was conducted under continuous archaeological supervision and halted at the uppermost horizon of archaeological remains or, where absent, the upper interface of geological deposits.
- 2.2.4 In most of the trenches, any archaeological features that were encountered were hand-cleaned in order to enhance their definition. However, the site did contain hazardous pockets of contamination, and therefore when these areas were encountered, in order to mitigate risk, the contaminated material was only subjected to mechanical excavation with no hand excavation taking place. Three main areas of potential risk were identified during the programme of archaeological excavation in Trenches 6 and 7, and in Area 1. All three areas contained potentially hazardous material, which substantially masked any archaeological features or required an immediate stop to any further work. In addition, several exploratory excavations took place during the final phase of excavations in Area 1. These were generally located within the vicinity of features that may have been associated with water management or the storage/holding of potentially hazardous, chemical substances. Two of the three targeted excavations encountered ingress/flooding and contaminated deposits at recorded depths.
- 2.2.5 All archaeological structures, features, and deposits were recorded stratigraphically with accompanying documentation (plans, sections, and high-resolution digital photographs, both of individual contexts and overall site shots from standard view points). Digital photography was extensively used throughout the course of the fieldwork for presentation purposes. Photographic records were also maintained on special photographic pro-forma sheets.
- 2.2.6 The structural remains within Area 1 were recorded using rectified photography and photogrammetric survey using an Unmanned Aerial Vehicle (UAV; a small remote-controlled drone) and additional digital photographs. Appropriate survey-control measures were established through the positioning of rectified photography cards and survey points. The position of these reference points was then surveyed using a GPS system to locate each and every record accurately. The survey data were then processed using a computer software package (AgiSoft), which allowed for the production of detailed plans and elevations, as well as three-dimensional models.

- 2.2.7 It is worth stressing that no portable artefacts (*eg* pottery, clay tobacco pipes etc) came from the site, nor did any environmental remains (*eg* animal bone etc). Hence, there was no requirement for post-excavation assessment/analysis of finds or samples.

2.3 Building-recording methodology

- 2.3.1 An early-mid-twentieth-century extant engine house, which had been incorporated into the later fabric of the bleach/dye works (*see Section 1.4.18 above*), and an area in the north-western corner of the site that contained several tanks and vats (*see Section 1.4.17 above*) was subjected to building recording. This recording was in line with national guidance (Historic England 2016), and, as stipulated in the WSI (CgMs Heritage 2017), the engine house formed the subject of a Level 2-type survey (measured floor plan, elevation, and cross-section), whilst the north-western corner of the site was subjected to an enhanced Level 1-type survey (photographic record and plan).
- 2.3.2 The building survey work was undertaken in July 2018, but was hampered at both sites due to several factors. Specifically, access to the former engine house was restricted, due to debris associated with the partial collapse of the roof, and areas of the floor were also absent, limiting the detailed investigation of some areas. Similarly, the structural remains located in the north-western corner of the site were fragmentary and obscured by heavy vegetation cover, which also reduced visibility and access to these areas.
- 2.3.3 **Descriptive records:** records to Historic England Level 2 (Historic England 2016), using OA North *pro forma* record sheets, were made of the principal building elements of the engine house, as well as any features of historical or architectural significance. The structural remains in the north-west corner of the site were subject to an enhanced Level 1 survey, and every attempt was made to provide as full a descriptive record as possible.
- 2.3.4 **Site drawings:** the survey drawings were created using a combination of hand measurements, using measuring tapes and handheld laser-measuring equipment (*Leica Disto*), with the results plotted on archiveable stable drafting film. The principal elevation of the engine house was created by photogrammetry using photographs taken from an extendable mast, with survey markers placed upon the elevation in order to provide the control for the photogrammetry. The survey control was established using a total station and adopted a local grid which was then superimposed upon existing mapping. Specialist photogrammetric software was used to create accurate two-dimensional models of the external elevations.
- 2.3.5 **Photographic record:** a Canon EOS digital SLR (18 megapixels) camera, with a selection of lenses, was used for the photographic record, which was set upon an extendable mast in combination with a remotely-operated shutter release for aerial views of the interiors. Images in Canon RAW format files (.cr2 format) were captured and saved as 8-bit TIFFs for archive purposes. The data are stored on two separate servers, each on different sites, and with appropriate back-up and disaster plans in place. In addition, hard copies of the images were created on paper of appropriate archival quality and will be deposited as part of the paper archive.

2.4 Archive

- 2.4.1 A full professional archive has been compiled in accordance with the WSI, and with current ClfA guidelines (ClfA 2014c). The archive will be deposited with the Bury Archive Service on completion of the project. Copies of this report will also be sent to the GMAAS, for inclusion in the Greater Manchester Historic Environment Record (HER). In addition, 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 EXCAVATION RESULTS

3.1 Introduction

- 3.1.1 This section presents the results obtained from the evaluation trenching and open-area excavation. Initially, the results from each of the evaluation trenches are described, followed by a discussion of the remains present in the open-area trench (Area 1). However, as evaluation Trenches 1-3 lay within Area 1, the results from these trenches have been integrated with the results from the open-area trench. Context numbers reflect the evaluation trench numbers (eg pit **102** is a feature within Trench 1, while ditch **304** is a feature within Trench 3), whilst those context numbers assigned to Area 1 run from **1000** onwards.
- 3.1.2 The stratigraphic sequence within all of the trenches was generally consistent. Natural clays were overlain by consolidation deposits with archaeological features located above and between. These deposits were sealed by a mix of hardcore/demolition debris and capped with concrete.
- 3.1.3 Ground conditions throughout the evaluation were generally good, and the trenches remained dry throughout. Where contaminated material was encountered, excavations were halted with no further manual work taking place. Heavily contaminated areas were fenced off, or backfilled for safety. Archaeological features, where present, were easy to identify against the underlying deposits.

3.2 Evaluation trenches

- 3.2.1 **Trench 4:** this trench was orientated north-east/south-west (Fig 2) and lay within the footprint of an earlier twentieth-century boiler house (see Section 1.4.17 above), being positioned in its north-eastern quadrant, running parallel with its eastern side wall.
- 3.2.2 The trench measured 8 x 2m and was excavated to a maximum depth of 0.3m (Fig 3). The excavated area was dominated by a brick surface (**403/404**), composed of heat-affected machine-made bricks and refractory bricks, either side of a 1.75m-wide brick-lined channel, which was aligned east/west (Plate 7). During the machine excavation of this later feature, asbestos was visible and hence excavation ceased and the trench was backfilled.



Plate 7: The heat-affected brick base and brick-lined channel (flue) in Trench 4

- 3.2.3 It is highly likely that these brick structures in Trench 4 represent the brick base and the flue of a boiler, that probably led to an adjacent chimney (Fig 4; see Section 3.2.4 below). Indeed, it is also probable that this was a Lancashire boiler, as these were in common usage throughout the latter part of the nineteenth century and into the early twentieth century in textile works across Greater Manchester and Lancashire (cf Phelps *et al* 2017, 29). The size of the boiler house, as depicted on historic mapping, suggests that it housed either two or three Lancashire boilers.
- 3.2.4 **Trench 5:** this trench measured 14 x 2.6m, was orientated east/west (Fig 2) and was positioned across the site of a chimney, associated with an adjacent boiler house (Fig 4; see Section 3.2.1 above), both of which are first depicted on the 1929 OS map (see Section 1.4.17 above). This trench also crossed an area that is known to have contained a line of late nineteenth-/early twentieth-century filter beds, which are depicted on the 1910 OS map (see Section 1.4.16 above).
- 3.2.5 Although no remains of the chimney were present, evidence relating to the filter beds did survive (Figs 3 and 5). This evidence included a fairly large brick-built tank (504), which measured c 3.4m wide, and that contained a central dividing wall, which created two 1.6m-wide chambers (Plate 8). The southern wall of the tank was the more substantial, measuring four-bricks wide (c 0.44m across), whilst the side walls and central dividing wall were narrower being two-bricks wide (c 0.22m wide). The southern wall, side walls and base of the tank had been constructed using handmade brick, bonded with sandy mortar, whilst the central dividing wall was composed of both handmade and machine-made, frogged bricks. As handmade brick was commonly used up until the 1880s/90s, and frogged bricks date to the twentieth century, it is therefore possible that, in this instance, the handmade bricks represented reused building materials that were derived from an earlier structure at the site, that had been demolished prior to the construction of the filter beds. It is also possible that

the handmade bricks were ultimately manufactured on site at the brick works that existed during the late nineteenth century (see Section 1.4.13 above).



Plate 8: The brick-built tank in Trench 5

- 3.2.6 The southern elevation of the tank had two c 0.5m-wide openings, which relate to the mouths of two culverts that channelled water into/out of the two separate chambers within the tank (Plate 9). Each of the culvert mouths were also provisioned with a metal sluice gate, of which the partial remains survived, allowing for the control of water into/out of the tank. The line of a brick-built culvert (**506**) was also visible running from the eastern end of the tank, outside of the evaluation trench, and this was almost certainly the culvert that served the tank. At this end of the trench a brick surface (**505**) was also present, whilst at the western end of the trench a short length of walling (**503**) was visible. This wall was composed of machine-made frogged bricks and ran parallel with the tank side walls.



Plate 9: The openings on the southern elevation of the tank in Trench 5

3.2.7 **Trench 6:** this trench (Fig 2) was positioned across the site of a large rectangular building that formed an element of the late nineteenth-century brickworks (see Section 1.4.13 above). At the start of the excavation of this trench, a large open-topped metal tank was exposed, that was filled with potentially contaminated water (Plate 10). Given the Health and Safety implications, including the exposure to and the release of potentially harmful substances, excavations within this area were abandoned and no further investigation of the tank was undertaken



Plate 10: The tank exposed in Trench 6

3.2.8 **Trench 7:** this trench measured 12.56 x 2.6m, was excavated to a maximum depth of 1.2m, and targeted a square building associated with the late nineteenth-century brick works (Fig 6), that lay at the terminal of a tramway (see Section 1.4.13 above). It was also apparent from the map evidence that this building had either been demolished and replaced by an ancillary building associated with the bleach works, plotted on the OS map of 1910, or had been incorporated into its design (see Section 1.4.16 above).

3.2.9 The trench was positioned across the south-western corner of the late nineteenth-century brick works' building, running parallel with its southern side wall and fragmentary remains of this building were present (Fig 3). These included a c 0.8m-wide sandstone wall (706), incorporating a large dressed sandstone block (705; Plate 11). This fairly substantial wall was aligned north-east/south-west and seemingly

formed the western side wall of the brick works' building. The presence of this wall also suggests that the late nineteenth-century building was indeed incorporated into the design of the later ancillary bleach works' building that also lay in this part of the site (see Section 3.2.8 above). To the east of this wall, within the interior of the building, a handmade brick structure (**708**) was also present, supporting a dressed sandstone slab (Plate 11). Although this structure is difficult to interpret, it might either represent a base for an upright, or another section of walling, again associated with the later nineteenth century brick works' building.



Plate 11: Wall **706** (left) and structure **708** (right), adjacent to wall **707** and surface **709**, in Trench 6

3.2.10 Several later walls and structures were also present in the trench. These included a wall composed of machine-made bricks (**707**) and a concrete surface (**709**) that lay adjacent to structure **708** (see Section 3.2.9 above; Plate 11). It is possible that these were created when the late nineteenth-century building was incorporated into the design of the early twentieth-century bleach works' ancillary building. In the western half of the trench were also two machine-made brick walls (**703** and **704**) of twentieth-century date (Plate 12). The more westerly of these (**703**) was a two-skin thick wall, which seems to correspond with the outline of the works building as depicted on mapping dating to 1963/4 (see Section 1.4.19 above). The other wall, however, was much more substantial, measuring c 1.2m wide; although it is not clear precisely what this section of walling relates to, it too probably formed an element of the mid-twentieth-century works.



Plate 12: Walls 703 (right) and 704 (left), in Trench 6

3.2.11 **Trench 8:** this trench (Fig 2) measured 15 x 2.8m and was excavated to a maximum depth of 2m, and it targeted a building associated with the late nineteenth-century brick works (see Section 1.4.13 above), and also the line of the culverted channel of the Holcombe Brook, as depicted on the 1893 OS map (see Section 1.4.11 above). No remains relating to the building or the channel were present in the trench and, in fact, only one length of walling (806) was encountered (Fig 3). This was a double-skin wall, composed of machine-made, frogged, bricks, the position of which corresponds with the footprint of the main works building as depicted on the 1939 OS map. More specifically, this wall formed the southern side wall of the eastern section of the early-mid-twentieth century bleach/dye works.

3.3 Area 1

3.3.1 Area 1 was located across the north-western extent of the site, encompassing evaluation Trenches 1-3 (Fig 2). The excavation area targeted archaeological remains associated with the original footprint of Redisher Wood Bleach Works and subsequent extensions observed on late nineteenth- and early twentieth-century OS mapping. A variety of structural remains were encountered across this area (Fig 7), including nineteenth-century stone walling, twentieth-century brick walling, stone and concrete floors, and the bases of machinery and vats/cisterns, most of which seem to date to the earlier part of the twentieth century when the site functioned as a bleach and dye works (Plate 13). Based on the character of these remains, and their stratigraphic relationships, four broad phases of building activity can be determined, dating to the early/mid-nineteenth century (Phase 1), mid-late nineteenth century (Phase 2), late nineteenth-early twentieth century (Phase 3), and early-mid-twentieth century (Phase 4; Fig 8).



Plate 13: Overhead view showing the excavated structural remains in Area 1

- 3.3.2 **Phase 1 (early/mid-nineteenth century):** the Phase 1 remains form elements of the earliest mill/bleach works at the site, and, as such, date to the earlier half of the nineteenth century (Fig 8). These remains were, however, fairly piecemeal in that they were confined to two lengths of walling, though these have proved to be particularly informative with regard to the early/mid-nineteenth-century power system present at the mill/works.
- 3.3.3 One of these walls formed a right-angled length of walling, which defined **Room 1017**. This was 0.5m thick and was constructed of squared rubble sandstone and mudstone masonry blocks, that were roughly coursed and bonded with lime-based mortar (Plate 14). The positioning of this wall indicates that it formed the south-eastern corner of the northern bay of the original mill/bleach works (*see Section 1.4.4 above*), and this right-angled wall was quoined at its south-eastern corner.



Plate 14: The south-western exterior elevation of the Phase 1 wall defining the northern bay (**Room 1017**) of the mill/bleach works

- 3.3.4 The other length of Phase 1 walling lay to the south-west and ran parallel with the south-western side of **Room 1017**, being set some 3m distant, with the area between the two walls being designated as **Room 1009**. This wall was also 0.5m thick, constructed of similar roughly square sandstone and mudstone blocks, bonded with lime-based mortar (Plate 15), and probably formed the northern side of the southern bay of the original mill/bleach works.



Plate 15: The north-eastern exterior elevation of the Phase 1 wall defining the southern bay of the mill/bleach works

- 3.3.5 It is therefore evident from the positioning of the Phase 1 walls that the two bays forming the mill/bleach works, were separated by a 3m-wide 'gap'. Excavation within **Room 1009** indicated that the walls defining this 'gap' extended to a depth of at least 3m below the present ground surface, and the wall defining the south-eastern, exterior elevation, of the northern bay also exhibited signs of water erosion, with some affected areas being repaired with handmade brick and/or river cobbles. Together, this evidence clearly indicates that the 'gap' formed a water channel, which would have been positioned at the centre of the early mill/bleach works. Therefore, given this, and based on the documentary evidence for water power at the early bleach works (see *Section 1.4.7 above*), it is quite likely that a waterwheel was positioned between the two bays of the mill/works, with the channel forming a mill race, that linked the reservoir to the west (the mill pond) with that to the east (the tail pond).
- 3.3.6 Significantly, there was evidence within the stone walls, defining **Room 1009**, for the position of this suspected waterwheel. On the northern side of this 'room' this comprised a large sandstone block, which was incorporated into the stone wall (Plate

16). This block measured 1.07 x 0.71m and contained an L-shaped slot, surrounded by six circular smaller rectangular and circular slots, marking the position of bolt holes. This block had also been encased in handmade brick on its eastern and western sides (Plate 17).



Plate 16: The large sandstone block (left) incorporated into the Phase 1 wall defining the northern bay of the mill/bleach works



Plate 17: Detail of the large sandstone block incorporated into the Phase 1 walling

3.3.7 Directly opposite, on the opposing wall, an area of infilled masonry, measuring c 1.5m wide, was also present suggesting that an opening originally existed within this wall that was blocked at a later date (Plate 18). It is therefore possible that these two opposing features denote the position of the axle of the waterwheel, with the opening

on the north-eastern wall of the southern bay marking the position of the gearing box for the waterwheel (Plate 19).



Plate 18: Infilled masonry (right) in the Phase 1 wall defining the southern bay of the mill/bleach works

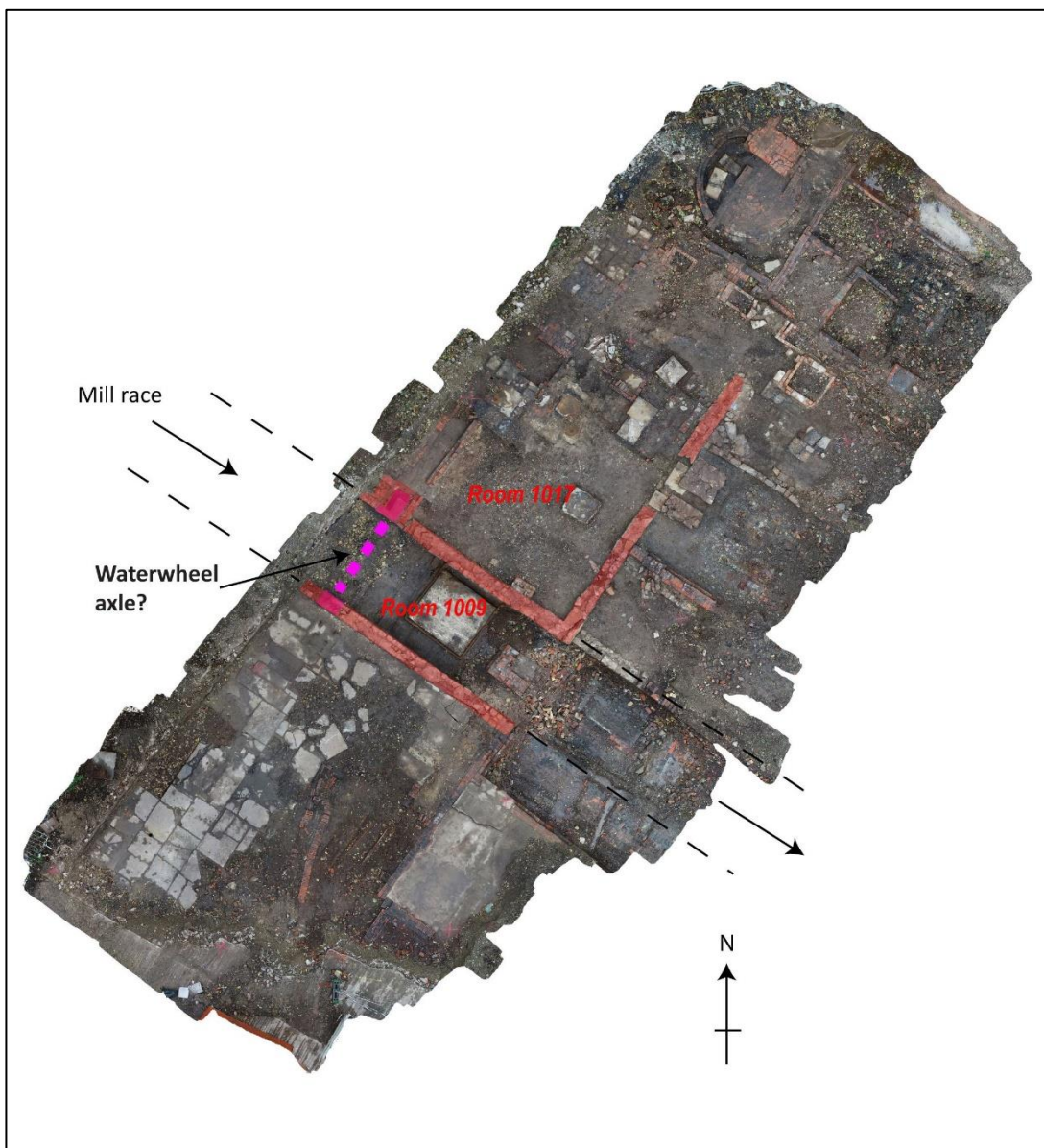


Plate 19: Overhead view of Area 1 with the Phase 1 remains highlighted

3.3.8 **Phase 2 (later nineteenth century):** the Phase 2 remains were very limited (Fig 8), but those that were present formed elements of the Redisher Wood Bleach Works that is depicted on the OS map of 1893 (see Section 1.4.10 above). It is evident from this map that by the time of its survey in 1891, the southern bay of the mill had been demolished, which in Area 1 would also have involved the removal of the Phase 1 waterwheel (see Section 3.3.7 above). The northern bay was, however, retained, though substantially extended on its eastern side. The map evidence and archaeological remains also indicate that, although the southern bay was demolished, one short section of walling that formed an element of its northern side was retained, which was used to create a small projecting room that interestingly broadly equates with the position of **Room 1009** in Area 1 (Fig 9; Plate 20).

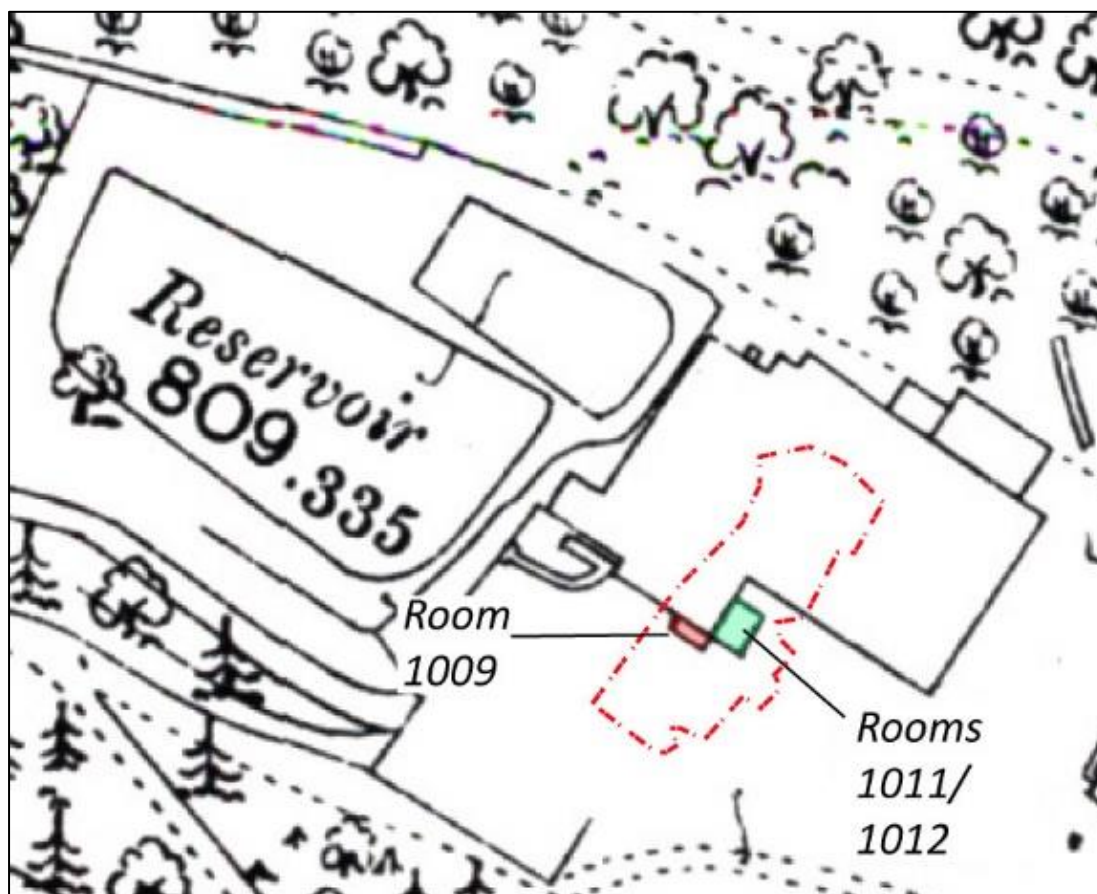


Plate 20: An extract from the OS map of 1893, showing the late nineteenth-century bleach works in relations to Area 1, with the positions of **Room 1009** (Phase 1) and **Rooms 1011 and 1012** (Phase 2) highlighted

- 3.3.9 The map evidence also indicates that a small building was abutted onto the south-eastern corner of the northern bay (Plate 20) and part of this building was present in Area 1. Moreover, the remains indicate that it contained two rooms, designated **Rooms 1011** and **1012**, which measured 2.4m and 3.9m wide respectively (Plate 21; Fig 9). The southern exterior wall of this building abutted the eastern side of the Phase 1 wall defining **Room 1017** (see Section 3.3.3 above), and was built of squared rubble masonry, bonded with a light grey lime-based mortar; this wall was 0.5m thick (Figs 7 and 8). Similarly, the northern exterior wall of the building also butted the Phase 1 wall of **Room 1017**. However, this wall was composed of squared dry rubble masonry and was more substantial measuring 0.7m wide, though much of it had been ‘robbed’/removed at a later date. The partition wall defining the two rooms was also stone built, and mortared, c 0.5m wide, and butted the Phase 1 wall of **Room 1017**.

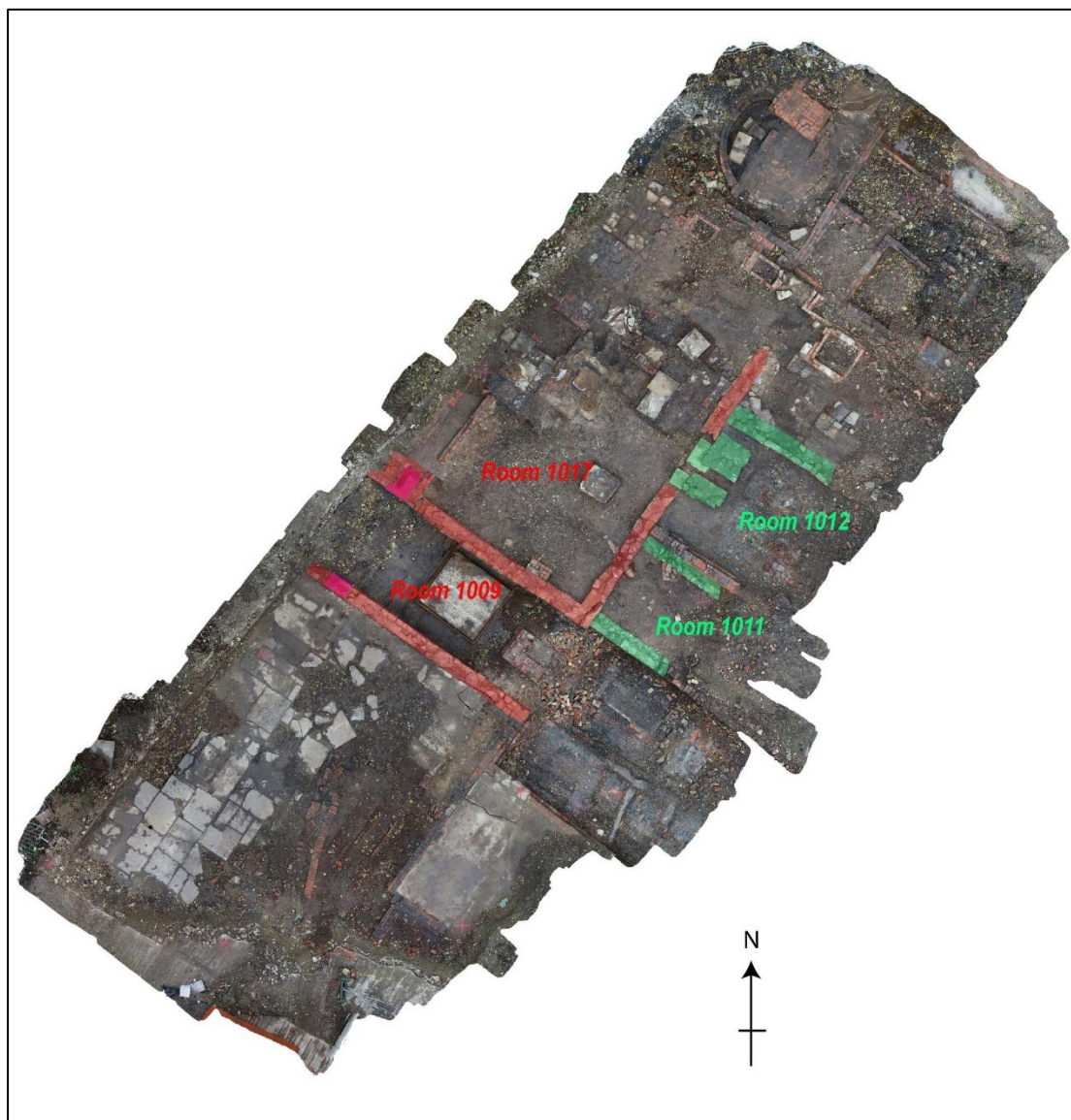


Plate 21: Overhead view of Area 1 with the Phase 2 remains highlighted in green

3.3.10 Although no floor surfaces survived in either of the rooms, **Room 1012** did contain two, late nineteenth-century structures, which truncated the Phase 1 wall defining **Room 1017** (Figs 7 and 8). Both structures were composed of stone rubble, bonded with mauve coloured lime-based mortar, and each was also partially set on a stone block and partially on a levelling deposit of shale (**1018**). The stone-rubble structures were set 0.36m apart and the more southerly measured 1.25 x 0.65m, whilst the northerly base measured 1.25 x 1.10m (Plate 22). Within the gap separating the bases three ‘holding down’ bolts were also present, whilst the stone slab that supported the northern structure also had a cut circular hole and arcing notch denoting the position of two additional bolts. This evidence clearly indicates that the structures and bolts represent a machine base, which secured a machine that lay within this part of the bleach works.



Plate 22: The Phase 2 stone machine base in Room 1013

- 3.3.11 **Phase 3 (late nineteenth-early twentieth century)**: the OS map of 1910 indicates that the building at the south-eastern corner of the northern bay, containing **Rooms 1011** and **1012** (see Section 3.3.9 above) had been expanded at some stage during the late nineteenth century, or the during the first decade of the twentieth century. Moreover, it is quite likely that this expansion was undertaken by Charles Ainsworth who acquired the works in 1898 and used it for both the bleaching and dyeing of textiles (see Section 1.4.14 above).
- 3.3.12 Clear evidence for this expansion was present in Area 1 in the form of **Room 1008** (Figs 8 and 10) This room lay immediately south-west of **Room 1011**, though it was also evident from the structural remains that when **Room 1008** was constructed **Room 1009** was also present and, in fact, both rooms were interlinked defining one functional area (Plate 23).

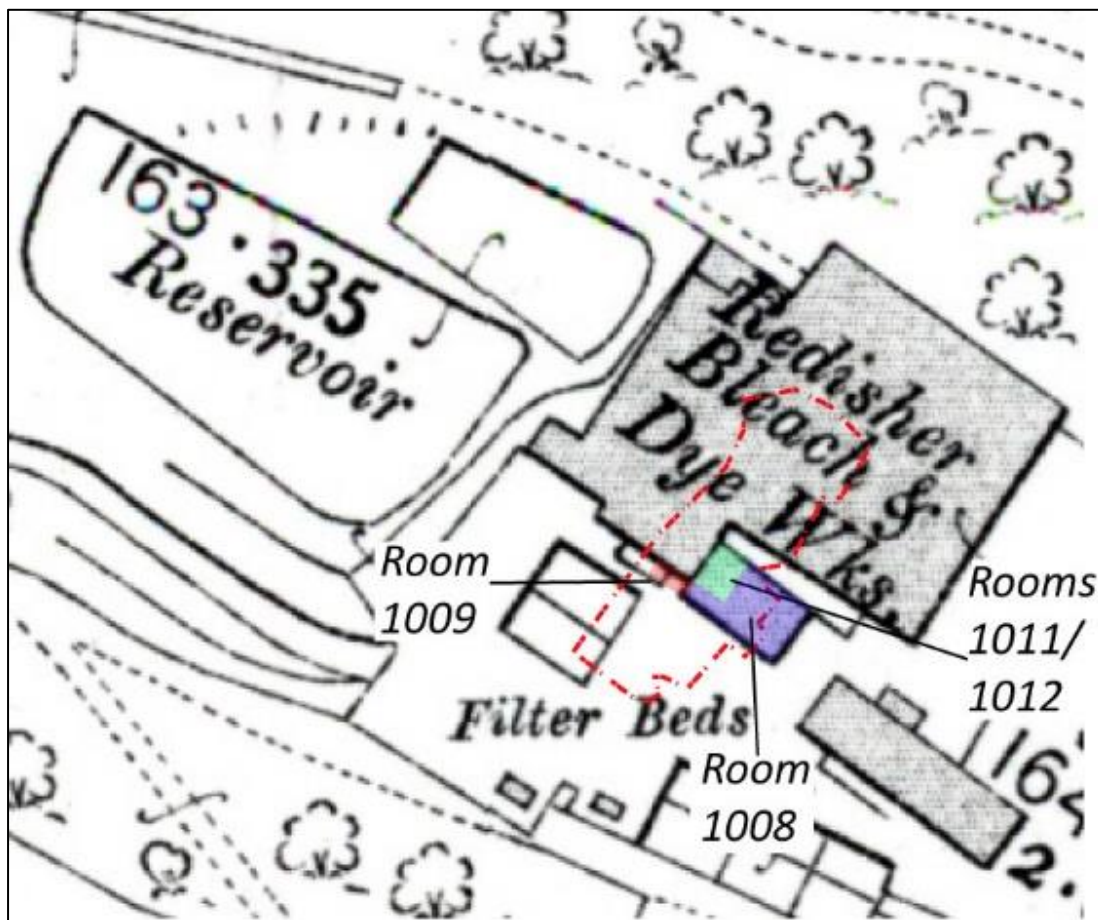


Plate 23: An extract from the OS map of 1910, showing the early twentieth-century bleach and dye works in relation to Area 1, with the positions of **Room 1009** (Phase 1), **Rooms 1011 and 1012** (Phase 2), and **Room 1008** (Phase 3) highlighted

3.3.13 Within Area 1, remains relating to the south-western corner of **Room 1008** were present (Plate 24). Specifically, a right-angled length of double-skin walling was exposed, constructed of machine-made bricks. This butted onto the south-eastern stone wall of **Room 1009** and formed the exterior wall of the extended room. To the north-west, the wall of **Room 1008**, which now formed an interior partition wall, had also been partially replaced, as part of this expansion/modification, by a Phase 3 double-skin wall composed of machine-made bricks; in its lower courses, beneath the former floor levels, this wall also contained two ceramic drains. Similarly, the stone partition wall separating **Rooms 1008** and **1009** (see Section 3.3.9 above) was also completely replaced by a machine-made brick wall, beneath which lay a ceramic drain, that also cut through the earlier wall line (Plate 25). However, this latter wall was more substantial than the other Phase 3 walls, being three-bricks wide.

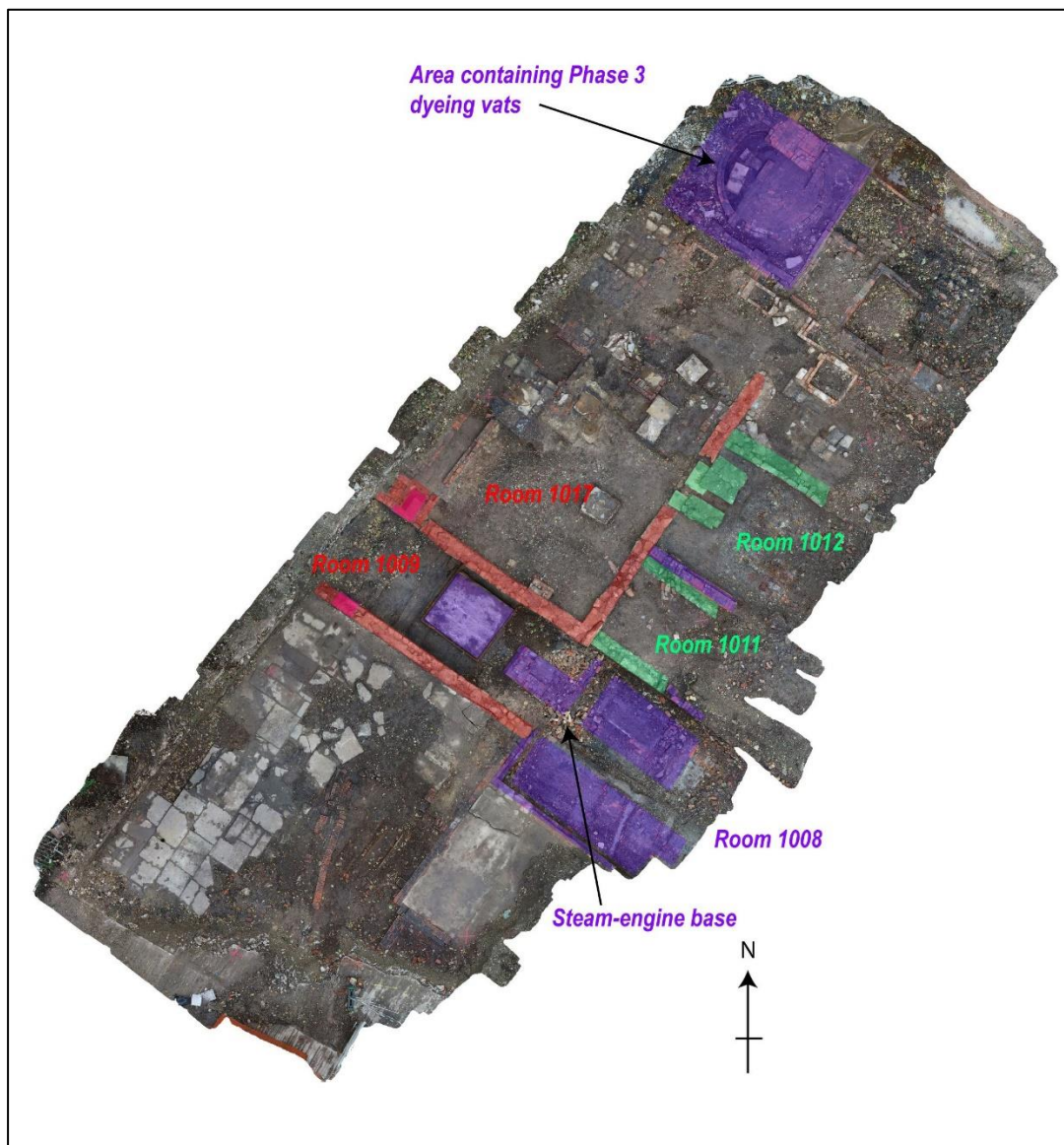


Plate 24: Overhead view of Area 1 with the Phase 3 remains highlighted in blue



Plate 25: The Phase 3 brick wall positioned separating **Rooms 1008** and **1009** and the Phase 3 drain (left). These overlie a Phase 2 stone wall

3.3.14 Significantly, within the confines of **Rooms 1008** and **1009**, which together formed one continuous room, were several structures which relate to the power system of the late nineteenth/early twentieth-century bleach and dye works (Fig 8). In **Room 1009** these included a large sandstone block, forming a base measuring c 2.2 x 1.95m, which contained eight iron ‘holding down’ bolts within the upper surface. These bolts were arranged in pairs and were positioned at the corners of the block. This block was also surrounded by a 2.5” diameter iron pipe (Plate 26). Set 0.91m south-east of this was another base. This was constructed of early twentieth-century frogged bricks, and slate, with cement mortars, and its upper surface, although truncated, contained a stone base with four iron fastening bolts (Plate 27). This base measured c 2.2 x 1.1m and a single-brick thick wall projected from its north-eastern side, which butted the Phase 2 stone wall defining **Room 1011**. Surrounding both of these bases was also an *in-situ* wooden floor, composed of floor boards measuring 3.10 x 0.27m that were aligned north-east/south-west (Plate 28).



Plate 26: The sandstone base in **Room 1009**



Plate 27: The brick and stone base in **Room 1009**



Plate 28: Detail of the wooden floor in Room 1009

- 3.3.15 Following recording, the wooden floor was removed and additional excavations were undertaken beneath it, to a depth of c 2.5m. Immediately beneath the floor a 0.2m deposit of black clay silt contaminated with a bright orange residue (possibly iron) was encountered and this sealed a 0.2m layer of concrete, which overlay redeposited material. At the lowest level of the excavation an early twentieth-century brick wall was observed, which was aligned parallel with the Phase 1 stone walls defining **Room 1009**. This wall was 0.8m high and sat upon clay deposits; however, it was not possible to determine its extent as during excavation at this depth there was continuous ingress of water from the clay deposits below and from surrounding contaminated deposits.
- 3.3.16 Excavation in **Room 1008**, to the south-east of the more easterly of the bases in **Room 1009** (see Section 3.3.14 above) also revealed several additional Phase 3 structures (Fig 8). Unfortunately, these had been heavily contaminated by hydrocarbons, which meant that the excavation was halted in this area, and their extent and form could not be fully determined (Plate 29). However, it was evident, following initial mechanical excavation, that these structures comprised an additional brick-built base, measuring c 1.95 wide, which extended for a least 3m and that contained a large sandstone slab. This base also lay adjacent to a c 1.9m-wide brick-built platform positioned in the southern part of **Room 1008**.



Plate 29: The structures in Room 1008 as seen following initial machine excavation

3.3.17 When the Phase 3 remains from **Rooms 1008** and **1009** are considered together, it is evident that these comprised two bases, with holding-down bolts, and a larger brick and stone base, adjacent to a brick platform. Significantly, based on their form and layout, it seems quite possible that these remains relate to a horizontal tandem-compound steam engine (Plate 30). If this was the case, the two bases in **Room 1009** would have secured the two cylinders of the engine, whilst the base and platform in **Room 1008** would have supported the piston and flywheel. This may also imply that the boiler(s) for the engine were positioned in the unexcavated portions of **Room 1008**.

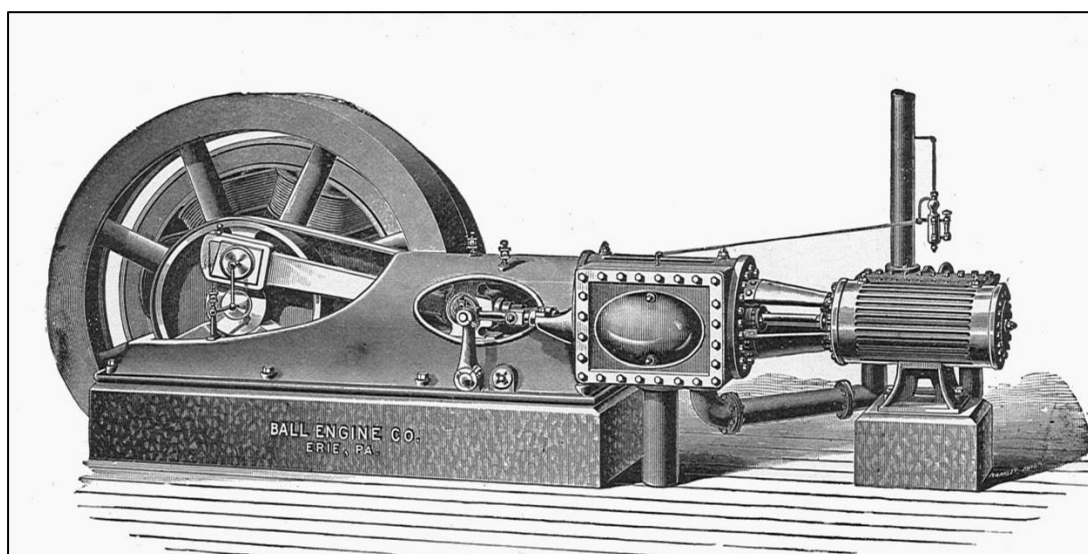


Plate 30: An 1897 engraving of a tandem-compound engine, of a type that may have been installed in Rooms 1008 and 1009

3.3.18 Other Phase 3 remains were also encountered in the northern corner of Area 1 (Plate 24). In this part of the trench, a series of Phase 4 dyeing vats/cisterns were present (see Section 3.3.21 below), and excavation beneath one uncovered the remains of an earlier dyeing vat, which presumably dates to the earlier part of the twentieth century. Excavation of this structure was, however, hampered due to the ingress of contaminated liquids, and so its full extent could not be determined, but it was evident that the vat had a stone base and stone-slab sides (Plate 31).



Plate 31: The partially exposed Phase 3 dyeing vat, heavily contaminated with hydrocarbons

3.3.19 **Phase 4 (early-mid-twentieth century)**: the OS map of 1929 indicates that by time of its publication the bleach and dye works had been significantly expanded (Plate 32; see Section 1.4.17 above). Across Area 1 and its vicinity this entailed the construction of a large south-westerly extension, which covered the footprint of the southern bay of the original early nineteenth-century mill/works. **Room 1008** was also subsumed into a much larger building that lay on the eastern side of the south-westerly extension. It is evident from the remains in Area 1 that this phase of enlargement entailed the decommissioning of the engine in **Rooms 1009** and **1008** (see Section 3.3.17 above) with its structural remains in **Room 1008** being subsequently sealed by a Phase 4 concrete floor. In addition, the Phase 3 dyeing vat in the northern corner of Area 1 was also sealed and replaced by a series of Phase 4 structures that were also associated with the dyeing of textiles (see Section 3.3.22 below).

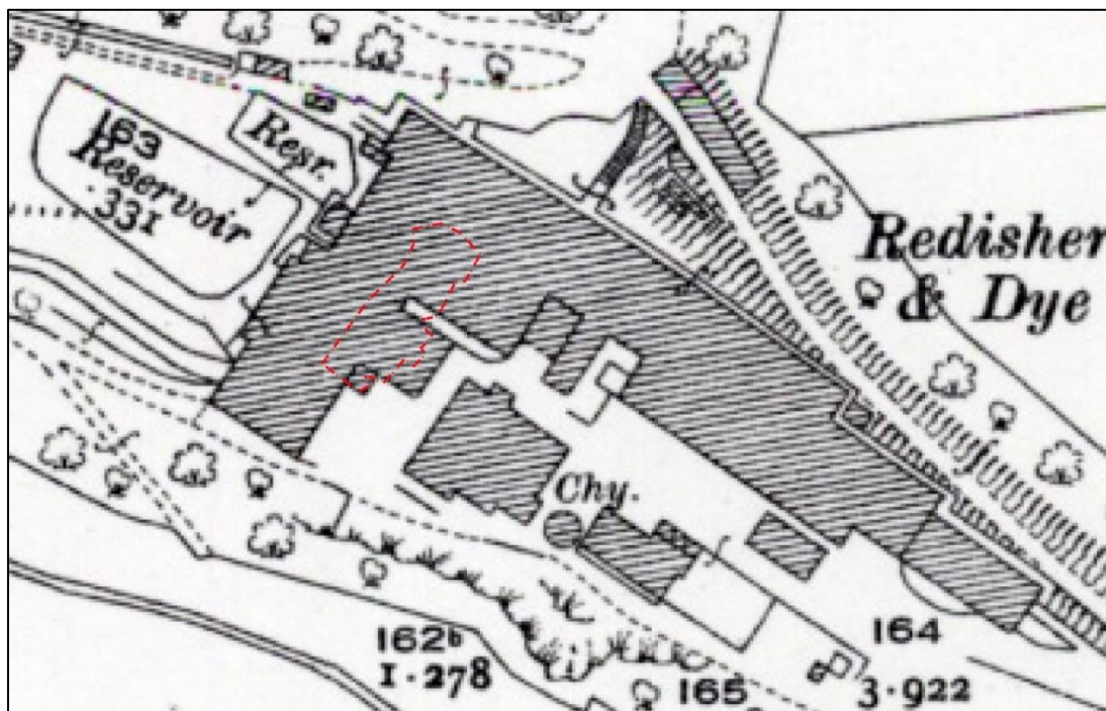


Plate 32: An extract from the OS map of 1929, showing the early-mid-twentieth-century bleach and dye works in relation to Area 1

3.3.20 The Phase 4 remains to the south of **Rooms 1009** and **1008**, related to two rooms that lay within the south-westerly extension, which were separated by a machine-made brick partition wall, aligned north-east/south-west, that abutted the Phase 1 wall defining the southern side of **Room 1009** (Fig 8; Plate 33). The larger of these contained a floor surface (**1004**) that was composed of a mix of stone flags and concrete, beneath which was a brick-built drain (Plate 34). Although there were very occasional recesses or metal plates within the fabric of the floor, it seems that there was a general absence of machinery or structures associated with the bleaching or dyeing process within this area. The smaller of the Phase 4 rooms in the south-westerly extension lay to the east and this contained a concrete floor (**1007**) and, similarly, contained an absence of evidence for machinery or structures associated with the bleaching/dyeing process.

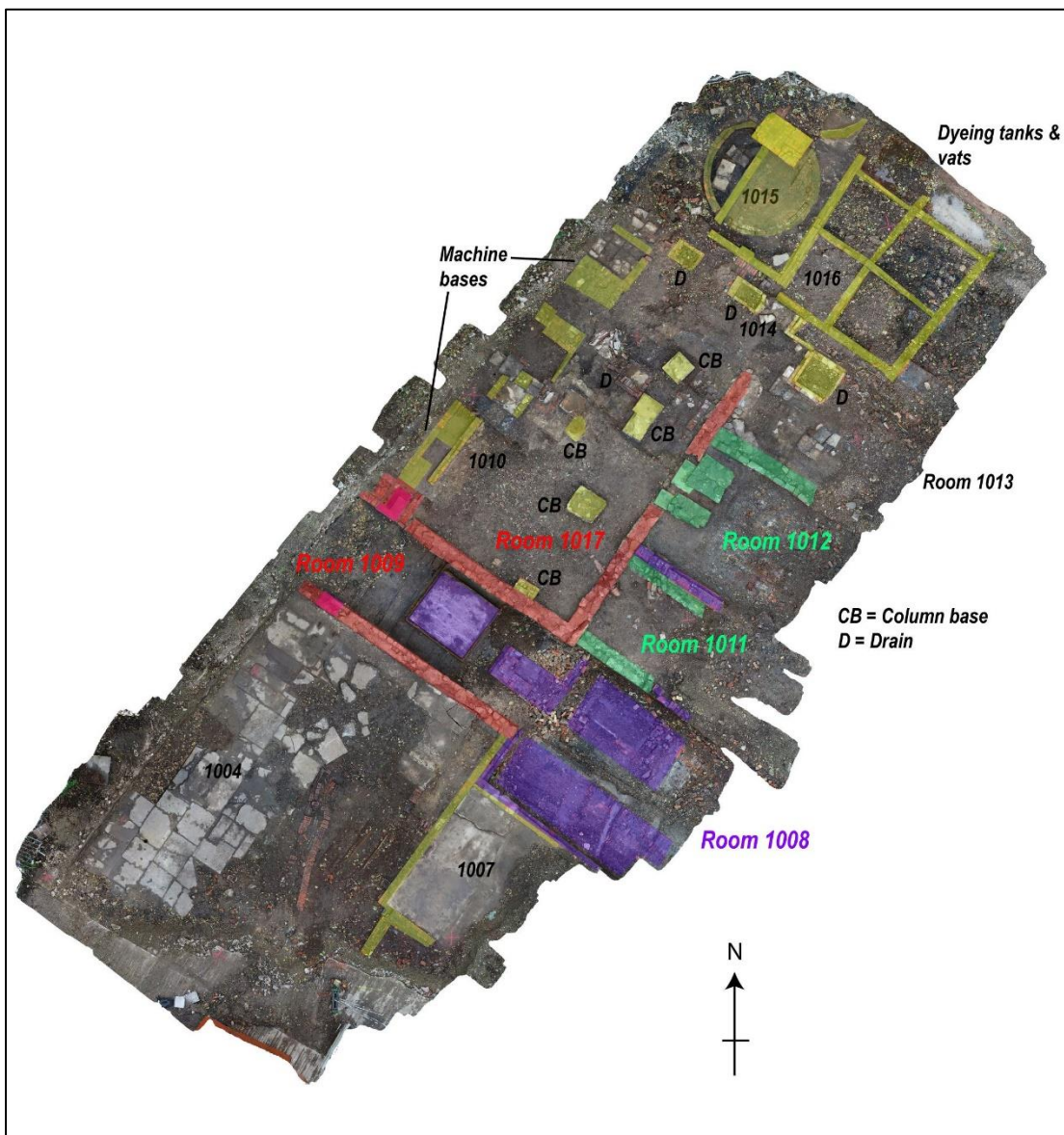


Plate 33: Overhead view of Area 1 with the Phase 4 remains highlighted in yellow



Plate 34: Floor surface 1004

3.3.21 To the north of **Room 1009**, numerous Phase 4 structures were present in Phase 1 **Room 1017** (see Section 3.3.3 above) and also within an adjoining area, designated as **Room 1013** (Plate 33). Significantly, several of these structures at the far northern end of the **Rooms 1017** and **1013** were clearly associated with dyeing. Importantly, these structures were built above earlier (Phase 3) dyeing vats (see Section 3.3.18 above), indicating that this part of the works had been used for the same activities for a considerable period of time. In addition, it was also apparent that the Phase 4 structures had been constructed sequentially, with the earliest structure comprising the base of a circular dyeing vat (**1015**) with a 3.6m diameter. The base was constructed of machine-made frogged bricks, and comprised a two-course exterior wall bounding a brick floor that was stained in places with a blue-coloured dye (Plate 35). The brick base of the vat was set upon a stone slab, containing a circular recess for the seating of the tank walls above. This slab was composed of four stone flags that were set on redeposited clay. Another stone slab, with a similar arcing recess, lay to the north, continuing outside of Area 1, indicating that a second circular dyeing vat lay in this part of the site (Plate 36).



Plate 35: The base of the dyeing vat (1015)



Plate 36: The circular recess defining the base of a circular dyeing vat

3.3.22 The life of these two circular vats seems, however, to have been short-lived, as they were subsequently replaced, in the mid-twentieth century, by a bank of rectangular/square dyeing tanks. The larger of these had been built directly over the circular dyeing vats (Plate 37), and although portions of this lay beyond Area 1, it was evident that it was defined by a double-skin brick wall and was 2.5m wide. Adjoining this tank, was a rectangular grid of twentieth-century brick walling that defining four additional square tanks (**1016**) covering c 3.50m², though an additional length of twentieth-century walling was observed to the immediate north east suggesting the presence of two more tanks that lay just outside Area 1. One of the tanks was excavated and this contained a thick, silty-clay deposit, which was heavily contaminated with a blue-coloured dye identical to that noted in the base of the circular dyeing vat (*see Section 3.3.21 above*). Its brick-built base was also encountered at a depth of 1m. At a later date, probably in the mid-twentieth century, the large rectangular tank was then replaced, by a brick plinth that was built over its western side, which measured c 1 x 1.7m (Plate 38).



Plate 37: The bank of rectangular dyeing vats and adjacent drains



Plate 38: The brick-built plinth

3.3.23 Several other features were also associated with the dyeing tanks and vats. These comprised three brick-built structures (collectively grouped as **1014**). Two of these, were small rectangular structures that lay immediately south of the area containing the circular dyeing vats (**1015**; see *Section 3.2.21 above*), whilst a larger square brick-built structure was positioned immediately south of the square dyeing tanks (**1016**; see *Section 3.2.22 above*; Plate 37). Significantly, a ceramic pipe linked all of these features indicating that they functioned as drains that were almost certainly used to empty the dyeing liquor from the vats and tanks to the north (Plate 39).



Plate 39: Drainage system 1014

3.3.24 To the south of the vats and tanks, in **Room 1013**, the partial remains of a flagged-floor surface were present. The map evidence indicates, however, that this 'room' and floor surface actually lay outside of works in a passageway. More substantial Phase 4 remains were, however, evident, in **Room 1017**, to the south of the dyeing vats/tanks. These included five small brick/stone bases, set in concrete, which were designed to carry cast-iron columns that would have provided additional support for the room above. On average, these bases measured 0.8m square and in one the remains of a cast-iron column were present (Plate 40). Four of these bases were set in a north-east/south-west line, and one had been butted directly against the Phase 1 walling defining the southern side of **Room 1007** (Plate 33). The remaining column (that containing the cast-iron column base), lay to the west, it had been partially sealed by the only surviving portions of concrete flooring present in this area, which also contained an embedded brickwork floor (Plate 40). A square, brick-built drain, similar in form to those that lay adjacent to the dyeing vats/tanks (*see Section 3.3.24 above*) also lay immediately west of one of the column bases.



Plate 40: The column base with the remains of the in-situ cast-iron column

3.3.25 On the western side of **Room 1007** two brick-built pads were present that were associated with short lengths of brick walling that lay to their north-east and south-west, and a small circular ceramic drain that lay immediately north-east of the northern pad. The pads measured c 1.8 x 0.8m, and were spaced c 1m apart, and were constructed using frogged bricks, bonded with dark grey/black cement. To the south-west, the base for another piece of machinery was also present (**1010**), which measured c 0.8 x 2.6m. This was defined by two rectangular stone bases, set 0.74m apart, encased by two lengths of double-skin walling (Plate 41). The northern base also

contained several iron fastening bolts. The function of these features is difficult to ascertain, though they probably supported machinery associated with the dyeing process, given the presence of dyeing vats and tanks to the north.



Plate 41: Machine base 1010

4 BUILDING SURVEY RESULTS

4.1 Introduction

4.1.1 The building survey targeted two parts of the site (Fig 2) that were deemed to contain historically significant extant structures. One of these areas contained an extant engine house, which is first depicted on the OS map of 1929 (Plate 42; see Section 1.4.17 above), indicating that it was constructed between 1908 and 1927, whilst the other area lay at the north-eastern corner of the site. This latter area was open and wooded at the time of the survey and lay adjacent to an extant reservoir, which formed the smaller of the western reservoirs that are initially depicted on the OS map of 1893 (see Section 1.4.11 above). It is, however, evident from OS mapping that originally it was covered and formed a north-eastern extension to the bleach and dye works that had been added at some stage between 1908 and 1927 (see Section 1.4.17 above), indicating that it was broadly contemporary with the surveyed engine house (Plate 42). It also contained a number of latter additions that are depicted on the OS map of 1939 (Plate 43).

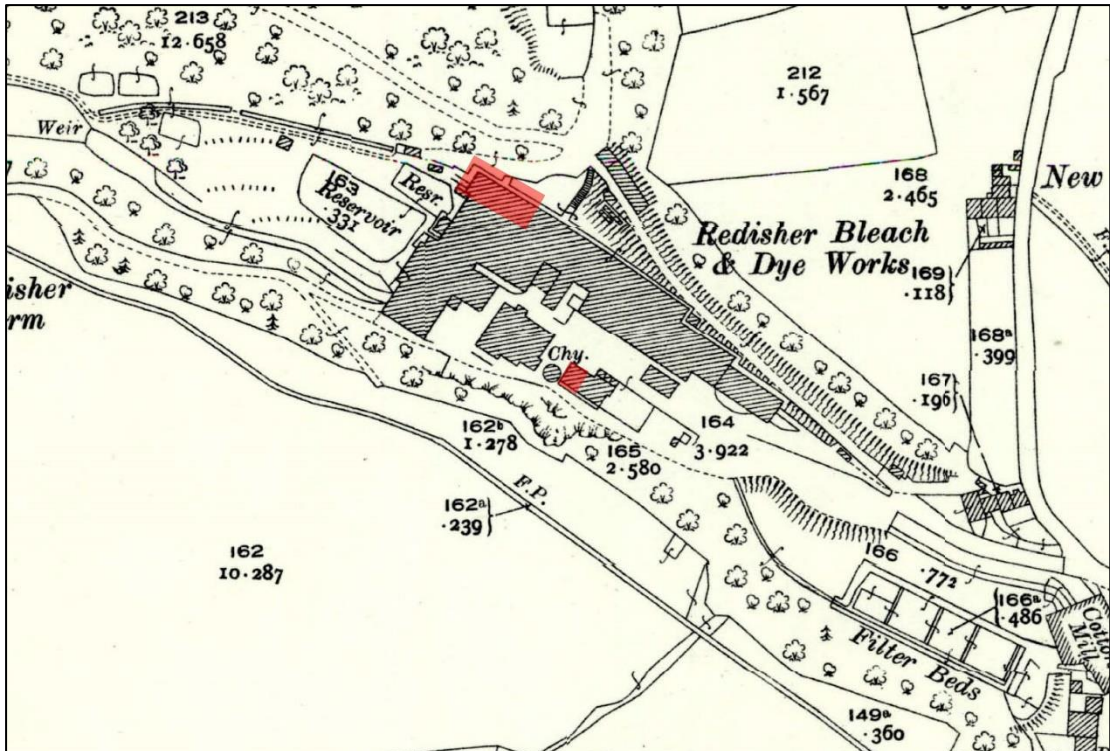


Plate 42: An extract from the OS map of 1929 with the building survey areas highlighted

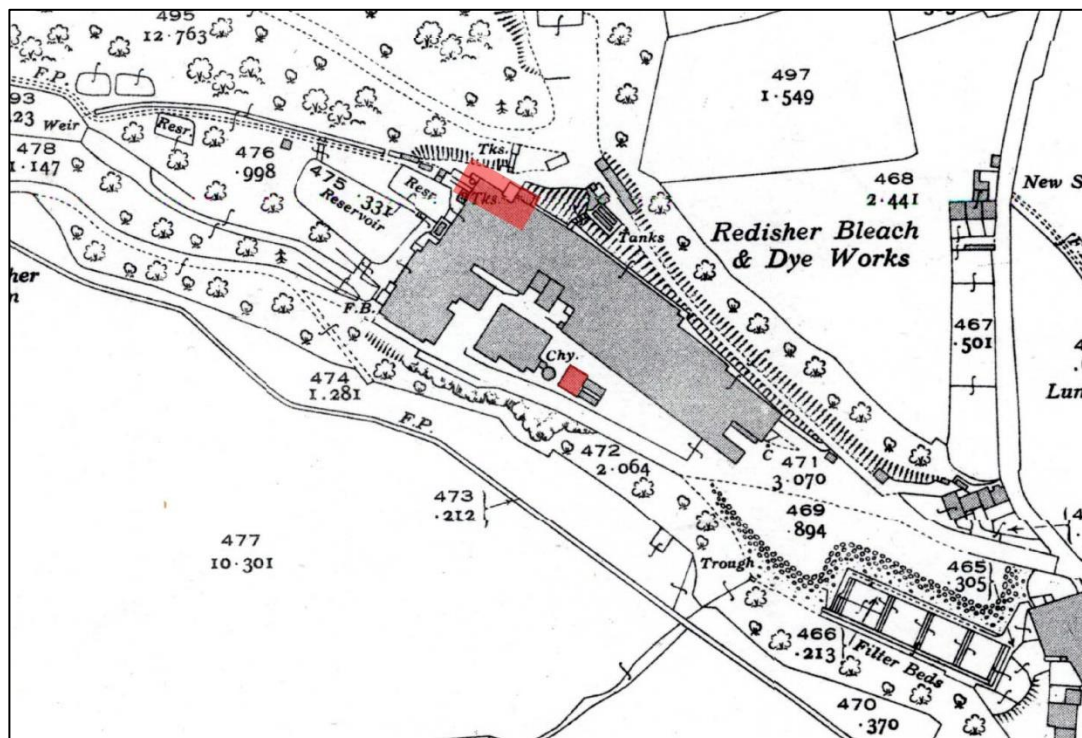


Plate 43: An extract from the OS map of 1939 with the building survey areas highlighted

4.2 The early twentieth-century engine house

- 4.2.1 The engine house was located on the southern side of the works and faced directly onto the access road that passed along the southern edge of the site. To the north it abutted the main body of the modern works, to the east it was adjoined by a modern single-storey linear range beneath a single pitch roof, while a modern corrugated steel shed had been erected against its western elevation.
- 4.2.2 **Exterior:** the structure was essentially square in plan, but incorporated a dog-leg at the southern end of the eastern wall that made it approximately a metre wider to the south (Fig 11). Although it only had a single-floor, it stood to nearly two-storeys in height and was constructed in hard-fired, twentieth-century red-brick (Plate 44). It had a flat roof of precast concrete beams set upon a framework of three steel I-section joists, which were hidden behind a low parapet wall. Its main entry point lay to the south.



Plate 44: Engine house, facing north

- 4.2.3 The southern elevation incorporated a set of blue double doors to the west of centre, set beneath a steel lintel (Plate 45; Fig 11). The brickwork on the eastern jamb of this door carried a radius, which was not identified on the doors opposing jamb, suggesting a degree of alteration. This opening may originally have been taller, for above the height of the lintel the wall was set back within a recessed rectangular panel that gave the appearance of infill. A second door, of pedestrian width, lay to the east of centre and employed a concrete lintel, above which a square metal vent had been set into the wall. Both the recessed panel and metal vent were topped by a large horizontal steel beam at approximately first-floor height, that spanned the width of both doors beneath. A third and larger door at the eastern end of the elevation had a concrete lintel, a chamfered sill at the base, and its jambs had been rendered in concrete in a manner that suggested the door had been inserted at a later date. This opening had been infilled with a mixture of concrete blocks and ceramic ventilator bricks.



Plate 45: Southern elevation of the engine house

- 4.2.4 At the western end of the elevation a steel hopper vent projected from the face of the wall, with another smaller vent set into the wall about 1.5m above it. To the east of this latter vent and sitting above the large horizontal steel beam, a square aperture topped with a sandstone lintel, near the centre of the elevation, had been infilled in brick.
- 4.2.5 Beneath the height of the parapet the ends of a pair of steel I-section beams projected slightly from the face of the wall at the centre and western end of the elevation. Each of the beams sat upon a short sandstone sill, but no evidence was identified for a third beam at the eastern end of the elevation. Of the remaining elevations only the southern end of the eastern elevation was visible above the height of the single-storey lean-to range, but it displayed no features of any kind.
- 4.2.6 **Interior:** internally, the building had been divided into two cells, with a larger L-shaped cell to the north-west and a smaller square cell in the south-eastern corner (Fig 11). The brick walls of the smaller cell had been coated in white paint and its concrete floor was matched by its own independent internal pre-cast concrete ceiling (Plate 46). There had evidently been a square aperture near the centre of the northern wall, which had been infilled with brick and another above it which had not, retaining its steel louvre vent (Plate 47). A mid-height horizontal steel beam set across the length of the eastern wall may have provided a lintel for a low, wide opening beneath it, although this feature had been blocked in brick (Plate 46), and the room included several pieces of equipment that may have formed part of some kind of heat exchanger.



Plate 46: Interior of the smaller square cell, facing east



Plate 47: Interior of the smaller square cell, facing north

4.2.7 The larger cell was open to its pre-cast concrete roof, and its walls were painted in the same manner as the smaller room. A circular steel tank occupied a position in the north-eastern corner, which partially obscured a doorway at the northern end of the eastern wall that connected the building with the interior of the lean-to building (Plate 48). Evidently there had been a second door at the northern end of the western wall, which had been blocked in brick (Plate 49). To the south of the latter door a small low rectangular window fitted with horizontal steel bars had been blocked from the

western side with concrete blockwork. On the same wall, a second and slightly larger window to the south of the first, was fitted with a louvre vent below a two-light glazed hopper (Plate 50).



Plate 48: Circular tank in north-eastern corner of the larger cell



Plate 49: Blocked doorway on the western wall of the larger cell

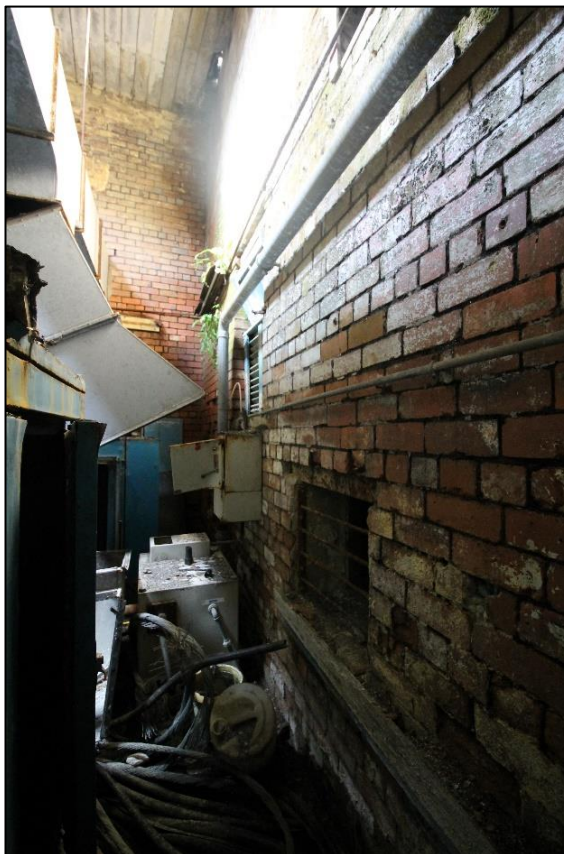


Plate 50: Western wall of the larger cell, showing blocked windows

- 4.2.8 There appeared to be a vertical construction joint at the eastern end of the wall dividing the smaller cell from the larger, perhaps indicating the subdivision to be a later event, but no further evidence of this event was noted. In addition to the circular tank, the room contained steel ducting and other equipment that appeared to be associated with air extraction.
- 4.2.9 From the interior of the lean-to range to the east, it was possible to inspect the lower portions of the building's eastern wall. The horizontal steel lintel identified on the opposing face was again observed and traces of paint indicated that the lower half of the wall had been painted blue, with white above (Plate 51). Additionally, the internal angle formed by the dog-leg wall had been plastered to half-height and the southern end of the wall was obscured by a bank of steel cabinets associated with managing electricity generation (Plate 52).

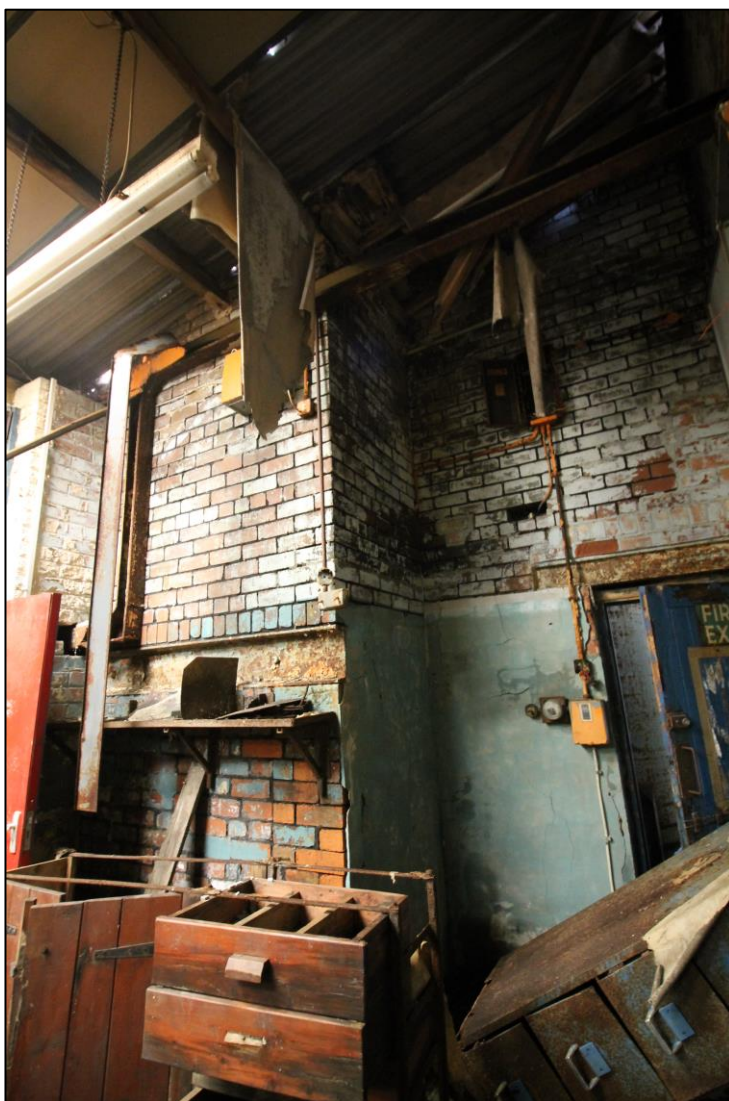


Plate 51: Lower half of the eastern wall of the larger cell, facing west



Plate 52: Electrical generation equipment at southern end of the eastern wall of the larger cell, facing south-west

4.3 The early twentieth-century extension

4.3.1 Several structures and buildings were identified and recorded in this part of the site which formed elements of the twentieth-century bleach and dye works (Fig 12). Specifically, these originally lay within an extension that had been made to the works during this period, at its north-eastern corner. One of these features was a tall rubble-built stone wall, which extending to a height of approximately 3.5m (Plate 53). The wall used coursed sandstone and was gently battered towards the top, and it had been built against a terraced slope; hence, it acted as a revetment wall, though it would also have formed the exterior wall of the extended section of the bleach and dye works. A series of smaller brick walls projected at a right angle from this wall, which formed several distinct bays. These walls varied in height and length but were all constructed of hard fired red brick of early twentieth century date. At the north-western end there was a brick-lined channel, 1.56m wide and filled with detritus, but surviving to a length of approximately 10m and aligned north-east/south-west. The brick foundations of a pair of small rectangular cells occupied the ground to the north.

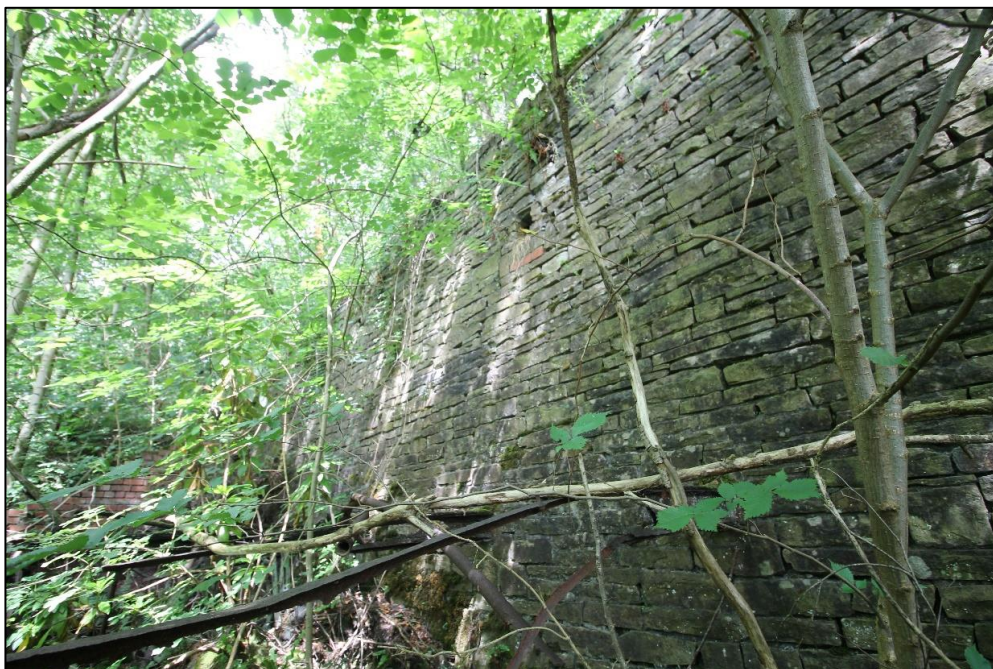


Plate 53: The early twentieth-century revetment wall

- 4.3.2 To the south-east of the smaller bays (see Section 4.3.1 above), was a larger bay with an adjoining row of six small timber-lined tanks running parallel to the stone revetment wall (Plate 54). The perished remains of a rubber pipe were preserved within several of the tanks, indicating the transfer of water between them and a substantial steel frame, tied into the surrounding walls, was mounted above the tanks (Plate 55). A double row of concrete vats also lay to the south-west, and although these were much obscured by vegetation, six were visible (Plate 56).



Plate 54: Timber tanks, facing north-west



Plate 55: Steel frame above timber tanks, facing east



Plate 56: Concrete vats, facing east

- 4.3.3 To the south-east of the vats, the revetment wall turned to the north-east, creating an additional square bay, set upon an area of slightly raised ground. A considerable quantity of tumble covered much of this bay, but a pair of steel beams projecting from the bank denoted the position of the roof in this part of the works (Plate 57). This bay is first depicted on the OS map of 1937 (Plate 43), and it was evident that it was bounded at the north-western end by a brick-built revetment wall rendered in cement and rising to a height of approximately 3m at its north-eastern end, while the

north-eastern side was defined by the exposed natural bedrock face for a distance in excess of 23m. In the north-western corner of the bay a rectangular brick structure had been erected, with a concrete single-pitch roof set upon steel and timber purlins, draining to the north-east. The building was open-sided to the south-west and had a cast iron pipe flange protruding from the face of its north-western wall (Plate 58). At the foot of this wall, directly beneath the pipe, lay what appeared to be a cast-iron end bearing box, with a second lying a short distance to the south-west (Plate 59).



Plate 57: Corner of stone-built revetment wall, with redundant roof beam extend to right of centre



Plate 58: Open-sided brick-built structure, facing south-west



Plate 59: End bearing box on north-western wall of open-sided building

- 4.3.4 The south-eastern wall of this building also had a large central aperture at its centre (Plate 60) and at its south-western end it turned though a right angle to continue to the north-east for a distance of 10m before abutting the corner of one of the modern industrial buildings. This created a narrow passage between this wall and the exposed bedrock, that could be accessed from an opening at the south-eastern end of the wall. The passage, which continued for a total length of over 17m, passed behind the

adjacent industrial building, where it terminated in a stone cross-wall with what appeared to be a narrow aperture at its base and a metal tank above (Plate 61).



Plate 60: South-eastern end of open-sided building



Plate 61: South-eastern end of narrow passage

5 DISCUSSION

5.1 Introduction: the development of the Redisher textile-finishing works

- 5.1.1 It is evident from the documentary and cartographic evidence (*see Section 1.4 above*) that the Redisher Works was established in the early years of the nineteenth century and, perhaps, began life as a cotton-spinning mill, before being ‘converted’ into a bleach works that was in operation in the mid-nineteenth century. The physical form of the bleach works was modified during the latter half of the nineteenth century, and this probably corresponded to its acquisition by Samuel Knowles, who represents an important figure in Bury’s textile finishing industry (*see Section 1.4.8 above*). It is also possible that Knowles established a brick works that is known from late nineteenth-century historic mapping to have lain immediately east of the bleach works, also in the redevelopment area. At the end of the nineteenth-century, in 1898, the works was purchased by Charles Ainsworth, another influential local figure (*see Section 1.4.14 above*), who also introducing dyeing to the finishing works, which now occurred alongside bleaching. It is also apparent from the cartographic evidence that Ainsworth placed some considerable investment into the Redisher Bleach and Dye Works, as between 1908 and 1927, it was expanded greatly in extent, through the construction of two large extensions and additional ancillary buildings. The works was subjected to some further, albeit smaller, expansion in the mid-twentieth century and eventually closed for business in 1961.
- 5.1.2 Significantly, the open-area excavation uncovered a series of remains at the eastern end of the works that can be related to the known historical development of the finishing works, across the nineteenth and twentieth centuries, with four main phases being apparent, whilst the building survey provided some further details relating to the early-mid-twentieth century works. Specifically, the open-area excavation and building survey produced evidence for the evolving power systems of the early works, and also for some of the nineteenth- the twentieth-century activities that occurred in the works. Indeed, particularly good evidence survived that related to Charles Ainsworth’s early-mid-twentieth-century bleach and dye works.

5.2 Power systems

- 5.2.1 Fairly good evidence was recorded that related to the evolving power systems of the works. The earlier of these remains were excavated in the Area 1 trench and included the evidence for a waterwheel (dating to Phase 1; *see Section 3.3.5 above*) that was positioned at the centre of the earlier nineteenth-century works, which during the early-mid-nineteenth century formed a stone-built building, containing two large bays. The remains seem to denote the position of the waterwheel axle that lay within a channel, which functioned as the mill race positioned between the two bays of the works. Mid-nineteenth-century mapping indicates that water used to drive the wheel was derived from a large pond/reservoir that lay immediately to the west of the works, that was filled with water from the Holcombe Brook, via a headrace channel that ran from a weir on this watercourse, located to the west of the bleach works. After driving the waterwheel, the water then entered a tail pond that was positioned on the eastern side of the mill. The pond supplying the head water and that receiving the tail water,

along with an additional smaller reservoir located to the west of the works, could also have supplied the works with the large volumes of water required by the bleaching process.

- 5.2.2 The discovery of a waterwheel at the Redisher Bleach Works comes as no great surprise, particularly as most of the other early-mid-nineteenth century finishing works in the Bury area, were provisioned with such features, and some, such as the Bury Ground Print Works, were still entirely powered by waterwheels up until the 1840s (Miller 2012, 7). Indeed, it seems from the documentary evidence that the waterwheel at Redisher was in operation in the 1860s, though it also evident by this date that a steam engine was also used that provided the works with additional power (*see Section 1.4.7 above*). The map evidence suggests that this steam plant was located on the northern side of the works, as both the OS maps of 1850 and 1893 plot a projecting structure. Moreover, the form of this projection, as depicted on the latter map, is concomitant with an external engine/boiler house (*see Section 1.4.10 above*), and based on its suspected mid-nineteenth-century date this would almost certainly have housed a vertical beam engine, with steam being possibly raised by a Cornish boiler (*cf Phelps et al 2017, 29*).
- 5.2.3 At some stage between the publication of the OS maps of 1850 and 1893 the waterwheel was, however, removed, which also involved the infilling of the tail pond to the east. Therefore, the works became fully dependant on steam power, though the area containing the former waterwheel was retained (designated as **Room 1009** in Area 1, Phase 2; *see Section 3.3.8 above*). Significantly, the remains in Area 1 indicate that at either the very end of the nineteenth-century, or in the initial years of the twentieth century (in Phase 3), there was a reorganisation and ‘updating’ of the works steam plant. This involved the installation of a ‘new’ steam engine at the southern end of the works, as depicted on the OS map of 1910, the base of which was uncovered in Area 1. The remains indicate that this formed a horizontal engine, of the tandem-compound type, which was a common style of steam engine used in the textile industry from the 1860s onwards, until the early part of the twentieth century (*op cit*, 57). Indeed, based on the known history of the site, it is quite possible that the horizontal engine at the Redisher Works was installed by Charles Ainsworth, quite soon after he acquired the works in 1898 (*see Section 1.4.14 above*), as part of a scheme of modernisation. At this date, Lancashire boilers would for have provided the steam pressures required to power the engine and it is possible that these were located in a building (in **Room 1008**; *see Section 3.3.17 above*) that was attached to the southern end of the works, as depicted on the OS map of 1910.
- 5.2.4 Further modifications were then made to the power systems by Ainsworth, at some stage between 1908 and 1927 (during Phase 4), during the expansion of his bleach and dye works. This involved decommissioning the horizontal engine that lay in Area 1, and partially capping its remains with a concrete floor (*see Section 3.3.19 above*). This probably also corresponded with the construction of a new independent engine house, that lay to the south of the main works’ building, which formed the subject of the building survey (*see Section 4.2 above*). Although no details were apparent relating to the type of engine that was present in this building, it is quite likely based on the date of the building that it housed a steam turbine that was linked to an electrical

generator, that powered the machinery in the works (Phelps *et al* 2017, 61). In addition, the boilers providing steam for the turbine, and also for other processes within the works, were probably housed in a detached building, associated with a chimney, that lay immediately to the north-west of the engine house. Evaluation Trench 4 targeted this latter building and, although the trench had to be abandoned due to the discovery of asbestos, it seems to have uncovered a brick base that probably represents the setting for a Lancashire boiler (*see Section 3.2.3 above*).

5.3 Bleaching

- 5.3.1 Bleaching formed an important element of textile finishing, which was undertaken in order to free cloth from impurities so that it could be successfully dyed or printed. It is known from the documentary sources that the Redisher Works formed a dedicated bleach works from at least the mid-1840s until its acquisition by Charles Ainsworth in 1898, after which time bleaching continued at the works, though in tandem with dyeing. During this period, bleaching was a factory-based activity that utilised a series of processes and machines (Ashmore 1969, 60; Miller 2012, 15-17). Specifically, an initial stage involved singeing the cloth in order to remove any fibres present on its surface, such as frayed filaments from weaving, to obtain a perfectly smooth surface (Ashmore 1969, 61). This process was achieved by using a singeing machine that contained red-hot copper plates that were heated by gas flames or a stove underneath. Following singeing, the cloth was then fed through a trough of water to extinguish any sparks. Once this preparatory process had been completed, lengths, of cloth were sewn together to form a continuous 'rope' that could be more easily moved between the various bleaching processes by winches, which drew the rope through overhead porcelain eyes (Dodd 1844, 47).
- 5.3.2 With the preparatory processes complete, the cloth then went to the bleach croft, which formed the largest area within a bleach works and contained many items of machinery, including steam engines, washing machines, liming machines, high-pressure kiers, and cisterns (OA North 2012; Miller 2012). In the bleach croft, the cloth was first subject to the 'grey wash' process, when it was alternately impregnated with scouring liquor, washed in a washing machine, and squeezed dry through rollers, which removed any dirt and size that had been applied during the weaving process (*ibid*). The cloth was then boiled for several hours in a kier, a large iron vessel filled with a solution of caustic soda. Boiling in lime, or 'bowking', circulated the solution continuously through the cloth at a high temperature (*ibid*).
- 5.3.3 The next stage represented the 'grey sour', when the cloth was treated with a weak solution of hydrochloric acid to dissolve any vestiges of lime, and was then washed thoroughly again (*ibid*). The next process was the bleaching, or chemicing, that aimed to remove the natural colouring matters in the fibre. This was achieved by passing the cloth through a clear solution of chloride of lime, or bleaching powder, after which it was left for several hours to allow the necessary chemical reactions to take place (*ibid*). Next the cloth was subjected to the 'white sour' process, which involved passing it through a dilute solution of sulphuric acid, followed immediately by a final washing in clean water, which rendered the cloth perfectly pure (*ibid*). The cloth was then passed through padded squeezing rollers and drying cylinders, after which the drying process

was completed in the 'hanging stove'. Stretching machines rectified any shrinking in the cloth, whilst the finishing process also required the cloth to be evenly and finely damped, fulfilled by the damping machine (*ibid*). Once the cloth had dried it was stored in 'white pile' cisterns ready for dyeing or printing.

- 5.3.4 Given the known structures and machinery involved in nineteenth-century factory-based bleaching, it is clear that at the former Redisher Works there was very little evidence for these. Indeed, only one internal structure was present, which seems to date to the later nineteenth century. This structure was exposed in the Area 1 and represents the base for a small machine (*see Section 3.3.10 above*). However, the machine base lay within a small room (**Room 1012**) that was attached to the main body of the works and hence it clearly lay outside of a large bleaching croft, where the bleaching process would have been undertaken. As such, its function is difficult to ascertain.
- 5.3.5 Slightly more evidence for twentieth-century bleaching was, however, recorded during the building survey across the north-eastern corner of the works. This part of the works was created between 1908 and 1927 (*see Section 1.4.17 above*) and based on the recorded remains seems to have formed an element of the main early-mid-twentieth-century bleaching croft. In this area several wooden tanks were identified, which seem to have held water, and might therefore relate to the washing of the cloth. In addition, a nearby bank of concrete vats was present and these could represent cisterns, associated with either the 'grey sour', 'chemic', or 'white sour' process.

5.4 Dyeing

- 5.4.1 From 1898 until its closure in 1961, dyeing was also undertaken at the Redisher Works, alongside bleaching, as a complementary finishing process. More generally, during this period, natural and synthetic dyes were in use, with the latter types being derived from coal tar distilled in a gas works (Simon 1996). In addition, across the twentieth century other types of dyes were adopted including reactive dyes, disperse dyes, azo dyeing and sulphur dyes (OA North 2008), and presumably some, or all of these, were also used at the Redisher Works. Traditionally, cotton fibres could also not be dyed without the aid of mordants, although 'direct colour' dyes that were water soluble were invented in the late nineteenth century that could be fixed directly onto the cloth (*ibid*).
- 5.4.2 Regarding the structures and machinery that would have been used to undertake dyeing within a late nineteenth/early twentieth-century dye works, these are summarized by Murphy (1911) and would have included heated vessels and vats for mixing dyes, dye becks, and jiggers used to agitate and fix the dyes onto the cloth, padding machines and mangles to saturate the cloth, whilst other machinery included cutting, drying, brushing, and raising apparatus. Dyeing was completed in the dye house, whilst the process of drying need to be undertaken rapidly, in order to prevent the colours running, and was normally undertaken in separate drying rooms, which were heated by stoves.
- 5.4.3 Significantly, it is evident from the late nineteenth and twentieth-century remains in Area 1 that the northern and central parts of this area formed part of a dye house that

contained some of the structures described by Murphy (*ibid*), that in this case seem to have been used to apply a blue-coloured dye to the textiles (*see Sections 3.3.21-22 above*). These structures included a sequence of rectangular/square vats, dating from Phases 3 and 4 (*see Sections 3.3.18 and 3.3.22 above*), along with the bases for two circular vats, dating to Phase 4 (*see Section 3.3.21 above*), which were built above the Phase 3 dyeing vats, and that were succeeded by the Phase 4 rectangular/square vats.

- 5.4.4 In terms of function, the rectangular vats probably formed dye becks, where the cloth was immersed in the dye. These vats would also have contained various mechanical fittings that would have kept the cloth being dyed in constant circulation amongst the dye. In contrast, the circular vats probably formed dye vessels. If this was the case, these could have supported an iron dish or bowl-shaped vessel that was used to mix the dyes. The vessel would also have been heated by steam, carried via a pipe. Other structures close to these vats included machine bases, dating to Phase 4. It is difficult to ascertain the types of machine carried by these bases, particularly as the bases lay at the edge of the trench and more of their remains might lie to the west, outside of the excavated area. However, it is possible that they secured padding machines or mangles. Immediately to the south of the dye house a large flagged area was also encountered that had a notable absence of machine bases and other structures associated with textile finishing (*see Section 3.3.20 above*). One possibility, therefore, is that this area formed a drying room, or perhaps a warehouse/store.

6 CONCLUSION

6.1 Success and significance

6.1.1 The excavated remains in Area 1 and those extant remains recorded during the building survey can be allied with the available historical records and these shed some further light on the form and operation of the nineteenth-century bleach works, and also the early-mid-twentieth-century bleach and dye works at Redisher. The greatest success of the project, however, resides with the information gleaned on the evolving power systems of the works, across the nineteenth and early part of the twentieth centuries, and also with the recording of remains related to distinct activity areas within the early-mid twentieth bleach and dye works. These results, whilst not warranting any further analysis or publication, contribute to the growing body of archaeological data relevant to the historic textile-finishing industry in the Bury area, and the wider Irwell Valley region.

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APPENDIX A TRENCH DESCRIPTIONS AND CONTEXT INVENTORY

Trench 4						
General description					Orientation	NE-SW
Trench contained brick floor surface and contaminated material					Length (m)	8.00
					Width (m)	2.00
					Max. depth (m)	0.30
Context No.	Type	Length (m)	Depth (m)	Description	Finds	Date
401	Layer	N/A	0.10	Concrete	N/A	20th Century
402	Layer	N/A	0.20	Demo rubble	N/A	20th Century
403	Surface	1.50	??	Frogged brick surface	N/A	20th Century
404	Surface	2.00	??	Frogged brick surface	N/A	20th Century

Trench 5						
General description					Orientation	SE-NW
Trench contained 19 th and 20 th Century features associated with water management.					Length (m)	14.00
					Width (m)	2.20
					Max. depth (m)	??
Context No.	Type	Length (m)	Depth (m)	Description	Finds	Date
501	Layer	N/A	0.20	Concrete	N/A	20th Century
502	Layer	N/A	??	Overburden	N/A	20th Century
503	Wall	0.86	??	Frogged brick, aligned NE-SW	N/A	20th Century
504	Structure	1.30	??	2x Possible brick lined filter beds, internal partitions frogged brick	N/A	20th Century
505	Surface	1.00	??	H-made brick, sandy mortar	N/A	20th Century
506	Wall	2.50	??	20 th Century drain	N/A	20th Century

Trench 7						
General description					Orientation	SE-NW
Trench contained several walls pertaining to the 20 th Century.					Length (m)	12.56
					Width (m)	2.60
					Max. depth (m)	1.20
Context No.	Type	Length (m)	Depth (m)	Description	Finds	Date
701	Layer	-	0.??	Concrete	N/A	20th Century
702	Layer	-	0.??	Overburden	N/A	20th Century
703	Wall	1.90	??	2x course h-made brick	N/A	20th Century
704	Wall	??	??	??	N/A	20th Century
705	Stone	1.20	0.40	Dressed stone block	N/A	20th Century
706	Wall	1.10	??	Sandstone wall	N/A	20th Century
707	Wall	0.85	0.30	h-made and frogged brick	N/A	20th Century
708	Structure	2.00	??	Dressed stone and h-made brick	N/A	20th Century
709	Surface	2.00		Concrete	N/A	20th Century

Trench 8						
General description					Orientation	NE-SW
Trench generally devoid of archaeology. Consists of concrete, capping earlier levelling deposits and 20th Century wall.					Length (m)	15
					Width (m)	2.80
					Max. depth (m)	2.00
Context No.	Type	Length (m)	Depth (m)	Description	Finds	Date
801	Layer	N/A	0.10	Concrete	N/A	20th Century
802	Layer	N/A	0.17	Concrete	N/A	20th Century
803	Layer	N/A	0.50	Demo rubble	N/A	20th Century
804	Layer	N/A	0.30	Stone rubble	N/A	20th Century
805	Layer	N/A	0.80	Cinder and demo rubble	N/A	20th Century
806	Wall	0.25	0.40	2x course, frogged brick, dark grey mortar	N/A	20th Century

Area 1						
General description					Orientation	NE-SW
Area 1 identified 20th Century features associated with the bleaching/dyeing industry alongside original 19th Century fabric.					Length (m)	25
					Width (m)	12
					Max. depth (m)	3.00
Context No.	Type	Length (m)	Depth (m)	Description	Findings	Date
1001	Layer	N/A	0.10	Concrete	N/A	20th Century
1002	Layer	N/A	0.30	Overburden	N/A	20th Century
1003	Layer	N/A	N/A	Natural clays	N/A	20th Century
1004	Surface	11.30 x 7.10	0.20	Stone flag and concrete floor	N/A	20th Century
1005	Structure	4.30	0.30	French drain, frogged brick	N/A	20th Century
1006	Structure	3.93	N/A	Frogged brick wall, 2x course	N/A	20th Century
1007	Room	4.60 x 2.80	N/A	Bounded by frogged brick walls, concrete floor	N/A	20th Century
1008	Room	5.85 x 5.20	1.40	Room containing 20th Century brick platforms & bases	N/A	20th Century
1009	Room	6.19 x 3.10	1.20	19th Century stone walls. Contains false wooden floor and machine bases	N/A	C19/20 th
1010	Structure	4.30 x 1.70	0.27	Stone machine base with 20th Century brickwork	N/A	20th Century
1011	Room	3.10 x 2.40	N/A	Possible 19th Century stone annex, 20th Century brick wall and drainage	N/A	C19/20 th
1012	Room	3.90 x 3.20	N/A	Possible 19th Century stone annex with L19th Century stone bases	N/A	C19/20 th
1013	Room	3.70 x 3.20	N/A	Possible 19th Century annex, stone floor & (1018)	N/A	C19/20 th
1014	Structure	6.50	N/A	20th Century brick drainage	N/A	20th Century
1015	Structure	3.60 (diam.)	N/A	20th Century brick cistern/tank	N/A	20th Century
1016	Structure	2.20 x 1.65	1.05	4-6x brick cisterns, contained blue dye & silt	N/A	20th Century
1017	Room	10.40 x 5.90	N/A	19th Century stone walls with 20th Century drainage features	N/A	C19/20 th

1018	Deposit	3.70 x 3.20	N/A	Shale levelling deposit, predominantly in (1013)	N/A	19th Century
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