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MANCHESTER

Post-excavation Assessment Report

Molineaux Webb & Co
Flint Glassworks,
New Islington,
Ancoats,
Manchester

Client:

Urban Splast Ltd

Planning Ref:

111587/FO/2016/N1

Technical Report:

Ian Miller and David
Dungworth

Report No:

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Location: Land between New Islington Marina, Coppersmith Road and Winder Drive in the Ancoats area of Manchester

NGR: Centred at NGR: 385325 398515

Project: Molineaux Webb & Co Flint Glassworks New Islington, Ancoats, Manchester: Archaeological Excavation

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Summary

Urban Splash has obtained a planning consent for the redevelopment of land at New Islington, in the Ancoats area of Manchester (centred on NGR 385325 398515). The development proposals allow for the erection of 20 three-storey dwelling houses, a six-storey building to create 44 self-contained residential apartments, and the erection of a six-storey apartment building to create a further 40 self-contained apartments on the first to fifth floors with non-residential uses at the ground floor (Planning Ref: 111587/FO/2016/N1). Delivery of the development proposals will necessitate considerable earth-moving works with a potential to remove any below-ground remains of archaeological interest that survive *in-situ*.

The site is of considerable archaeological interest, as it incorporates the site of one of Manchester's largest and most important 19th-century glassworks, which was established in 1827 as Maginnis Molineaux & Co, and became known subsequently as the Molineaux Webb & Co Manchester Flint Glassworks. In addition, the scheme area covers a tract of early 19th-century workers' housing, a former canal dock, and a large 19th-century dye works, which are also features of some historic interest.

In the light of the archaeological interest in the site, Manchester City Council attached a condition (Condition 10) to planning consent that required a programme of intrusive archaeological investigation to be carried out in advance of development works. Following consultation with the Greater Manchester Archaeological Advisory Service, in their capacity as Archaeological Advisors to Manchester City Council, it was recommended that an initial programme of works should comprise the excavation of 14 evaluation trenches across the development area. These initial trenches were excavated by Salford Archaeology in two tranches between January 2017 and May 2020, and revealed extensive and well-preserved structural elements of the 19th-century glassworks, together with elements of early 19th-century workers' housing.

Based upon the results obtained from the evaluation trenching, the Greater Manchester Archaeological Advisory Service recommended that further archaeological investigation was merited and should comprise an open-area excavation across the footprint of the early core of the former glassworks, together with the rear yards and privies of a block of early 19th-century workers' houses. This was carried out by Salford Archaeology in May 2020, and revealed the foundations of the main processing area within the glassworks, including part of the glass-melting furnace and its associated flue, annealing oven, workshops and a probable warehouse / office block, together with a large assemblage of glass-working waste that has considerable potential to furnish significant information on the manufacture of glass vessels in the 19th century.

A post-excavation assessment of the dataset has been carried out following the completion of all elements of the fieldwork. This has concluded that the results obtained from the archaeological investigation are of at least regional importance, and the dataset has considerable potential to contribute to an enhanced understanding of the 19th-century glass-manufacturing processes in Manchester, and clearly merit a programme of further analysis leading to final publication in an appropriate format that places the site in its context of Manchester's 19th-century glass-manufacturing industry.

1. Introduction

1.1 Planning Background

Urban Splash has obtained planning consent for the redevelopment of land at New Islington, in the Ancoats area of Manchester (Figure 1). The development proposals allow for the erection of 20 three-storey dwelling houses, a six-storey building to create 44 self-contained residential apartments, and the erection of a six-storey apartment building to create a further 40 self-contained apartments on the first to fifth floors with non-residential uses at the ground floor, together with associated car parking, landscaping and boundary treatments (Planning Ref: 111587/FO/2016/N1). Delivery of the development proposals will necessitate considerable earth-moving works with a potential to remove any below-ground remains of archaeological interest that survive *in-situ*.

The site is of considerable archaeological interest as it incorporates the site of one of Manchester's largest and most important 19th-century glassworks, which was established in 1827 as Maginnis Molineaux & Co, and became known subsequently as the Molineaux Webb & Co Manchester Flint Glassworks. In addition, the application area covers a tract of early 19th-century workers' housing, a former canal dock, and a large 19th-century dye works, which are also features of some historic interest.

In the light of the archaeological interest in the site, Manchester City Council attached a condition (Condition 10) to planning consent that required a programme of intrusive archaeological investigation to be carried out in advance of development works. Condition 10 stated that:

'No development shall take place until the applicant or their agents or their successors in title has secured the implementation of a programme of archaeological works to be undertaken in accordance with a Written Scheme of Investigation (WSI), prepared by the appointed archaeological contractor. The WSI should be submitted to and approved in writing by the local planning authority. The development shall not be occupied until the site investigation has been completed in accordance with the approved WSI. The WSI shall cover the following:

- (a) A phased programme and methodology of site investigation and recording to include: -
 - targeted field evaluation trenching;
 - (depending upon the evaluation results) a strip map and record exercise;
 - targeted open area excavation.
- (b) A programme for post investigation assessment to include:
 - analysis of the site investigation records and finds;
 - production of a final report on the significance of the archaeological and historical interest represented.
- (c) Provision for publication and dissemination of the analysis and report on the site investigation.
- (d) Provision for archive deposition of the report, finds and records of the site investigation.
- (e) Nomination of a competent person or persons/organisation to undertake the works set out within the approved WSI.

Reason - To investigate the archaeological interest of the site and record and preserve any remains of archaeological interest, pursuant to saved policy DC20.1 of the Unitary Development Plan for the City of Manchester and guidance in the National Planning Policy Framework.'

In the first instance, ten evaluation trenches were excavated across the site by Salford Archaeology in January 2017. The trenches were placed across the footprint of former buildings of potential archaeological interest, including elements of the 19th-century glassworks, early 19th-century workers' housing, an infilled canal dock, and the large Canal Street Dye Works. The results obtained from the evaluation trenching demonstrated that whilst all buried structural elements of the former Canal Street Dye Works appeared to have been largely removed during 20th-century clearance and redevelopment of the site, significant archaeological remains of the glassworks and the workers' housing in the north-eastern part of the development area survived *in-situ*.

In the light of these results, and following consultation with the Greater Manchester Archaeological Advisory Service, it was recommended that further archaeological investigation of the site was merited in advance of development to ensure that a detailed record of significant buried remains was compiled prior to their ultimate loss. It was recommended that this was achieved via the excavation of a single large trench targeted on the footprint of the 19th-century glassworks, and the rear part of a block of workers' housing in the north-eastern part of the site (Figure 2).

Following completion of the fieldwork in May 2020, an assessment has been made of the project archive, with a view to defining the merits and scope of completing further analysis and publication, in accordance with guidelines provided by the National Planning Policy Framework. This assessment examined the results of the excavation, and has assessed the potential for further analysis of each category of data with regard to the project's research aims. The process has been designed to correspond to the objectives laid out in the guidance document *Management of Research Projects in the Historic Environment* (Historic England 2015).

1.2 Original Research Aims and Objectives

The aim of the excavation was to fully excavate and record any archaeological remains of the former glassworks that survived below ground, and to produce a post-excavation assessment of all recovered material and data. This was a process which fits with several of the initiatives for archaeological research of the industrial and modern periods stated in the current *Archaeological Research Framework for North West England* (Newman and McNeil 2007; McNeil and Newman 2007). These include, but are by no means limited to, the following:

- *Initiative 7.35*: Industry specific studies are needed for those industries that have received little archaeological attention (Newman and McNeil 2007, 154);
- *Initiative 7.41*: The retention of all later period artefacts and their routine analysis as part of all archaeological excavation projects (*op cit*, 156);
- *Initiative 7.42*: Examination, mapping and evaluation of the occurrence of vernacular materials and objects in 19th-century contexts (*op cit*, 156).

The principal aims of the project were:

- to produce a record of the form of the 19th-century glassworks and associated buildings;
- to retain material associated with glass-working and sample industrial deposits and residues for analysis;
- to determine any changes to processes and economic focus over time;
- to further understanding of the changing urban landscape of Manchester through the late 18th and 19th centuries;
- to compile an archival record of any archaeological remains within the development area;
- to produce a post-excavation assessment report of recovered data and materials to inform the requirements for final analysis, reporting and publication; and
- to make available the results of the work.

The principal objectives of the archaeological investigation were:

- to carry out full archaeological excavation of the open-area trench;
- to produce a written and illustrated post-excavation assessment report of the findings of the excavation;
- to provide sufficient information to enable an informed decision to be made about the requirements for final analysis, reporting and publication;
- to produce an ordered archive for the project; and
- to make available the results of the work.

1.3 Location

The site is situated within the Ancoats area of Manchester, on the north-east side of the city centre (Figure 1). It is bounded by New Islington Marina to the west, Coppersmith Road to the east, and Lockyard Lane to the north (centred on NGR 385325 398515).

Although Permo-Triassic red mudstones, siltstones and sandstones ('New Red Sandstone') constitute much of the geology of the Lancashire lowlands, the solid rock rarely emerges from beneath its thick covering of glacial and post-glacial deposits, which is dominated by clay soils (Countryside Commission 1998, 87). The overlying drift in the Manchester area incorporates Pleistocene boulder clays of glacial origin, and sands, gravels, and clays of fluvial/lacustrine origin (Hall *et al* 1995, 8).

Topographically, the Manchester Conurbation as a region lies within an undulating lowland basin, which is bounded by the Pennine uplands to the east and to the north. The region comprises the Mersey river valley, which is dominated by its heavily meandering river within a broad flood plain (Countryside Commission 1998, 125). The topography of the study area, however, reflects the shallow valley of Shooters Brook, a rivulet that flows westwards from Newton Heath, through Ancoats and into the river Medlock (Ashworth 1987, 22). Shooters Brook was culverted during the early 19th century, and the topography of the valley has since been masked considerably by urban expansion.



Plate 1: Recent aerial view across Ancoats, marking the development area (© Google Earth)

2. Historical Background

2.1 Introduction

The following section presents a summary historical background, and is intended to provide a context in which to consider the results obtained from the archaeological investigation.

2.2 Development of the English Glass Industry

Glass-making was introduced to Britain by the Romans in the 1st century AD. However, the character and scale of glass production during this period is poorly understood, and it is unclear whether glass was made from raw materials, or melted from imported pre-manufactured material (Crossley 1993, 29). During the Middle Ages the industry was concentrated in heavily forested areas as the glass-makers required a ready supply of wood to fuel their furnaces and bracken as a source of potash, and hence the traditional centre of glass-making was the Weald of Sussex and Surrey (Ashmore 1969, 123). Glass production during this period, often referred to as 'forest glass', was carried out on a fairly small scale, and the glass was of a poor quality, reflecting the simple furnace design of the time, and the impurities within the potash that was used (Dungworth 2003, 2). The quality of glass improved dramatically during the late 16th century as a result of the influence of immigrant French glass workers (Vose 1980, 106-10).

In 1615, James I banned wood as a fuel for glass furnaces, effectively killing the forest glass industry and forcing glass-makers to redesign their furnaces to operate on coal. This required a solution to several technical difficulties; coal burns with a shorter flame than wood and therefore requires the heat source to be closer to the glass melting pots, and also demands much larger volumes of air. These requirements led to the introduction of furnaces with grates and deeper flues (Crossley 1990, 232-35). Vose (1980, 146) suggests that the most important feature of the coal-fired furnace was the iron bars which formed the grate. Christopher Merrett, writing in the mid-17th century, described the early grates as 'great iron bars crossing smaller ones which hinder the passing of the coals, but give passage to the descent of the ashes' (Neri 1662).

The use of coal necessitated modifications to furnace superstructures to facilitate the efficient venting of sulphur produced from burning coal. It is clear, for instance, that the English glass cone furnace was developed in order to remove the smoke and soot and to create a stable atmosphere, in addition to increasing the size of glass furnaces. This structure typically comprised an open-ended cone around and over the furnace, which increased the draught through the grate whilst maintaining a steady working temperature around the furnace (Parkin 2000, 8). After its introduction in the late 17th century, the cone furnace became widely recognised as a classic symbol of the English glass-making industry.

The sudden and total change from the use of wood to coal fuel also resulted in a shift in the focus of the English glass industry from the traditional centres in the south of the country to the coalfields of the north (Ashmore 1969, 123). Hence, Tyneside, South Lancashire and South Yorkshire all developed as important glass-making centres during the 17th century, together with Bristol and the West Midlands.

Whilst it has been argued that Britain became a net exporter of glass and was in the forefront of European glass-making during the 17th century (Charleston 1984), the finest colourless glass was produced by Venetian workers and imported to Britain until the later part of the century. In 1676, however, George Ravenscroft succeeded in producing good quality colourless glass in England by introducing lead in addition to potash as a flux. The invention of colourless lead glass, which is also known as lead crystal or flint glass, had a profound impact on glass manufacture (Dungworth 2003, 5). Upon the expiry of Ravenscroft's patent in 1681, the production of lead glass was taken up by numerous glass-makers; in a list of 88 glasshouses compiled in 1696, 27 were producing 'flint glass' (Vose 1980, 198-99).

It is widely thought that covered glass-making crucibles were introduced shortly after Ravenscroft's development of lead glass, although there is no historical or archaeological evidence to support this conjecture (*op cit*, 147). There are, however, accounts of open crucibles in use during the mid-17th century. Merrett, for instance, describes open crucibles that were 20 inches wide at the rim and narrowed down towards the base (Neri 1662).

A major advance in the industry was the introduction of plate glass, whereby glass was cast in thick plates and then flattened by heavy rollers. The glass was finished by grinding and polishing. The first company for the manufacture of English plate glass was established in 1773, and commenced its operations at Ravenhead, near St Helens (Redding 1842, 89). The workmen for this enterprise were brought over from France, but by the mid-19th century 'the great majority of persons employed are Englishmen' (*op cit*, 90). Redding also claimed that English glass of the 19th century was superior to that of either the French or Venetian artisans as a direct result of 'the application of chemical and mechanical science to the improvement of several processes', but noted that 'great jealousy is manifested by the proprietors in keeping secret the details of their processes' (*ibid*).

A significant advance was the introduction of the press-moulding technique of glass production, which was developed in America during the late 1820s. It was taken up in England in the 1830s, initially in the West Midlands, and eventually became a large industry in its own right. The first press-moulded glass known to have been produced in Manchester has been dated to 1848, although it was not produced widely in the area until the 1860s. This broadly coincided with the introduction of tank furnaces and regenerative gas furnaces to the Pilkington glassworks in St Helens. This German technology, developed by the Siemens brothers, played an important role in the growth of the glass industry there (Krupa and Heawood 2002), and these new methods began to replace the old glass cones and pots. The Manchester industry, however, does not appear to have taken advantage of this new technology, and continued to manufacture glass using the traditional crucibles, although the results of an archaeological investigation at the Percival, Vickers & Co Glassworks in Ancoats implies that considerable modifications were made to the traditional cones which housed the furnaces (Miller 2007).

Few details are available regarding the improvements made to glass furnaces during the 19th century, reflecting the situation that 'glass-making was a closely guarded secret and little was recorded in the period 1826 to 1896' (Parkin 2000, 2). However, it is generally accepted that whilst the round reverberatory furnaces of the early 19th century contained two or four crucibles, the period 1835-50 saw enlargements to accommodate eight or ten crucibles, each with a capacity of up to five hundredweight of molten glass (*op cit*, 14).

2.3 Development of the Glass Industry in South Lancashire

The earliest evidence for glass-making in the Manchester area has been obtained from entries in the parish registers of Stockport and Ashton-under-Lyne for the years 1605-53 (Vose 1980, 146). The first coal-fired glasshouse in the region to have been excavated archaeologically was that at Haughton Green, near Denton, which was in production between 1636 and 1643 (Vose 1994). This early glassworks was established on the west bank of the river Tame, and produced green, blue and black domestic glass, including decorated vessels, bottles and window glass. References to other 17th-century glassworks appear in a list of glasshouses in England and Wales compiled at the end of the century (Houghton 1696), which refers to two works in Lancashire, one near Warrington, erected in c. 1650 (Harris 1968), and one at Sutton that was established c. 1698. An expansion of the region's glass industry is attested by the erection of more glassworks during the 18th century; a works opened at Prescott in 1719 (Buckley 1929), two works were established in Liverpool (Ashmore 1982, 14), a bottle works was put into production at Thatto Heath, near St Helens, and the products of a Salford glasshouse were advertised in local papers in 1759-60, and included bottles, vials, bell glasses, retorts, lamp glasses and garden glasses (Ashmore 1969, 124). In 1785, Imison and King opened a works in Newton Heath for the manufacture of 'all sorts of glass wares', and references to the Manchester firm of Atherton and Whalley, cut and engraved glass manufacturers, date back to 1795 (Dodsworth 1980, 64). However, of these, the Haughton Green site was the only glassworks in the region to have been included in the handlist of assessed sites in the *MPP Step 3 Report* (Crossley 1996, 15).

The first well-documented large-scale glasshouse in Lancashire was established at Ravenhead, St Helens, in 1773 (Redding 1842, 89). St Helens had become established as the main centre of plate-glass manufacture in the country by the 1860s, reflecting the local availability of raw materials such as coal, alkalis from the chemical works, and good supplies of suitable sand (Krupa and Heawood 2002). Manchester, however, also emerged as a major glass-manufacturing centre; the industry was well enough established by 1821 for glassblowers to take part in the processions that marked the coronation of George IV (Dodsworth 1980, 64), and by 1872 Manchester was the largest employer of glass-makers in England (Yates 1987, 29). Nevertheless, the industry there has not attracted the research and status it perhaps deserves. The Manchester industry, moreover, appears to have developed in some isolation from the other main glass-making centres; a contemporary observer noted that 'Manchester glass has a reputation of its own. There are distinct features about it that do not pertain to the glass of other districts' (*Pottery Gazette and Glass Trade Review* 1898, 1120). The bulk of Manchester's 19th-century glassworks, and certainly the largest concerns, were contained within the Oldham Road and Ancoats area, although another concentration of works was also established in Hulme.

Baines (1825, 420) lists seven glassworks within Manchester and Salford in his directory, although some of those appeared to be glass merchants or engravers rather than actual producers. The earliest glassworks in Ancoats, established in 1827, was that of Maginnis Molineaux and Co, which became the Molineaux Webb Ltd Co Manchester Flint Glassworks. In 1833, Jackson, Woolfall and Percival established the Manchester Glass Bottle Works at 6, Prussia Street, Ancoats. One of the partners established his own manufactory in 1844 on nearby Jersey Street, after spending several years as the manager of the Molineaux Webb works (Children's Employment Commission 1843).

Other significant glass-making firms that were established in Ancoats during this period included Burtles Tate Ltd at the Poland Street works, Thomas Kidd and Co at the Holt Town Glassworks, Ker Webb and Co at the Prussia Street Glassworks, the Ancoats Machine Glassworks, and the Phoenix Glassworks on Collyhurst Street.

An important factor in the prosperity of the Manchester glass industry during the third quarter of the 19th century was the increased demand for press-moulded wares, although the pioneer firms of the area, such as Molineaux Webb and Percival Vickers, began their production in the manufacture of traditional fine cut and engraved tablewares. These products were recognised as being of a high quality; 'it may be affirmed without prejudice to other manufacturers in localities where such business is now carried on, that the Manchester glass is in no way inferior to the best in the country' (*The Art Journal* 1851, 290). The first Manchester firm to produce pressed glass is thought to have been Molineaux Webb, who were manufacturing such wares as early as 1848, although they did not begin to register designs regularly until the 1860s (Dodsworth 1980, 67).

Many of the Manchester works closed during the 1890s, largely as a result of the great depression in trade (Yates 1987, 37), and very few survived into the 20th century. This situation is reflected in a detailed survey of Manchester's industries undertaken during the 1920s, which makes no reference to glass manufacture in the city (Clay and Brady 1929).

2.4 Development of Ancoats

At the beginning of the 13th century, Ancoats was known as *Elnecot*, derived from the Old English *ana cots*, which means 'lonely cottage' (Cooper 2002, 13). Ancoats retained a semi-rural aspect until the late 18th century, but by 1800 the area had been transformed into an effective industrial suburb. This transformation began in the 1770s, when land owned by the Leigh family was sold to Thomas Bound, a builder, who then sold it on to others for development. Building speculation then drove further expansion, with plots of land within a grid-iron pattern of streets being sold for development. The principal driving force of development was the national demand for textiles, particularly cotton, and the introduction of steam-powered spinning mills (Williams with Farnie 1992, 3).

The proposed line of the Rochdale Canal ran between Shooters Brook and the new focus of development, offering the potential of cheap and reliable transport for goods and materials. The completion of this canal in 1804 coincided broadly with the introduction of efficient steam engines capable of producing rotative power. A small number of enterprising firms seized the opportunity presented by this combination of factors, resulting in the creation of a new breed of mill building in Ancoats. The net result was the creation of 'the world's first industrial suburb', an edge-of-town industrial estate with associated housing and community facilities (Miller and Wild 2007).

Apart from textile mills, numerous other industries became established in the area, including copperas works, iron foundries, steel works, sizing works, wire works, hat manufactories, and machine works, as shown on contemporary maps of the area. Ancoats also emerged as a major glass-making district, although the historical significance of these industries in general has tended to be eclipsed by the dominance of the textile trade, and glass manufacture by the pre-eminence of the St Helens' industry.

2.5 Molineaux Webb & Co Glassworks

Glass-making was established in Manchester by the late 18th century, and by c. 1830 Ancoats had evolved as an important centre for this industry, in both regional and national terms (Miller and Wild 2007). One of the earliest glassworks to be established in the area was that of Maginnis Molineaux and Co, which was founded in 1827 (Dodsworth 1980, 64). Between 1832 and 1845, the works traded as Molineaux Webb Ellis & Co, flint glass and vial manufacturers, and then as the Molineaux Webb & Co Manchester Flint Glassworks. It is not certain what sort of glass was manufactured in the first few decades. Molineaux and Webb subsequently became famous for the manufacture of press-moulded vessels, with numerous patterns registered from 1864 until 1928, when the company was wound up.

Press-moulding appears to have been developed in the 1820s in America, where 12 patents were registered between 1825 and 1830 (Latimore 1979, 17). The technology was introduced to England in the early 1830s, but adoption was slow. The initial lack of success might be found in the Excise taxation on glass production, which was based on weight of glass. Early press-moulded glass tended to be quite thick and heavy: this would increase the tax that had to be paid per item. In general terms, the Excise taxation and especially the associated regulations tended to stifle any technological innovation (Dungworth 2019). In 1845, the Excise taxation on glass manufacture was repealed. This was a direct encouragement to production but also allowed glass manufacturers greater freedom in the glass recipes used (Holt *et al* 2014; Willmott *et al* 2012). Most early press-moulded glass was made in colourless glass (like most of the blown 'flint' glass of the period), but the 19th century saw the introduction of a wide range of colour effects (Holt *et al* 2014; Latimore 1979; Willmott *et al* 2012). The firm had developed a reputation for producing high-quality products by the middle of the 19th century. At the Great Exhibition in 1851, for instance, Molineaux Webb & Co was awarded a prize medal, and the firm was described as 'taking the lead in this department of industrial art' (*Freeman's Journal* 25 November 1851).

Molineaux Webb flourished in the later 19th century, in large part on the back of press-moulded glass; the works was the first Manchester firm known to have produced pressed glass, which commenced in c. 1848, although no pressed glass designs appear in the pattern book. Latimore reports that Molineaux and Webb registered (multiple) designs on 45 occasions between 1864 and 1883 and that these were mostly of 'utilitarian articles such as cream jugs, sugar basins, butter dishes, celery glasses, plates, etc' (Latimore 1979, 97). One of their earliest and most successful designs was a 'Greek key' (an extended meander) which was used to decorate plates.

The works manufactured a range of decorative pieces of cut and engraved glass. Little is known about these wares, other than the forms shown in a factory pattern book of c. 1870. This contains just over 2000 designs, including some 500 designs of decanters, together with sugar basins and creams, caraffes and tumblers, water jugs and goblets.

Like many other glass manufacturers, Molineaux Webb suffered during the late 19th-century recessions and the First World War, as the demand for tableware was more efficiently met by overseas producers.

The original core of the works was situated on the south side of Kirkby Street. It is depicted on Banks & Co's map of 1831 as an irregular-shaped complex on the north-western bank of the Islington Branch canal. The detail shown on the 60": 1 mile Ordnance Survey Town Plan indicates the site to have been remodelled by 1851, which seemingly included the erection of a substantial circular feature in the centre of the site, presumably representing a glass-melting furnace (Plate 2). A long building fronting onto Kirby Street probably formed warehouse and office accommodation, with another building and yard at the south-eastern end of the works. The function of the latter building is uncertain, although it is shown to have contained a central covered passage, and possibly a chimney, suggesting it was a processing area.



Plate 2: Development area boundary superimposed on the Ordnance Survey Town Plan of 1851

The glassworks was expanded considerably during the second half of the 19th century. The remodelled works is depicted on the Ordnance Survey Town Plan of 1891 and the 25": 1 mile edition of 1893, which shows three glass-melting furnaces to have been erected on the former brick field to the south-east of the original furnace (Plate 3). This expansion seemingly necessitated the demolition of the building containing the central covered passage, depicted on the Ordnance Survey map of 1851. Associated with these new furnaces were several ancillary buildings, which are likely to have included an annealing oven, cutting and engraving workshops, and storerooms.

The glassworks retained the same layout until its closure in the late 1920s. The buildings were left vacated and fell into dereliction. However, a series of photographs of the works was taken shortly before the ultimate demolition of the buildings (Plates 4-7).



Plate 3: Development area boundary superimposed on the Ordnance Survey map of 1893



Plate 4: View of the warehouse fronting onto Kirkby Street, with the chimneys of two glass-melting furnaces visible to the rear

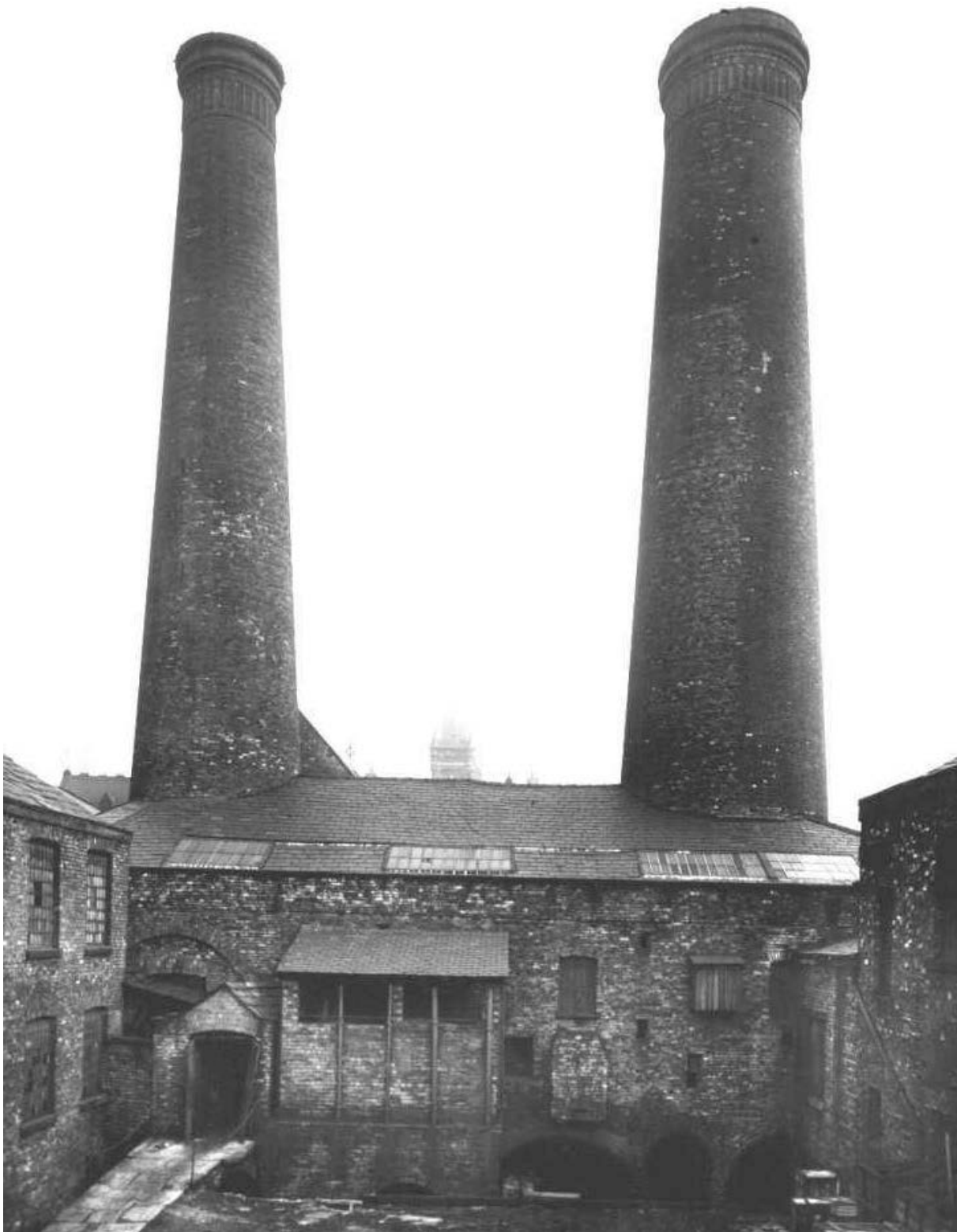


Plate 5: View of the two glass-melting furnaces prior to demolition



Plate 6: View of a glass-melting furnace during demolition



Plate 7: View of the glassworks shortly before demolition

2.6 *Previous Archaeological Work*

In October 2010, Oxford Archaeology North carried out further investigation of the site, which comprised the excavation of three trenches parallel and adjacent to Coppersmith Road (Figure 3). The results obtained from the first evaluation trench, placed in the north-western part of the site, indicated that the building that had occupied this part of the site had probably been used as a warehouse or for office accommodation, and retained little, or no, evidence for the glass-manufacturing processes carried out at the works; part of this building was also exposed to the south-east, within Trench 2. The buried remains of this building comprised an interior flagstone floor, which was exposed at a depth of 1.60m below the modern ground surface, and internal brick walls. These remains are considered to be of limited archaeological interest.

The structural remains exposed across the south-eastern part of Trench 2 provided evidence for at least two phases of the development of the glassworks. They also included the fragmentary remains of a flue seemingly associated with the late 19th-century glass-melting furnace, which was situated immediately to the south-west of the excavated trench, and unavailable for investigation (OA North 2010).

3. Methodology

3.1 Archaeological Evaluation

The principal aim of the archaeological evaluation was to confirm the presence of below-ground archaeological remains within the study area and, if present, establish their extent, condition and significance.

All trenches were opened with a mechanical excavator equipped with a toothless grading bucket, under the close and constant archaeological supervision. Following initial exposure of archaeological horizons, investigation was carried out by hand, and included cleaning, examination, sampling and recording in the appropriate manner. Archaeological hand-dug investigation and recording proceeded to the top of significant archaeological levels, and were sufficient to allow the nature, extent, survival and significance of archaeological remains to be identified.

3.2 Archaeological Excavation

The main aim of the excavation was to compile a detailed archival record all the archaeological remains with the area targeted for investigation. The trench was opened with a mechanical excavator equipped with a toothless grading bucket, under the close and constant archaeological supervision. Following initial exposure of structural remains, investigation was carried out by hand, and included cleaning, examination, sampling and recording in the appropriate manner.

A 'site location plan' indicating site north was prepared, together with a plan showing the location of the archaeological remains uncovered in relation to the investigation area and the Ordnance Survey National Grid.

Standard archaeological recording methods were employed, comprising a written record (both description and interpretation with annotated sketches where appropriate), scaled drawings both in plan and in section, photographic record, and retrieval and annotation of archaeological finds and samples.

Written records were produced using *pro-forma* context record sheets. Plans of the structural remains were drawn at an appropriate scale, with all plans including the Ordnance Datum (OD) height. A full photographic record was compiled using digital single lens reflex (SLR). This recorded both the detail and the general context of the principal features and the site as a whole. Photographs were also taken of all areas, including access routes, to provide a record of conditions prior to and on completion of the fieldwork. Registers were kept of all photographs, levels, plans, sections, finds and samples taken in the field.

All fieldwork conformed to best professional practice and was carried out in strict accordance with the guidelines provided by the Chartered Institute for Archaeologists (CIfA), including *Standard and Guidance for an Archaeological Evaluation* (CIfA 2014a), *Standards and Guidance for Archaeological Excavation* (CIfA 2014b), and *Standard and Guidance for the Creation, Compilation, Transfer and Deposition of Archaeological Archives* (CIfA 2014c).

4. Archaeological Evaluation

4.1 Introduction

The scheme area was investigated initially via the excavation of ten evaluation trenches, which was carried out by Salford Archaeology in January 2017 (Figure 3). A second tranche of evaluation trenches was excavated in May 2020.

4.2 Trenches 1-10

The site had been partially raised with a bund of made ground that covered the whole of the south-eastern part of the site and the south-west side of the north-eastern part of the site. The area in the north-western part of the site, that was investigated by trenches 1-3 and the north-west end of Trench 4, were not covered with this modern bund. The south-western half of the site was determined to have no intact remains. This was tested by trenches 6, 7, 8, 9 and 10. With the exception of Trench 10, which was halted at a shallow depth due to the presence of a modern plastic service or drainage duct, the trenches in this area were between 3.5m and 4m deep and contained no surviving remains. Modern concrete was encountered in Trench 9 at a depth of 4m. Natural clay was observed within trenches 6 and 7 at depths of 4.6m and 4.7m. Natural ground was not reached in Trench 8, which was abandoned at a depth of 4.6m due to collapse. All of these trenches comprised uncompacted made ground with bands of clay, brick rubble, ash and refuse.

The following section provides a brief summary of the results obtained from trenches 1-5 in the north-eastern half of the site, although it should be noted that some of the dimensions of the contexts given may vary to those in the excavation narrative, as further detail of individual structures was revealed. A description of trenches 6-10 is omitted as no archaeological remains were encountered.

4.2.1 Trench 1

In Trench 1, the tops of hand-made brick cellar walls were observed running along its length at a depth of 1.5m to 1.6m. These location of these walls corresponded closely with cellared workers' housing shown on the 1851 and 1893 OS mapping.

4.2.2 Trench 2

Trench 2 contained significant remains relating to the former glassworks. The remains of several walls and a brick floor were revealed in the north-eastern part of the trench at a depth of 2m. In the south-western part of the trench were the remains of part of a circular glass-melting furnace at a depth of 2.3m. All these remains were constructed of hand-made bricks with lime-based mortar, consistent with a construction date in the first half of the 19th century.

4.2.3 Trench 3

Trench 3 contained the remains of hand-made brick walls relating to ancillary buildings associated with the glassworks at a depth of 2.6m. At its south-west end was a brick wall with a line of what appeared to be stone kerbs. These remains were also thought to be associated with the glassworks and were encountered at a depth of 2.8m below the modern ground surface.

4.2.4 Trench 4

Trench 4 crossed into the area covered by the modern bund. The south-eastern half of the trench had to be abandoned due to collapse after being excavated to a depth of 4m through very loose material. Towards its north-western end a small section of intact wall of hand-made bricks was observed, with natural clay below it at a depth of 3m. The wall was considered to be associated with the glassworks.

4.2.5 Trench 5

Trench 5, excavated across a former canal dock, was excavated to a depth of 3.5m at which point stone flags were observed across the length of the trench. These flags are likely to have been laid across the dock after it went out of use and was filled in, and appear to be part of a partially covered yard associated with the glassworks on the 1893 mapping.

4.2.6 Conclusion

The findings from the initial tranche of evaluation trenches suggested that the south-western half of the area was devoid of any significant remains and would not require further investigation. The north-eastern half of the area contained intact remains of archaeological significance. These survived at depths of between 1.5m and 3.5m, with the remains of workers' housings being at 1.5m and the glassworks structures between 2m and 3m. The canal dock likely survived below the flagged yard at a depth in excess of 3.5m below the modern ground surface.

4.3 Trenches 11-14

The aim of the second tranche of evaluation trenches, excavated in May 2020, was to determine the presence or absence of any archaeological remains relating to the later part of the Molineaux Webb Glassworks. This was achieved through the excavation of four evaluation trenches across the south-eastern part of the site over the location of the buildings constructed as part of the later 19th-century expansion of the complex.

Recent groundworks in this part of the site had resulted in a raised surface level across the whole investigation area. As a result, overburden and levelling deposits of demolition debris, clay and stone chippings were identified in each trench to depths of between 2.50m and 3.00m, with archaeological horizons lying below. To mitigate against these increased excavation depths, the trenches were excavated as a series of smaller trial pits, each of which was backfilled before the next pit was opened. This strategy enabled archaeological deposits to be identified whilst maintaining safe working practices.

4.3.1 Trench 11

This trench lay on the northern side of the site, over the location of one of the ancillary buildings associated with the later 19th-century glass furnaces. The trench was excavated as three trial pits, each measuring c. 2.00m x 2.00m, to depths of between 3.50m - 4.10m. All three pits revealed the overburden layer to be 2.50m thick, lying directly over a black, partially organic silt with occasional inclusions of fragmented brick lying up to 1.00m thick on top of a fabric membrane. This layer was reduced to 0.10m thick in the easternmost trench by the presence of a modern drain surrounded by stone-packing material.

In the central pit, layers of greyish-brown and blackish-grey clay were identified below the modern overburden, which contained no finds, features or inclusions and lay over the natural greyish-brown clay. The western pit was almost identical in composition up to a depth of 2.80m where an east/west-aligned wall (006) of hand-made bricks was revealed within a black-brown demolition deposit. The wall was too deeply buried to record fully, although it was seen to be composed of seven courses of brick laid with a white lime mortar (Plate 8).



Plate 8: Western pit of Trench 11 showing wall 006 at the base of the trench. Looking south-east.

4.3.2 Trench 12

Trench 12 was located on the south-eastern side of the site, across the footprint of the furnaces added to the glassworks in the later 19th century. Again, the trench was excavated in sections and was divided into two trial pits and a short evaluation trench to the south-west. The pits measured c. 2.00m x 3.00m, and the small trench measured 2.00m x 6.00m.

A 2.60m-thick layer of overburden (002) was revealed beneath the modern ground surface. This consisted of demolition debris and lenses of reddish-grey clay. In the northernmost trial pit, this deposit overlay several further modern levelling layers, comprising yellowish-grey stone chippings (007), demolition debris set in a dark greyish-brown silt (008), and red construction sand (009). These deposits overlay the natural yellowish-grey clay.

The central trial pit was similar in its composition of levelling layers. Below this, at a depth of 3.00m, lay an area of hand-made bricks (011), which was interpreted as a possible degraded brick floor. This feature lay against a compacted grey silt.

The trial pit at the southernmost end of the trench revealed demolition material to a depth of 2.60m, overlying the fabric membrane. This covered two courses of grey engineering brick, (013), aligned north-east/south-west along the centre of the trench. A surface of modern concrete paving slabs (014) was revealed lying against 013 to the south-east, which continued beyond the trench to the east and overlay a layer (015) of bright orange sand (Plate 9).



Plate 9: Trench 12, south-western end, showing engineering brick 013 in the centre with paving slabs 014 and sand 015 to the south-east

4.3.3 Trench 13

Trench 13 was originally intended to investigate ancillary buildings associated with the later 19th-century expansion of the glassworks. Due to the presence of a service pipe running north-east/south-west across the site, however, alterations were made to both the length and location of Trench 3. The new location lay c. 3.00m to the north-east, over the footprint of one of the later 19th-century furnaces. The trench measured c. 2.00m x 3.20m.

The modern overburden (002) had a depth of 2.30m, and overlay a 0.10m thick layer of yellowish-grey stone chippings that, in turn, sealed a 0.55m thick deposit of modern demolition debris. The only feature of interest was a structure (019) composed of hand-made bricks that was six courses wide, and aligned north-east/south-west and continued beyond the trench edges in both directions. Structure 019 lay directly on top of the natural light grey clay.

4.3.4 Trench 14

Trench 14 lay in the south-western corner of the site, and was placed across the footprint of buildings to the west of the 19th-century furnaces. Again, the depth of modern overburden 002 required the trench to be excavated in three sections.

The western and central trial pits of Trench 4 again revealed overburden 002 lying to a depth of 2.00m. In the western pit, this deposit overlay a blackish-brown silty demolition layer 020 which was c. 0.50m thick. A compacted floor surface (021) was identified below 002, 2.00m from the western end of the pit, which was composed of a layer of blackened cement over two layers of hand-made bricks. The surface appeared to continue to the north and south beyond the trench edges. Below this surface lay a waterlogged deposit of mixed clay and demolition debris, 022, which could not be fully investigated.

Underlying overburden 002 at the south-eastern end of the central trial pit was a flagged floor surface (023), which measured 1.20m x 2.00m and continued southwards beyond the edge of the trench. The surface was composed of stone flags each measuring approximately 0.60m x 0.80m and lay against a deposit of demolition debris, 024, to the north-east. This deposit also lay against a feature (025) of hand-made bricks that was situated 1.70m to the north-east of surface 023. Feature 025 was constructed from three courses of hand-made brick, laid five bricks wide and bonded with a greyish lime mortar. This was interpreted to be related to one of the external walls of the buildings seen on the 1893 OS mapping.

The northernmost trial pit of Trench 14 also contained 002 to a depth of 2.30m, and contained a higher proportion of clay than in the rest of the trench. Again, this deposit was laid on a fabric membrane but below this lay a structure composed of paving slabs and modern engineering bricks (026), which comprised three rows of bricks running north-east/south-west with flagstones laid on either side (Plate 10). The bricks and northern flagstones were sealed 2.00m from the southern end of the trial pit by a layer of compacted black silt (027). The southern flagstones continued for a further 2.90m northwards beyond the trench edge. Due to their similarity and proximity, it was thought that features 026, 013 and 014 were related to the same modern structure.



Plate 10: Trench 14, north-eastern trial pit, showing surface 026. Looking north-east.

4.3.5 Conclusion

The results obtained from the second tranche of evaluation trenches indicated that the foundations of the glassworks in the south-eastern part of the site had been largely removed during redevelopment works in the late 20th century, or were buried too deeply to enable any further archaeological investigation.

5. Excavation Results

5.1 Introduction

The open-area excavation at New Islington produced significant results pertaining to the former Molineaux Webb Glassworks, which produced fine tableware for more than a century. Structural remains of the glasshouse walls, central flue, furnace and annealing house were uncovered, together with some walls of the warehouse / office block, and a substantial assemblage of glass fragments. The rear yards of several early 19th-century workers' houses were also revealed to the north-west of the glassworks.

Each of the structures, features and deposits encountered during the excavation has been ascribed to one of four general phases of activity. This phasing is based on the site matrix and initial assessment of the artefactual evidence and is both broad and provisional, as is appropriate for a post-excitation assessment of the dataset. Dating to these broad phases can be linked to the sequence of historical mapping (Figures 4-7):

Phase 1 – 1827 – Mid-19th Century

Phase 2 – Mid-19th Century – Late 19th Century

Phase 3 – Late 19th Century – 1930s

Phase 4 – Post-1930s



Plate 11: General view across the excavated remains of the Molineaux Webb Glassworks, looking south. Scale 1m

5.2 Phase 1 (1827 - Mid-19th Century)

The glassworks was established in 1827, first appearing on Bancks & Co's map of 1831, where it is shown to have consisted of a large building on a rectangular-shaped plot with various projecting wings and a series of open courtyards (Figure 4).

A short section of a north-east/south-west-aligned wall (050) exposed in the northern part of the site corresponded to the north-western wall of the glasshouse, as shown on Bancks & Co's map (Figure 4) and the Town Plan of 1851 (Figure 5). Wall 050 comprised hand-made bricks bonded with lime-based mortar, was 0.48m wide (four brick-courses) and survived to a length of 6.40m; it was truncated by modern services to the south-west. The foundations of the wall cut into the natural clay geology. It was abutted on its south-eastern side by a wall (051) of refractory bricks (Phase 3). Cartographic evidence suggests this wall remained extant until the closure of the works, although from 1951 it appeared to demarcate the north-eastern perimeter of an area that had become an open courtyard following the demolition of part of the original main building. Fragmentary remains of brick walls 077 and 078 represented the continuation of wall 050 and an internal wall respectively (Plate 12).



Plate 12: Wall 077, representing a continuation of wall 050 to the right, and possible internal wall 078 to the left, looking south-west. Scale 1m

Wall 048 / 049, exposed along the north-eastern edge of the excavated area, possibly represented the south-west wall of a small rectangular building shown on Bancks & Co's map of 1831 (Figure 3). A small section of wall 048 at the north-west end of wall 049 probably demarcated the north-western wall of the rectangular building (Plate 13). By 1851 (Phase 2), this building had been incorporated into a much larger and longer building fronting Kirby Street, probably the warehouse and administration block.

Wall 049 comprised hand-made bricks bonded with lime-based mortar, consistent with an early 19th-century construction date. It survived to length of 3.50m and was 0.75m wide (equating to six brick courses), with evidence of three rectangular or square voids filled with cinder, suggestive of flues. The south-easterly void had stone slabs incorporated in the side and base, as seen in the cross-section of the wall (Plate 14). Situated to the south were two areas of flagstone floor (064 and 066), separated by a single-skin brick-built partition (065).



Plate 13: Phase I walls 048 in the foreground and wall 049 in the centre, looking south-east. Scale 1m



Plate 14: Section of wall 049, looking north-west. Scale 1m

Despite the fact that the glass-melting furnace and associated central flue within the glasshouse are not shown clearly on Banks & Co's map of 1831, seems most probable that these were part of the original build. The south-western quadrant of the furnace wall (006) was identified during the excavation (Plate 15), whilst the interior of the south-eastern side of the furnace showed evidence of remodelling. Element of the central flue survived as two parallel walls (003 and 004), although truncated in various places by modern services (Figure 8). The floor (002) of the flue was found to have a row of stone flags through the centre, flanked on either side by rows of brickwork (Plate 16).

The central flue around the area of the furnace was filled with demolition rubble (001), together with substantial amounts of varying types of glass fragments. Some of these fragments appeared to represent vessels that had 'failed' during the annealing process, having lost their form, and are likely to have been selected for recycling as cullet. This suggests that the remodelling of the furnace may have been associated with its conversion for melting cullet.

A series of brick-built structures (008, 009 and 010) revealed at the south-western end of the central flue seemingly represented the position at which the central flue exited the glasshouse, as shown on the Ordnance Survey Town Plan of 1851 (Figure 5). Some of the component bricks were hand-made and bonded with lime-based mortar, whilst later additions (011, 012, 013 and 014) were bonded with black ash-based mortar (Plates 17 and 18); these probably derived from an expansion of the glasshouse to create the enlarged building shown on the Ordnance Survey Town Plan of 1891 (Figure 6).



Plate 15: Furnace wall 006 and flue wall 004, looking south-west. Scale 2m



Plate 16: Furnace wall 006 (right) and the central flue, looking south-west. Scale 2m



Plate 17: The end of the central flue, showing brick structure 009-014, looking south-west. Scale 2m



Plate 18: The end of the central flue, showing brick structure 009-014, looking south-west. Scale 2m

5.3 Phase 2 (Mid-19th Century – Late 19th Century)

By 1851, a large rectangular building fronting Kirby Street had replaced the earlier, smaller, rectangular building, which was to become the warehouse / office block. A free-standing, exterior wall (043) had been added between the rear of the warehouse / office block and the glasshouse, creating a narrow alley between the buildings. Wall 074, exposed a short distance to the north-west, was on the same alignment and probably formed a continuation of wall 043 (Figure 8). The passage appeared to have had a stone-flagged floor (079) with a stone-built drain (069) along the south-western side.

Brick floor 038, two associated walls (037 and 060) and stone-flagged floor 059 appeared to represent internal floors and/or rooms within the glasshouse / annealing house seen on the Ordnance Survey Town Plan of 1851 (Figure 5). Wall 037 to the north-east of floor 038 was probably of a contemporary build, indicated by the lime-based mortar, whereas wall 060 to the south-east could be identified as a later modification indicated by the use of black-ash mortar (Plate 19). Stone-flagged floor 059 was probably laid at the same time that wall 060 was constructed, relating to internal changes within the building (Plates 20 and 21).



Plate 19: Brick floor 038 and associated walls 037 and 060, looking north-east. Scale 1m



Plate 20: Stone-flagged floor 059, brick floor 038 and associated walls 037 and 060, looking north-west. Scale 1m



Plate 21: Stone-flagged floor 059, between walls 060 and 004, looking north-east. Scale 1m

5.4 Phase 3 (Late 19th Century – 1930s)

By 1891, the glasshouse had been subject to significant extensions on all sides except to the north (Figure 6). The main building had been extended to the south-east and south-west with the remains of the former flue exit (009-014) now completely encompassed within the footprint of the building. The south-western end of the central flue, beyond the furnace, is no longer shown on the Ordnance Survey Town Plan of 1891 map, but the excavation results proved it remained extant, regardless of a possible change of function to the original furnace.

An open-sided, brick structure had been constructed against the eastern edge of the glasshouse connecting it to the passage wall 043 / 049, shown on historical mapping as a covered entrance (Figure 6). Along the north-east side of the glasshouse, part of the structure that had once been the entrance to the central flue, had been demolished and replaced with brick-floored structure 052 that was bounded to the north by a substantial wall (053), composed of hand-made bricks (Plate 22). The results overlaid onto the 1891 Town Plan suggests part of the remains belonged within the new enclosure, and part lay outside in an open courtyard, divided by poorly constructed wall 057, which had a large stone block at base of the north-western end. Wall 057 was bonded with black ash mortar, consistent with a construction date in the second half of the 19th century, and had been built on top of brick floor 052. A further wall (054) does not correspond to any structures shown on the sequence of historical maps, suggesting it could have been an internal partition.

These alterations shortened the length of the north-eastern end of the central flue, with the entrance now accessed from the new structure.



Plate 22: Remains of brick floor 052 and associated walls 053-055, looking east. Scale 1m

The Annealing House

Another significant change during Phase 3 was the addition of an annealing house at the northern edge of the glass-working site. Part of the building to the south-west, represented by structures 037, 038 and 060, had been demolished, creating an open space between the main building and the annealing house.

An insulating wall, three brick-courses wide, using refractory brick bonded with black-ash mortar (051), was constructed against the south-east side of the original, north-west, exterior wall 050 (Plate 23). The rest of the building comprised an arrangement of sunken, brick channels mostly constructed using hand-made brick bonded with lime-based mortar, including walls 062 and 063, with later additions and insertions bonded with black-ash mortar, such as wall 070, which comprised hand-made bricks bonded with black-ash mortar; this wall appeared to form the north-eastern side of the annealing area

Two small chimney-like features were also identified, one of which was served by a brick-vaulted flue (068) that lay along the north-eastern side of the annealing house (Plate 24).

The remains of a second chimney was identified on the surface of the annealing house remains. An opening at the base of this chimney had been blocked with a stone, the removal of which confirmed the two chimneys were connected (Plate 25).



Plate 23: The remains of the annealing house, showing refractory brick wall 051, chimney and associated flue, looking south-west. Scale 1m



Plate 24: Detail of brick-vaulted flue 068 with wall 067, looking south-east. Scale 1m



Plate 25: Second chimney with opening revealed at the base, looking north-west. Scale 1m

5.5 Phase 4 (Post-1930s)

The annealing house appeared on the Ordnance Survey maps of 1908 and 1922 (Figure 7), although it appears to have been cleared by the 1940s, together with most of the buildings on the north-western part of the site, including the furnaces. The range of buildings along the south-eastern side of the glassworks, including the covered passage, seem to have been remodelling during this period, as evidenced by the reconstruction of the north-western end of wall 055 had been re-built, indicated by black-ash mortar, and bullnose bricks had been used to create a new corner, which was keyed into internal wall 056 (Plate 26). Wall 075 formed the north-western wall of the remodelled structure. The remains of two brick-built steps (058 and 076), forming part of a possible internal staircase, were constructed between walls 056 and 075 during this period. A stone floor surface 080 was uncovered at the bottom of the two stairs after the removal of the cinder fill (041) between walls 056 and 075.

By the 1950s, the later buildings housing the second, third and fourth furnaces to the south-east of the site, are marked as 'ruins', suggesting the new company made no use of the large extension.



Plate 26: Wall 055 remodelled during Phase 4, looking south-west. Scale 1m

5.6 Workers' Houses

A row of terraced houses along Canal Street, first shown clearly on Bancks & Co's map of 1831, lay within the north-western part of the site, although only the rear of the properties was available for excavation (Figure 4). The Ordnance Survey Town Plan of 1850 appears to show a series of pavement lights against the houses, indicating that they had cellars. This was corroborated by the archaeological results, where a passage to the rear of the houses was clearly below ground level, with a bricked-up doorway in the rear wall of the houses. Removal of the bricks blocking the doorway revealed typical cellar fill beyond, confirming it had once been a cellar, although this part of the site was not available for full excavation.

The rear wall (027) of the houses was partially exposed, together with a narrow passage and remains pertaining to outside toilets, or privies (Plate 27). Wall 027 comprised hand-made bricks bonded with lime-based mortar, and was two brick-courses wide; an isolated small fragment of a continuation of this wall (026), keyed into the stub of a partition between two houses, was identified some distance to the north east (Figure 9). A narrow passage lay below ground level immediately to the rear of the houses, with wall 028 marking the south-eastern side (Figure 9); the fabric of this wall similarly comprised hand-made bricks bonded with lime-based mortar, consistent with an early 19th-century construction date. The north-eastern end of the passage had a brick floor (033), although this was absent to the south-west (Plate 28).

Four, poor-quality, later walls (031, 032, 035 and 042) had been inserted across the passage, essentially dividing it into segments. Their function was unclear, although it seems likely that they represented the abandonment of the cellars as dwellings. The passage had presumably provided access to the cellar at the rear of the properties, and had been backfilled with demolition rubble (034) that contained early 20th-century material.

The sequence of historical mapping shows that the houses were served with a small yard to the rear, each containing a privy. The foundations of the wall (029) that enclosed the yard to the rear, and providing a boundary between the yard of the adjacent glassworks, was exposed during the excavation. Wall 029 again comprised hand-made bricks bonded with lime-based mortar. Part of the wall had been subject to repairs during the second half of the 19th century, represented by a short section of wall (030) of hand-made bricks bonded with black ash mortar.

Very few physical remains of the privies survived *in-situ*, and were limited to the vestiges of a flagstone floor (045) and a partition wall between two privies (046). It is perhaps of note that no drainage was uncovered in association with these privies, suggesting that they were not served with running water, and probably housed simple ash closets.

The sequence of historical mapping shows that The Collier's Arms public house occupied the north-eastern end of the terraced properties. The fragmentary remains of the southern wall of the public house (18 / 19 / 20) were uncovered in the north-western corner of the excavated area (Figure 9). These walls all comprised hand-made bricks bonded with lime-based mortar, and were probably of the same construction date as the excavated houses.



Plate 27: Excavated remains at the rear of houses fronting Canal Street, looking north-east. Scale 1m



Plate 28: Passage to the rear of the houses fronting Canal Street, showing inserted cross-walls and brick floor 033, looking north. Scale 1m

6. Material Assessed

6.1 Introduction

The entire paper and material archive generated from all stages of the fieldwork was examined to ascertain its potential for further study. The method of assessment used varied with the class of information examined, although in each case it was undertaken in accordance with guidance provided by English Heritage in *Management of Archaeological Projects*, 2nd edition (English Heritage 1991) and updated subsequently by MoRPHE (Historic England 2015). All classes of finds were examined in full, with observations supplemented by the records generated during the course of the fieldwork and maintained within the project archive. Quantifications are incorporated within the individual assessments. A breakdown of the paper and photographic archive appears in Table 1.

Total Contexts from the Excavation	80 (<i>Appendix 1</i>)
Drawings	15
Total Digital Photographs	250

Table 1: Quantification of the paper / digital archive

6.2 Aims and Objectives

The aim of the assessment was to evaluate all classes of data from the excavation, in order to establish the merits of further analysis appropriate to the potential demonstrated by the site archive. A statement of the significance of the results from each element of the archive is given below. The quantification and assessments represent an amalgamation of the total body of work undertaken in 2020.

The objectives of this assessment correspond to *Appendix 4 of Management of Archaeological Projects*, 2nd edition (English Heritage 1991). They are:

- to assess the quantity, provenance and condition of all classes of material: stratigraphical, artefactual and environmental;
- to comment on the range and variety of that material;
- to assess the potential of the material to address questions raised in the course of the project;
- to formulate any further questions arising from the assessment.

This assessment will present:

- a factual summary, characterising the quantity and perceived quality of the data contained within the site archive;
- a statement of the academic potential of the data;
- recommendations for the storage and curation of the data.

6.3 *Stratigraphic Data*

6.3.1 *Assessment*

The paper archive represents a percentage of the overall data gathered during the course of the excavation (Table 1). The context record has confirmed the identification of features and structures of various periods.

6.3.2 *Potential*

Analysis of the stratigraphic data has the ability to refine the site sequence and to add value to the artefact analysis. A thorough appraisal of the context sheets, drawing, digital plans and site matrices would allow nuances and sub-phasing to be devised for the structural remains, and the relationships between the structural remains to be more established accurately.

6.4 *Photographic Data*

6.4.1 *Assessment*

In all, there are 250 site images, excluding a series of aerial images. The site photographs cover the whole of the excavation works. Large amounts of overlapping photographs were taken of the more significant structural remains. These photographs were coordinated with GPS-referenced targets and potentially allow photogrammetry to be carried out during the post-excavation process. The images are an invaluable aid in all aspects of post-excavation assessment and analysis. They provide a general and detailed pictorial record of the site throughout all phases of its excavation and recording.

6.4.2 *Potential*

The images include archaeological features and finds and also record how the site was excavated in the form of 'working-shots'. They will undoubtedly aid the stratigraphic analysis. The images could also be integrated with the site database to provide a visual element, which is helpful when dealing with a large corpus of information, and also have the ability to add valuable illustrative material to the final report and publication. The photogrammetry aspect of the site photography, if deemed necessary and useful, could be undertaken in-house by Salford Archaeology using software such as Agisoft Photoscan.

6.5 *Digital Data*

6.5.1 *Assessment*

The digital data include all the records of survey undertaken using the GPS, and the digital photographic archive (including the rectified photography described above). Surveying was undertaken throughout the excavation process and was used to record the heights, depths, and sizes of all the archaeological features within the site.

6.5.2 *Potential*

The survey data will likely be an invaluable source of information when interpreting the site. The survey data will aid in the production of phased site plans and will allow more nuanced interpretation to take place with regard to the locations and spread of features. Height information tied into Ordnance Datum will also be taken from this survey data.

6.6 The Finds Evidence

6.6.1 Introduction

A moderately sized artefactual assemblage was recovered from the excavations at New Islington. The majority of this consists of manufacturing debris deriving from the Molineaux Webb Glassworks that occupied the site from the late 1820s. Other materials include fragments of pottery, clay tobacco pipes and metalwork, none of which pre-date the glassworks, and are all mid-19th to mid-20th century in date (Table 2). An assessment of each class of artefact group is provided in the following sections. The aim of the finds assessment is to evaluate all classes of archaeological material from the excavation to assess their significance and research potential.

Material	Contexts	Count	Weight	Period (century)
Animal bone	3	15	191	Undated
Ceramic other	1	3	1591	19 th – 20 th century
Clay tobacco pipe	4	25	97	19 th century
Copper	1	1	78	19 th century
Glass	6	144	6482	19 th - 20 th century
Glass Waste	4	–	535900	19 th century
Iron	2	6	299	19 th -20 th century
Lead	1	1	101	Undated
Pottery	6	196	6100	19 th -20 th century
Rubber	2	3	53	20 th century
Shell	1	3	44	Undated
Slate	1	1	34	Undated
Stone	1	4	1051	Undated
Tile	2	3	213	19 th -20 th century
Total		405	552kg	

Table 2: All finds recovered from New Islington by material, count, weight and period

6.6.2 Methodology

The vast majority of glass material was recovered from the fills of the furnace and flue (001), whilst the pottery and more household items were recovered from material backfilled into 19th-century rooms. Pottery and other materials were collected from stratified contexts and features using a 100% sampling policy. All finds were returned to the Salford Archaeology finds laboratory in sealed and labelled polyethylene bags. All finds were washed, except metal and organic material, which were dry brushed, and grouped by material for assessment.

6.6.3 Overview

The excavation resulted in the recovery of 405 artefacts with a total weight of 552kg. The glass waste has not been individually counted, and is not represented in the total number of finds. The remaining finds were catalogued by material, counted and weighed. The assemblage ranges in date from the mid-19th and 20th centuries. The vast majority of material was retrieved from the flue furnace deposit 001, as well as demolition layers in the former workshop area of the glassworks and around the workers' housing (034, 036, 039, 040, 041 and 044).

None of the material appears to pre-date the Molineaux Webb Glassworks. All the material from the workers' houses and workshop deposits are fragmentary, as may be anticipated given their recovery from demolition deposits.

6.6.4 The Pottery

The pottery assemblage is fragmentary and is all 19th-century to modern in date. A total of 196 sherds were retrieved from demolition fills from within the housing and workshop rooms (Table 3). The pottery includes blue and white transfer-printed tableware, dark-glazed coarseware, brown-glazed earthenware including teapot fragments, industrial slipware including mochaware (Plate 29), porcelain, stoneware, and unglazed earthenware. The pottery is typical of a 19th-century urban assemblage, and has no further research potential.

Pottery class	Count	Weight	Period
Brown-glazed earthenware	6	186	19 th -20 th
Tableware	117	2189	19 th -20 th
Creamware	2	143	19 th
Dark-glazed coarseware	12	1441	19 th
Industrial slipware	17	300	19 th
Porcelain	16	230	19 th
Stoneware	22	1528	19 th
Unglazed earthenware	2	64	19 th -20 th
Yellow ware (modern)	2	19	19 th

Table 3: Pottery types retrieved from New Islington

6.6.5 Clay Tobacco Pipes

A total of 25 clay tobacco pipe fragments were retrieved from the excavation. This comprises 21 unstamped stem fragments, one of which exhibits green glazing, and four partial or complete pipe bowls. All the bowls date to the middle of the 19th century, and one exhibits a fluting design (Plate 30). The pipes provide no further research potential.



Plate 29: Mochaware cup fragment (034)

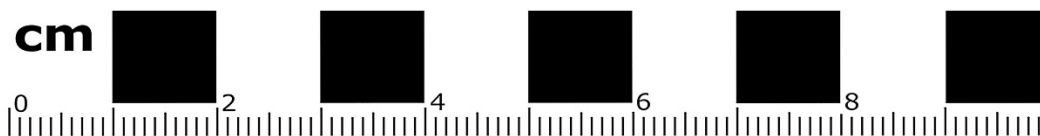


Plate 30: Fluted clay tobacco pipe bowl (034)

6.6.6 Glass Vessels

The vast majority of the glass from the site is waste glass from the furnace of the glassworks. A number of vessels or shards were also retrieved from the housing deposits. This consists of late 19th- to early 20th-century bottles glass, including a broken Codd bottle 'THE MANCHESTER BREWERY CO LTD' (Plate 31), and the base of a green bottle 'PRATT & SON MANCHESTER' (Plate 32). The firm of Pratt & Son was established in 1879 as mineral water and ginger beer manufacturers, and occupied premises on Leigh Street in Ancoats until 1909 (Miller and Wild 2007).

A large selection of glass bottle stoppers were recovered from (001) of the glass-melting furnace (Plate 33), with various decorated tops. Various decorative glass beakers were also retrieved from this deposit (Plate 34).



Plate 31: Manchester Brewery Codd bottle (039)

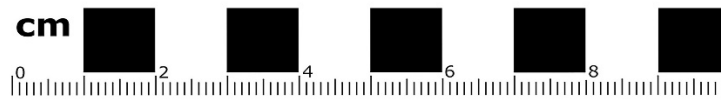


Plate 32: 'PRATT & SON' bottle (044)

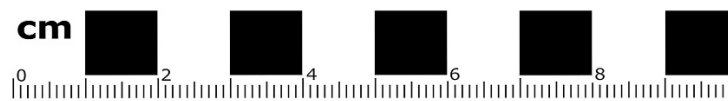


Plate 33: Glass bottle / decanter stoppers (001)



Plate 34: Press-moulded glass beakers (001)

6.6.7 Industrial Residues (Dr David Dungworth)

Introduction

The assessment of the glass-working debris was undertaken during COVID-19 social-distancing measures, and has had to be based on less information than would be normal. Some tasks that would normally have been carried out at assessment stage will be deferred until analysis for publication has been agreed (and carried out as part of that analysis).

Methodology

Normally, the assessment would be based on the visual examination of all of the glass-working debris (with at least reference to the finished glass artefacts, cf Historic England 2018); however, current COVID-19 social-distancing measures have restricted access to the material. Fortunately, the author attended site during excavation (13th February 2020) and was able to see some of the glass and glass-working debris. This assessment has been based on the impressions gained during the site visit.

Quantification

The site visit showed that large quantities of vessel glass had been recovered. A large proportion of the material seen then comprised press-moulded glass in a pale yellowish-green translucent glass. The visual characteristics of this glass suggests that it was probably made using uranium as a colourant (possibly with other colourants). It was clear that these glass vessels included a proportion of wasters where the glass had failed to completely fill the mould or where the glass had deformed by excessive heat (likely to have occurred during annealing).

The second impression gained from a cursory examination of glass on site, was that some of the glass comprised colourless ash trays (such simple artefacts were often a staple for glass factories during their later years). Salford Archaeology staff have reported that the total weight of vessel glass recovered is a little under 292kg and that three-quarters of this comprises green glass. Current information does not allow the confirmation that all of this green glass was coloured with uranium (other shades of green could be achieved using iron, copper, chromium, etc). It is also unclear at the moment whether all glass vessels were press-moulded, or if a proportion were free-blown (cf Holt *et al* 2014; Willmott *et al* 2012).

Material	Weight (kg)
All green vessel glass	223.57
All clear vessel glass	56.94
All other opaque/blue/brown vessel glass	11.26
All vessel glass	291.77

Table 4: Vessel glass from New Islington (Molineaux and Webb)

Glass-working Waste

The assemblage of glass-working waste is reported to include a total of 263.74kg of material; however, it is not certain at the present time what sorts of glass-working debris are represented (and in what proportions). A full understanding of the significance and potential of this assemblage is not possible at this time due to COVID-19 social-distancing measures. The following categories of material *could* be present:

Material	Description	Potential
Glass-working waste	Fragments of glass in random shapes and often with abundant fracture surfaces. Some examples show flow (drips, etc). This material can also include moils.	High
Devitrified glass	Usually amorphous lumps of glassy material that are also opaque. The range of colours displayed is varied (eg green, blue, amber and/or black). Some of this material may have undergone microphase separation rather than devitrification (cf Dungworth and Paynter 2011)	Low
Crucible	Refractory ceramic vessel in which glass was melted.	Moderate
Refractory ceramic	Refractory ceramic but lacking a form that allows the certain identification as crucible or brick (usually because present as relatively small fragments).	Low-Moderate
Brick	Pale-coloured ceramic, usually tempered with grog (and possibly quartz). Often with black or maroon glazed surfaces, confirming exposure to high temperatures (and probably coal-fired).	Low-Moderate
Clinker	The vitrified ash of coal, usually black (sometimes maroon at the surface), and often porous.	Nil-Low

Table 5: Vessel glass from New Islington (Molineaux and Webb)

Potential

The glass and the glass-working debris from New Islington (Molineaux and Webb) form a large assemblage of material with considerable potential to provide detailed information on the range of glasses produced. The full potential is unclear because COVID19 restrictions have prevented the author viewing all relevant material. It is not clear how much of the assemblage derives from early manufacture before the adoption of press-moulding. The apparent uranium-coloured glass forms a substantial proportion of the material seen and it is likely that this was all produced after the 1860s (Holt *et al* 2014). In addition, any investigation of chronological changes in glass-making practices is currently hampered by the lack of stratigraphic or phasing information. The typological examination of finished glass could provide some information on the periods of manufacture that are represented by the material (cf contemporary design books, adverts, etc). Ideally, material would be selected for chemical analysis to determine the range of glass compositions produced during different phases of Molineaux and Webb.

- 1827-45 *Early manufacture I.* Bottles? Flint glass? Other glass? Was any glass made using press-moulding? The effects of Excise regulations.
- 1845-64 *Early manufacture II.* What changes were made to glass manufacture after the repeal of the Excise taxation (and regulations)? Was press-moulding introduced?
- 1864-85 *Peak manufacture.* Most press-moulded designs were registered. What was the relationship between the form and aesthetics of glass objects and their materiality? Were any other types of glass made?
- 1885–1927 *Decline.* How might the economic challenges to glass manufacture be manifested in the material nature of the glass?

At present, the relative abundance of other categories of glass-working waste are unknown but these usually have less potential for analysis when compared to finished glass and glass-working waste. The analysis of any refractory ceramic could indicate temperatures achieved. The analysis of crucibles could indicate both the types of glass melted and the nature of the fuel used to heat the furnace (coal or gas).

6.6.8 Metalwork

A very small quantity of metalwork was retrieved from the excavation. This includes a copper pipe fragment, various iron rods and nails, and a lead strip. These items are probably the remains of industrial activity, and have no further research potential.

6.6.9 Animal Bones and Shells

A total of 15 animal bones were retrieved from fills within the housing on site. This includes various small animal bones and a decorated knife handle (Plate 35). Three oyster shells were also retrieved from house fills (044).

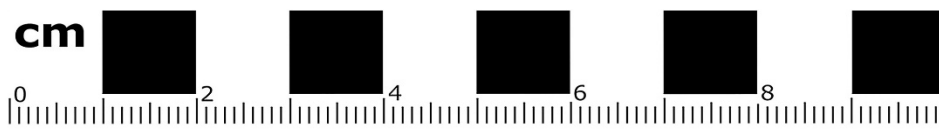


Plate 35: Decorated bone handle with corroded end (036)

6.6.10 Stonework

Two carved stone wheels were recovered from deposit 001 in the backfill of the glass-melting furnace, which are likely to be from an industrial trolley associated with the glassworks (Plate 37). Two further stone fragments were recovered, as well as a perforated piece of slate, probably part of a roof tile (Plate 37).

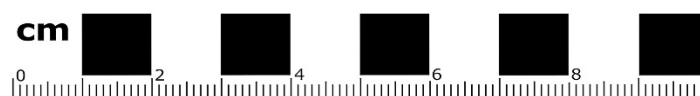


Plate 36: Stone wheels (001)



Plate 37: Perforated slate (041)

6.6.11 Potential

All the material from New Islington dates to the period when housing and workshops stood on the site or later. No material pre-dates the 19th century. All the material is urban or industrial and gives an insight into the objects utilised during the mid- to late 19th century and into the 20th century. None of the finds are of note, apart from the decorated bone handle and, with the exception of the glass-manufacturing waste, none merit any further analysis. The other finds will be returned to the landowner or discarded once the project is completed.

7. Curation and Conservation

7.1 Recipient Museum

The paper and electronic archive will be offered for deposition with the Museum of Science & Industry in Manchester.

7.2 Conservation

Most of the assemblage is well-preserved and in good condition, and thus the conservation requirement is low.

7.3 Storage

The complete project archive, which will include written records, plans, digital plans and photographs will be prepared following the guidelines set out in *Environmental standards for the permanent storage of excavated material from archaeological sites* (UKIC 1984, Conservation Guidelines 3) prior to deposition.

For long-term storage of the digital data, CDs will be used, the content including the reports, plans, scanned images and digital photographs. Each CD will be fully indexed and accompanied by the relevant metadata for provenance. The digital record should ideally be duplicated as a paper record for long-term archiving, including printouts of photographs and survey plots, labelled and summarised.

All dry and stable finds will be packed according to the museum's specifications, in either acid-free cardboard boxes, or in airtight plastic boxes for unstable material. The artefactual assemblage is predominantly stable, but should be packed carefully with bubble wrap protecting the bags to minimise movement and abrasion in the boxes.

7.4 Packaging

The assemblage is currently well-packaged and will require no further packaging. Box lists derived from the site database have been compiled and will be updated when the identification of objects is complete.

7.5 Discard Policy

A discard policy will be prepared, in consultation with the recipient museum. Material of no discernible long-term archaeological potential will be discarded, with the museum's agreement.

8. *Statement of Potential*

8.1 *Introduction*

The archaeological investigation undertaken at New Islington has provided an invaluable opportunity to investigate the development of the glass-manufacturing industry in Manchester. The Manchester glass industry had a high reputation throughout Britain and developed somewhat apart from glass manufacturing elsewhere in the country. However, little study has been carried out on this important industry, and the New Islington excavation produced an important assemblage of 19th-century glass-working waste and crucible fragments that clearly merit scientific analysis.

Overall, the results of the 2020 excavation can be regarded as being of at least regional importance, and the assessment of the individual elements of the project archive shows that it has some potential to contribute to research agendas at a regional, and potentially national, level. Some data pertinent to the original research themes was recovered. Assessment of the stratigraphic data generated by the fieldwork is primarily concerned with the potential of the data to address these fieldwork aims and, if appropriate, formulate new questions and research aims that can be addressed by an analytical phase of the post-excavation programme.

The fieldwork was undertaken in accordance with the strategy set out in the original Written Scheme of Investigation, in order to address the aims put forward in that document. Assessment of the stratigraphic, artefactual and environmental data generated by the fieldwork is primarily concerned with the potential of the data to address these fieldwork aims, and to formulate new questions and research aims that can be addressed during the analytical phase of the post-excavation programme.

8.2 *Principal Potential*

8.2.1 *Overview*

The present section reviews the success of the fieldwork and post-excavation assessment in providing data to address the original research aims. Assessment of the primary stratigraphic records has established activity on the site during the industrial period. The sequence is summarised in *Section 5*, above. Of particular importance is the collection of a significant assemblage of glass-working waste. Of equal importance is the body of historical data available for the glassworks. The development of the site, the physical evidence uncovered during the excavation and the accompanying historical information is discussed below.

The dataset obtained from the investigation at New Islington has the potential to add considerably to the small but currently increasing body of evidence relating to the development of glass manufacturing in Britain during the 19th century. Relatively few glassworks of this period have been examined through detailed archaeological excavation and so physical evidence is currently lacking. This lack of physical evidence is compounded by the fact that during this period much experimentation with glass recipes, furnaces and techniques was being carried out but very little was written down. This was partially due to a fear of industrial espionage in a very competitive industry and also partially to avoid certain industry regulations and infringements in technological patents by other companies.

The information that may be obtained from detailed analysis of the Molineaux Webb Glassworks excavation evidence has the potential to produce regionally, possibly nationally, important information on this little understood industry.

Detailed below are the five main areas of potential arising from the data collected during the investigation.

Glass manufacturing waste: the greatest potential lies with the large quantity of glass-manufacturing waste that was retrieved from the excavation. This material consisted of a broad range of waste types of sufficient quality to merit in-depth scientific analysis. This has considerable potential to provide detailed information on the chemical nature of the glass produced, to improve the current understanding of flint glass and pressed glass manufacture in the later 19th century, and to reveal choices in the raw materials employed and associated technologies. The only comparable material from Manchester that has been studied to date is an assemblage of glass-manufacturing waste from the Percival Vickers Glassworks in Ancoats, the analysis of which provided hugely significant results that will provide an invaluable dataset with which to compare the material from Molineaux Webb.

Historical research: although a general background history for the site area has been produced, more in-depth historical study needs to be undertaken to create a detailed historical narrative for the Molineaux Webb Glassworks. In particular, a review of *The Pottery Gazette and Glass Trade Review* for the period that the glassworks was in operation may yield significant information. The resultant narrative would then be cross-referenced with the scientific and stratigraphic analysis to produce a definitive historical sequence for the glassworks and the development of the technology and processes.

Comparative study: once a detailed narrative is produced for the glassworks this should be compared to other investigated glassworks, both in Manchester and beyond. This comparative study has the potential to add greatly to the overall regional and national picture of the development of the glass industry and its place within the overall 19th-century British economy.

Publication: the results of the above four branches of analytical study have considerable potential to make an important contribution to an understanding of glass production in 19th-century Manchester and beyond, and will merit the production of an academic publication in an appropriate format, either as a detailed article in a relevant journal, or as an Occasional Paper that places the glassworks in context with other documented glass-manufacturing sites in the Manchester region.

8.2.2 Stratigraphy and Phasing

Stratigraphic data will provide the framework within which the other analyses can take place. The stratigraphic sequence excavated at New Islington is informative but relatively simple. Generally, though the site was historically known to have undergone several expansions during the early 19th century, little archaeological evidence for such phasing was found. Some further interrogation of the dataset may yield additional information to that elucidated during assessment, and has potential for more in-depth description and discussion.

The stratigraphy will need to be revisited once the finds and industrial residue assemblages have been analysed, in order to incorporate any new evidence and to test and revise the stratigraphic interpretations developed at assessment.

8.2.3 *Artefactual Data*

Elements of the artefactual assemblage recovered from the site have some potential for further analysis, primarily the glass-working waste.

The full analysis of the glass-working waste will be achieved through a programme of scientific analysis to determine microstructure, and mineralogical and chemical composition.

8.3 *Research Priorities*

The aim of the excavation was to fully record as much as possible of the 19th-century glassworks, a process that fits with several of the initiatives for archaeological research of the industrial and modern periods stated in the current *Archaeological Research Framework for North West England* (Newman and McNeil 2007; McNeil and Newman 2007). These include, but are by no means limited to, the following:

- *Initiative 7.35*: 'Industry specific studies are needed for those industries that have received little archaeological attention (Newman and McNeil 2007, 154);
- *Initiative 7.41*: 'The retention of all later period artefacts and their routine analysis as part of all archaeological excavation projects (Newman and McNeil 2007, 156).

9. Updated Project Design

9.1 Aims and Objectives of the Programme of Analysis

This section follows the guidance of MoRPHE regarding the formulation of updated research aims (Historic England 2015). The original aims for the project remain valid (*Section 2.1 above*), but can be updated with new aims and objectives derived from the statement of potential set out in *Section 8*. While specific aims and objectives for the analysis of this assemblage emerge from the above assessment, the assemblage is unique and it is likely that new questions (and hopefully answers) will evolve during the course of analysis. The programme of analysis will attempt to accommodate new questions as they arise.

The overall aim will be to understand how glass was manufactured in the early / mid-19th-century in Manchester, although there are additional research priorities associated with other aspects of the dataset. To achieve this, the updated research aims will consider the following:

- the development of glass-making processes through scientific analysis of the retrieved glass-manufacturing waste;
- the development of the technology used in the glassworks through detailed analysis of the stratigraphic sequence;
- detailed historical narrative for the glassworks and subsequent re-use of the works;
- comparison of the evidence at Molineaux and Webb with other excavated glassworks, especially the Percival, Vickers & Co Glassworks on Jersey Street in Ancoats (Miller 2007, Willmott *et al* 2012).

Updated Research Aim 1: what information can be gained from the scientific analysis of the glass-manufacturing waste?

- *Objective 1:* can we determine what types of glass were being produced and how?
- *Objective 2:* is it possible to see the development of the glass-making processes in the chemical analysis of the waste?
- *Objective 3:* can the use of particular materials be assigned to different chemical processes?

Updated Research Aim 2: how did the furnace, and associated technologies, develop throughout the life of the glassworks?

- *Objective 1:* can we determine the exact stratigraphic/temporal sequence for the development of the furnace and associated technology?
- *Objective 2:* is it possible to assign the adoption of particular technological developments to different structures and modifications over time?
- *Objective 3:* can we assign difference modifications and developments to different processes seen in the chemical analysis?

Updated Research Aim 3: what is the full detailed history of the glassworks and subsequent occupiers?

- *Objective 1:* can we cross reference the results of the historical study with results of the chemical analysis and stratigraphic study of the development of the structures?
- *Objective 2:* can the historical information throw light onto the social aspect of industry as it relates to the glassworks and subsequent occupiers, and the rise and collapse of the industry itself?
- *Objective 3:* what can be inferred from the results of the various analyses on the contribution of the glassworks to the overall industry and economy?

Updated Research Aim 4: is it possible to compare the information from the Molineaux and Webb Glassworks with other examples of glassworks both in the region and nationally?

- *Objective 1:* how does the Molineaux Webb Glassworks fit in with the overall picture of the 19th-century glass industry? How does it add to this picture and is it typical or atypical?
- *Objective 2:* can we determine if the glassworks has either influenced or been influenced by other glassworks and by the adoption of technologies within other industries?

Addressing these objectives will provide a large dataset which can be compared in detail to the historical accounts of smalt manufacture. This will have great potential to provide a comprehensive account of glass manufacturing in the 19th century in Manchester, and may even serve as a basis for any future investigations of glass manufacturing.

9.2 Aims and Objectives of the Programme of Analysis

In accordance with the guidelines provided in MAP2 and MoRPHE (English Heritage 1991; Historic England 2015), it is proposed that the results of the project should be presented as follows:

- *Project archive:* the completion of the project will result in an integrated project archive, which will be offered for deposition with the Museum of Science and Industry in Manchester. A copy of the report will also be lodged with Manchester Archives and Local Studies.
- *Publication:* appropriate dissemination of the results obtained from the analytical phase of the project will be required. It is proposed that a paper will be prepared for publication in an appropriate academic journal, such as *Post Medieval Archaeology* and / or *Industrial Archaeology Review*, together with publication as an Occasional Paper that places the glassworks in context with other documented glass-manufacturing sites in the Manchester region.

10. Method Statement

10.1 Programme Structure

The post-excavation programme, designed to fulfil the research aims outlined in *Section 9*, will be divided into the following stages:

- full cataloguing of any data representatively sampled;
- analysis;
- synthesis;
- preparation of draft text and illustrative material;
- publication;
- archive deposition.

10.2 Management, Monitoring and Review

Task 1: management and monitoring tasks have been built into the project. These tasks will include project monitoring, advice and co-ordination, problem solving, and conducting meetings with project staff and all interested external parties.

Reviews of the project will include both the specialists and the Salford Archaeology staff who are undertaking the analysis, and will provide an opportunity for all involved to present and receive information, to discuss the research aims, and permit an exchange of ideas. All specialists will be consulted following editing and prior to publication of their reports. In addition, there will be regular project review meetings at appropriate intervals throughout the preparation of the report.

10.3 Stratigraphy, Analysis and Synthesis

Task 2: the stratigraphic data will need to be studied in greater detail in order to refine the provisional phasing. More detailed structural analysis will be undertaken on complex features. Existing matrices will require assimilation into one overall matrix, showing the amended periods and sub-phasing.

Once the data have been analysed and a stratigraphic narrative completed, it will be possible to prepare phase plans. Such phase plans are a prerequisite for specialist analysis of the relevant artefact assemblages. Analysis and synthesis of the results of specialist analysis of some classes of finds, and especially the glass, will, however, contribute to the site phasing.

10.4 Digital Data in the Analysis Phase

Task 3: at the start of the fieldwork in 2020, a basic Microsoft *Excel* database was set up to record finds and archaeological contexts, along with a CAD environment, in which all plans and sections could be placed to produce a composite view of the site.

Digital photographs: links to digital photographs will be embedded within the database where appropriate.

CAD Drawings: in order that a detailed analytical text of the stratigraphic information can be produced, phase drawings, sections and other relevant illustrations, as required, will be drafted. These will provide detailed information on the periods and sub-phases of the site, and will indicate stratigraphically related groups. The draft text and phase drawings will form the basis both of the summary information to be supplied to specialists and of the stratigraphic section of the final published report.

10.5 Industrial Debris

Task 4: approximately 70 selected samples will be analysed using inductively coupled plasma (ICP) spectroscopy. This will provide detailed information on chemical composition for a wide range of elements and to a great sensitivity (detection limit). This technique will also provide a strong comparability to the Percival Vickers analyses (Willmott *et al* 2012). The ICP analysis will be carried on my behalf by the British Geological Survey (Keyworth laboratories) and will include the analysis of reference material to ensure good data quality. The data will comprise an Excel spreadsheet listing chemical concentration of all analysed elements for each sample (as well as reference materials).

Some glass-working materials are not homogeneous and ICP analysis will be supplemented with scanning electron microscopy (including an energy dispersive spectrometer for chemical analysis). The scanning electron microscope will be hired from a relevant university department (Russell Group). This will provide spatially coherent chemical data (Excel spreadsheet) as well as digital images (TIFFs) of the microstructure.

10.6 Integration of Datasets and Synthesis

Task 5: during each part of the analytical programme, a selection will be made of appropriate material for illustration. This will include general plans and sections, phase plans, and illustrations of artefacts, as appropriate.

10.7 Illustrations

Task 6: a suite of detailed drawings, suitable for publication, will be prepared once the analysis of the dataset has been completed.

10.8 Production of Text and Publication

Task 7: following the completion of the analysis of the stratigraphic and artefactual evidence, an archive report will be produced. The results of the programme of archaeological works will also be synthesised and prepared for publication in a suitable academic vehicle, such as inclusion as an article(s) in national journals such as *Industrial Archaeology Review* and / or *Post Medieval Archaeology*, and as an Occasional Paper that places the glassworks in context with other documented glass-manufacturing sites in the Manchester region.

10.9 Archive Deposition

Task 8: Salford Archaeology undertakes to liaise throughout the project with the receiving museum to meet its deposition policies. On completion of the analysis, a discard policy will be implemented. On submission of the completed text for publication, the archive will be updated as necessary and the receiving museum will be contacted to obtain the latest information on its deposition arrangements. Material in files and boxes will be checked, and indices and box lists will be compiled and appended.

The digital archive will be checked and indexed, and hard copies made of the data, if required by the recipient museum. The digital data will be accompanied by metadata, which will explain origin and accuracy.

11. Presentation of Results

11.1 Introduction

Following the analysis and interpretation of the data, the results should be placed in the public domain, in accordance with best practice. Given the importance of the material, it is anticipated that dissemination will consist of a full archive report, and synthesis as an article for publication in at least one academic journal, and as an Occasional Paper that places the glassworks in context with other documented glass-manufacturing sites in the Manchester region.

11.2 Final Archive Report

It is proposed that an archive report is produced and sent to the Greater Manchester Historic Environment Record, in addition to its deposition with the site archive. This will include details of structural and stratigraphic elements of the site and associated activity, and analytical reports on the finds and industrial debris sampling.

11.3 Archive Report Structure

A provisional breakdown of the contents of the proposed archive report is provided below. In advance of completion of the full post-excavation analysis, this synopsis can only be regarded as a draft, although it is anticipated that the archive report will work to the following general headings and content:

Summary and Acknowledgements

1 Introduction

- Site location
- Circumstances of project

2 Archaeological Background

- Documentary evidence
- Historical background

3 Results of the Archaeological Excavations

- Outline of the archaeological works
- Description of the development of the site

4 The Finds

5 General Discussion

- Interpretation of the site, describing the results of the archaeological excavation

Bibliography

12. Resources and Management

12.1 Project Team

The team consists of internal Salford Archaeology staff and external consultants (Table 6). The project will be managed by Ian Miller.

Name	Organisation	Tasks
Ian Miller	Salford Archaeology	Project management; production of publication text and editing
Katie Fletcher	Salford Archaeology	Stratigraphic analysis and publication text
Richard Ker	Salford Archaeology	Illustration
Lorraine McVinnie	Salford Archaeology	Archive
David Dungworth	Heritage Science Solutions	Glass-working waste analysis

Table 6: Proposed project team

12.2 Management Structure

The Project Manager may delegate specific aspects of the project to other key staff, who both supervise others and have a direct input into the compilation of the report. They may also undertake direct liaison with external consultants and specialists who are contributing to the publication report, and the museum named as the recipient of the project archive. The Project Manager will define and control the scope and form of the post-excavation programme.

Communication between all concerned in the post-excavation programme is of paramount importance and it is essential that the specialists involved liaise closely in order that comparable data are obtained. To this end, regular meetings and reviews are envisaged between all project staff and between particular groups of specialists. All information will be disseminated at regular intervals, thus ensuring that everyone is aware of current progress, strategy and thinking.

Salford Archaeology would also be able to provide updates on the progress of the work if required at regular intervals during the course of the project. To this end, a small advisory group would be convened as appropriate. Ideally, membership would comprise representatives from GMAAS and the Salford Archaeology project team.

Salford Archaeology places importance on the tight and effective management of projects in order to deliver best value to our clients. An element of managerial time will be dedicated to on-going quality assurance and internal monitoring. This is part of our internal quality assurance system and ensures the prompt delivery of the agreed report or other deliverables on time and budget.

Acknowledgments

Salford Archaeology would like to thank Urban Splash, and particularly Hunter Lyden, for commissioning and supporting the archaeological works. Thanks are expressed to Norman Redhead for providing monitoring support on behalf of the Greater Manchester Archaeological Advisory Service (GMAAS).

The evaluation was carried out by Oliver Cook and Sarah Cattell, and the excavation was undertaken by Mandy Burns, Andy Coutts, Indigo Ridgwell, Rob Howarth, Lorraine McVinnie and Eleesha Davies. The report was compiled by Ian Miller, with contributions from Dr Samantha Rowe and Dr David Dungworth, and the illustrations were prepared by Sarah Mottershead. The report was edited by Graham Mottershead, who was also responsible for project management.

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Appendix 1: Context List

Context No.	Area	Description
001	Furnace and flue	Demolition rubble fill of central flue with high content of broken glass
002	Furnace and flue	Brick and stone-flagged central flue floor
003	Furnace and flue	South-east wall of central flue
004	Furnace and flue	North-west wall of central flue
005	Furnace and flue	Later period brick wall at the south-west end of wall 003
006	Furnace and flue	Furnace wall, south-east corner of furnace
007	Furnace and flue	Brick wall seen in the south-east trench edge/section to the south-west of wall 005
008	Furnace and flue	Substantial, hand-made brick/lime mortar wall at the south-west end of the central flue
009	Furnace and flue	Square, brick feature north of wall 008
010	Furnace and flue	Hand-made brick/lime mortar wall inside the south-west end of the central flue
011	Furnace and flue	Hand-made brick/black ash mortar wall next to wall 010, within cut 015
012	Furnace and flue	Hand-made brick/black ash mortar, possible floor at the south-west end of the central flue
013	Furnace and flue	Foundation cut into clay for wall 014
014	Furnace and flue	Brick wall within foundation cut 013
015	Furnace and flue	Foundation cut into clay for wall 011
016	Furnace and flue	Re-deposited, foundation cut material filling cut 015
017	Modern building	Modern, machine-made brick/cement mortar wall in the north corner of the excavation
018	Collier's Arms	Hand-made brick/black ash mortar wall between walls 017 and 019
019	Collier's Arms	Hand-made brick/lime mortar wall between walls 018 and 020
020	Collier's Arms	Hand-made brick/lime mortar wall between walls 019 and 021

Context No.	Area	Description
021	Collier's Arms	Hand-made brick/lime mortar wall between walls 020 and 022
022	Collier's Arms	Hand-made brick/lime mortar wall angled between walls 021 and 023
023	Collier's Arms	Ceramic drain pipes between walls 022 and 024, probably later addition to the pub
024	Collier's Arms	Hand-made brick/lime mortar wall between drains 023 and 025
025	Modern service	Modern, plastic, service pipe set in concrete casing at the south-east end of wall 024
026	Houses	Hand-made brick/lime mortar, partial remains, L-shaped wall towards the north corner of the excavation
027	Houses	Hand-made brick/lime mortar wall along the north-west trench edge, later black ash mortar additions – rear wall of houses?
028	Houses	Hand-made brick/lime mortar wall, parallel to 027, on the south-east side
029	Houses	Hand-made brick/lime mortar wall parallel to walls 027 and 028 – rear yard/passage wall?
030	Houses	Hand-made brick/black ash mortar, later phase addition to wall 029 – privies
031	Houses	Hand-made brick/black ash mortar, cross-wall between walls 027 and 029
032	Houses	Hand-made brick/black ash mortar, cross-wall between walls 027 and 028, south-west of wall 031
033	Houses	Hand-made brick/lime mortar, subterranean floor between walls 027 and 028
034	Houses	Demolition rubble fill above floor 033
035	Houses	Hand-made brick/lime mortar, cross-wall between walls 027 and 028, south-west of wall 032
036	Houses	Mixed made-ground fill between walls 027, 028, 032 and 035
037	Annealing House	Hand-made brick floor in the north corner of the workshop
038	Annealing House	Hand-made brick/lime mortar wall along the north-east side of floor 037

Context No.	Area	Description
039	Houses	Mixed made-ground fill between walls 028 and 029/030
040	Workshop?	Demolition rubble fill above floor 052
041	Workshop?	Demolition rubble fill between flue walls 003 and 004
042	Houses	Hand-made brick/lime mortar, cross-wall between walls 027 and 028, south-west of wall 035
043	Glassworks	Large, hand-made brick/lime mortar wall along eastern edge of excavation – perimeter wall?
044	Houses	Mixed made-ground fill between walls 035, 027 and 028
045	Houses	Partial stone-flagged floor on the west side of wall 030, probably floor of the privies
046	Houses	Partition wall of hand-made bricks between two privies
047	Houses	Partition wall of hand-made bricks between two privies
048	Workshop?	Hand-made brick/lime mortar wall at the north end of wall 049
049	Workshop?	Brick wall along the north-east edge of excavation
050	Glasshouse	Wall composed of hand-made bricks bonded with lime-based mortar, forming the north-western wall of the glasshouse
051	Annealing House	Refractory brick, insulating wall along the south-east side of main wall 050, probably representing part of the annealing room
052	Workshop?	Hand-made brick floor within workshop
053	Workshop?	Hand-made brick/lime mortar, north-east wall of workshop
054	Workshop?	Hand-made brick/lime mortar, south-east wall of workshop
055	Workshop?	Hand-made brick/lime mortar, south-west wall of workshop
056	Workshop?	Hand-made brick/lime mortar, south-west return of wall 055

Context No.	Area	Description
057	Workshop?	Later phase, partial wall within workshop, hand-made brick/black ash mortar, stone blocks at each end, badly damaged during excavation
058	Workshop?	Wire-cut brick/black ash mortar, cross-wall between walls 003 and 056, possible later phase staircase?
059	Workshop?	Stone-flagged floor between walls 004 and 060, later phase
060	Annealing House	Hand-made brick/lime mortar wall between wall 038 and floor 059
061	Annealing House	Refractory brick wall forming a small, square chimney
062	Annealing House	Hand-made brick/lime mortar, curved brick wall on the north-east side of wall 063
063	Annealing House	Hand-made brick/lime mortar wall between floor 059 and curved wall 062
064	Warehouse / Office	Stone-flagged floor in trench along the north-east edge of excavation
065	Warehouse / Office	Hand-made brick/lime mortar, single brick-course, dividing wall seen in the floor between 064 and 066
066	Warehouse / Office	Stone-flagged floor on north side of wall 065
067	Warehouse / Office	Hand-made brick/lime mortar wall or former doorway seen in trench edge
068	Annealing area	Hand-made brick/lime mortar, vaulted flue, damaged and silted up
069	Annealing area	Stone-carved drainage channel
070	Annealing area	Hand-made brick/black ash mortar, later phase on the north-east side of the annealing area
071	Annealing area	Hand-made brick, slightly curved wall seen on the surface of the north-east side of 072
072	Annealing area	Hand-made brickwork on the south-west side of 071
073	Central flue	Hand-made brick/black ash mortar, two-brick courses on top of original central flue wall 004

Context No.	Area	Description
074	Warehouse / Office	Wall composed of wire-cut bricks bonded with black-ash mortar, forming part of the warehouse / office building wall; continuation of wall 043. Abutted central flue walls 003 and 004.
075	Workshop/staircase	Wire-cut brick/black ash mortar wall between walls 003 and 056, part of later phase staircase
076	Workshop/staircase	Wire-cut brick/black ash mortar wall between walls 075 and 056, on the south side of 058, part of later phase staircase
077	Glasshouse	Wall of hand-made bricks bonded with lime mortar, Continuation of glasshouse wall 050
078	Glasshouse	Hand-made brick/lime mortar, partial remains of a wall parallel to 077 on the south-east side
079	Warehouse / Office	Stone flag seen in section above brick-vaulted flue 068, possible former footpath?
080	Workshop?	Stone-flagged floor at the bottom of later phase staircase between walls 058 and 076

Appendix 2: Finds' Catalogue

Material	Context	Description	Count	Weight (g)	Century
animal bone	034		3	55	Undated
animal bone	036	including decorated bone handle	6	105	Undated
animal bone	044		6	31	Undated
blue and white china	034	plates and cup fragments	20	468	19 th
blue and white china	036	sherds cups plates	25	389	19 th
blue and white china	044	various cup sherds transfer	49	710	19 th
brown coarseware	044		4	180	19 th
brown earthenware	036		3	72	19 th
brown g earthenware	039	teapot sherds	2	92	19 th
brown g earthenware	044	sherd	1	22	19 th
cbm	001	drain pipe	3	1591	19 th
china	034		3	51	19 th
china	036	painted china	1	17	19 th
china	036	bottle and cup sherds	7	323	19 th
china	040	white handle	1	11	19 th
china	041	sherds	7	182	19 th
china	044		4	38	19 th
clay pipe	001	plain stem	1	1	19 th
clay pipe	034	Two plain stems and fluted pipe late 19 th	3	24	19 th
clay pipe	036	Eight plain stems and plain 19 th century bowl	9	40	19 th
clay pipe	044	Ten stems one with green glaze, one bowl fragment with fluting, one complete plain bowl mid-19 th century	12	32	19 th
copper	001	copper pipe	1	78	20 th
creamware	041	dish	2	143	19 th
dark g coarseware	034	storage rim	1	245	19 th
dark g coarseware	0	storage vessel base	1	269	19 th

Material	Context	Description	Count	Weight (g)	Century
dark g coarseware	036	storage vessels rims	3	389	19 th
dark g coarseware	044	storage jar vessels	3	358	19 th
glass	001	clear glass stoppers, various shapes	59	1222	19 th
glass	001	various glass fragments and slabs	38	1782	19 th
glass	001	various decorated beakers	7	1474	19 th
glass	036	small sherds	3	15	20 th
glass	039	glass bottles including partial Codd bottle 'THE MANCHESTER BREWERY CO LTD'	6	986	19 th
glass	040	complete clear bottle with residue	1	193	20 th
glass	041	various glass fragments	20	222	19 th
glass	044	glass bottle fragments including green base 'PRATT & SON MANCHESTER'	10	588	20 th
industrial slipware	001		2	68	19 th
industrial slipware	034	cup	2	43	19 th
industrial slipware	044	cup sherds	8	57	19 th
iron	041	iron nails	3	69	19 th
iron	044	iron rods	3	230	19 th
lead	036	lead strip	1	101	Undated
mochaware	034	cup sherd with feather design	1	32	19 th
mochaware	040	cup sherd	1	33	19 th
oyster shell	044		3	44	Undated
porcelain	041	white cup sherds	14	92	19 th
porcelain	044	decorative porcelain pieces	2	138	19 th
rubber	001	plastic bottle stoppers	2	41	20 th
rubber	041	plastic bottle stoppers	1	12	20 th
slate	041	perforated slate, roof tile	1	34	Undated
slipware	036	cup sherds	3	67	19 th

Material	Context	Description	Count	Weight (g)	Century
stone	001	two stone wheels from a trailer, two stone fragments, one with white glaze	4	1051	19 th
stoneware	034	decorated sherd	1	40	19 th
stoneware	034	bottle sherds	4	646	19 th
stoneware	036		5	251	19 th
stoneware	041		2	29	19 th
stoneware	044	various vessels	10	562	19 th
tile	001	glazed white tile	1	154	19 th
tile	041	green glazed tile	2	59	19 th
unglazed earthenware	036	plant pot	1	52	19 th
unglazed earthenware	041	plant pot	1	12	19 th
yellow ware	044	small modern yellow ware	2	19	19 th

Appendix 3: Illustrations

- Figure 1: Site location, showing the development area boundary
- Figure 2: Excavation area superimposed on modern mapping
- Figure 3: Location of the evaluation trenching
- Figure 4: Excavated remains superimposed on Bancks &Co's map of 1831
- Figure 5: Excavated remains superimposed on the Ordnance Survey Town Plan of 1851
- Figure 6: Excavated remains superimposed on the Ordnance Survey Town Plan of 1891
- Figure 7: Excavated remains superimposed on the Ordnance Survey map of 1922
- Figure 8: Plan of the structural remains exposed in the excavation area
- Figure 9: Plan of the structural remains of the workers' houses exposed in the excavation area



Figure 1:
Site location, showing the development area boundary

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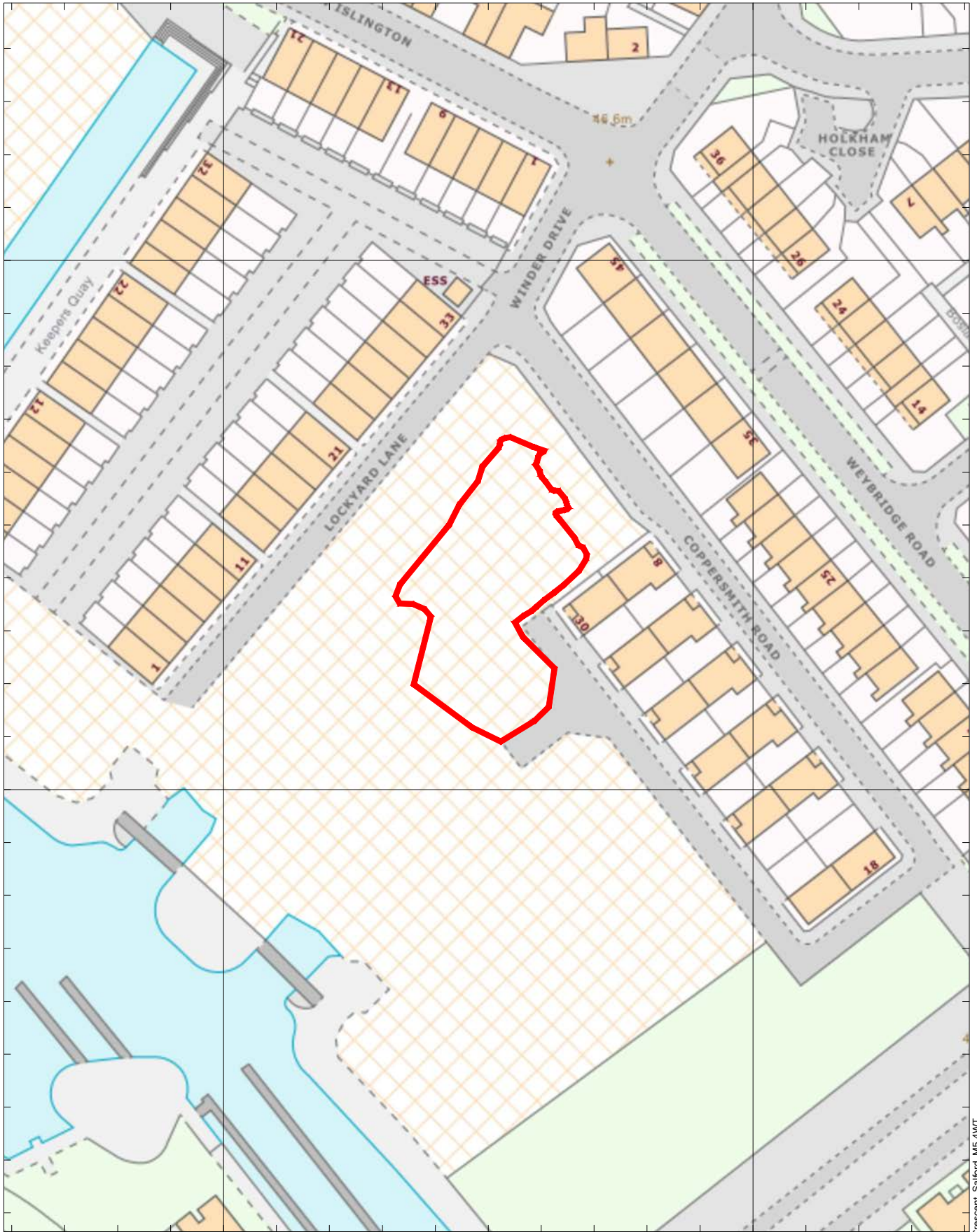


Figure 2:

Excavation area superimposed onto modern mapping

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Key:

— Excavation Area



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0

50 m



Scale at A4 1:1000

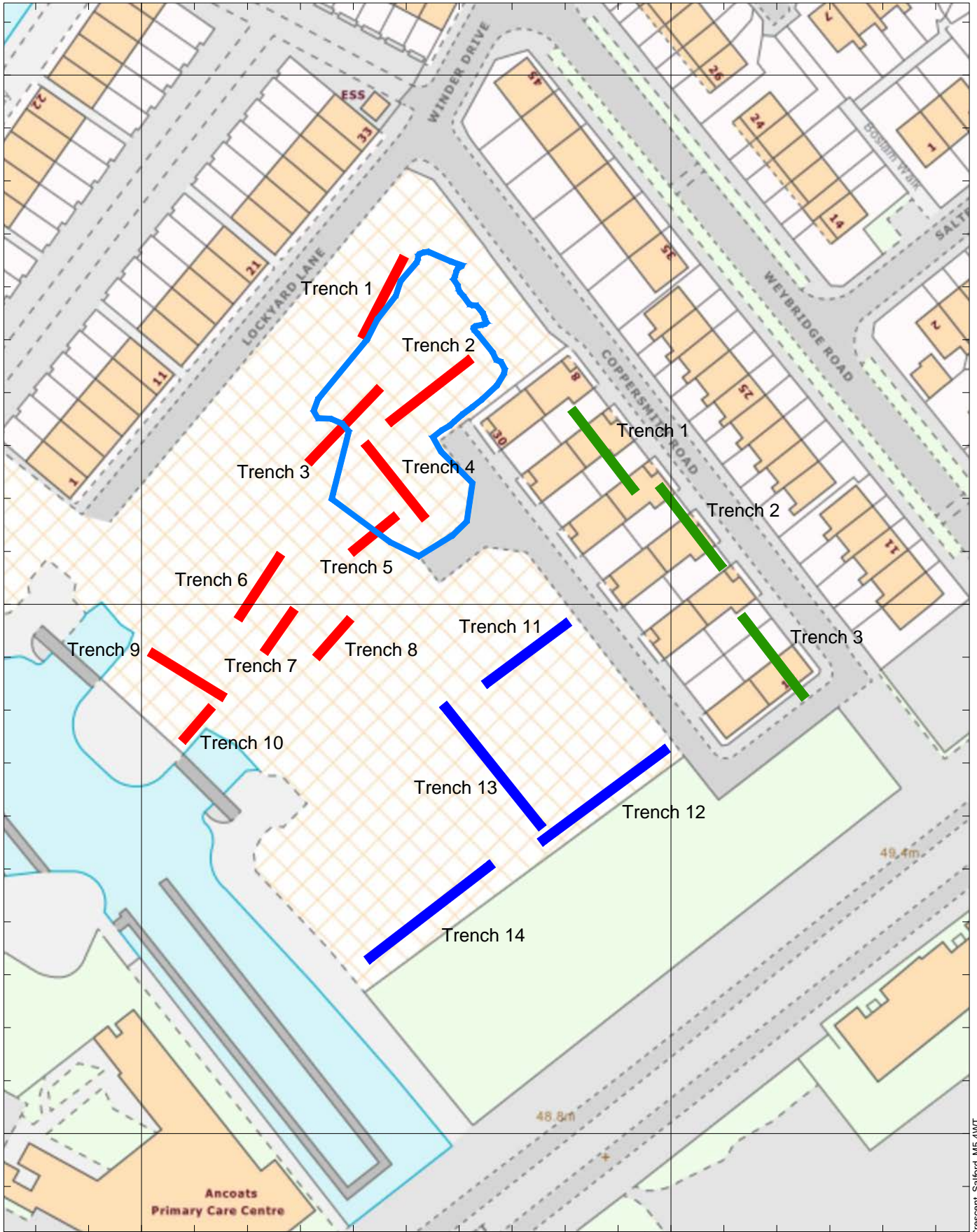


Figure 3:

Location of the evaluation trenches

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Key:

- █ 2010 Trenches
- █ Trenches excavated in January 2017
- █ Trenches excavated in May 2020
- █ Excavation Area



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0 50 m



Scale at A4 1:1000



Figure 4 :
Excavated remains superimposed onto Bancks & Co's of 1831



Figure 5:

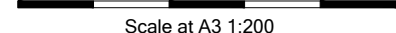
Excavated remains superimposed onto the Ordnance Survey Town Plan of 1851

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0 10 m



Scale at A3 1:200

Key:

- █ Brick Wall
- █ Brick Surface
- █ Brick Structure

- █ Fire Brick
- █ Flags
- █ Stone

- █ Mortar
- █ Pipe



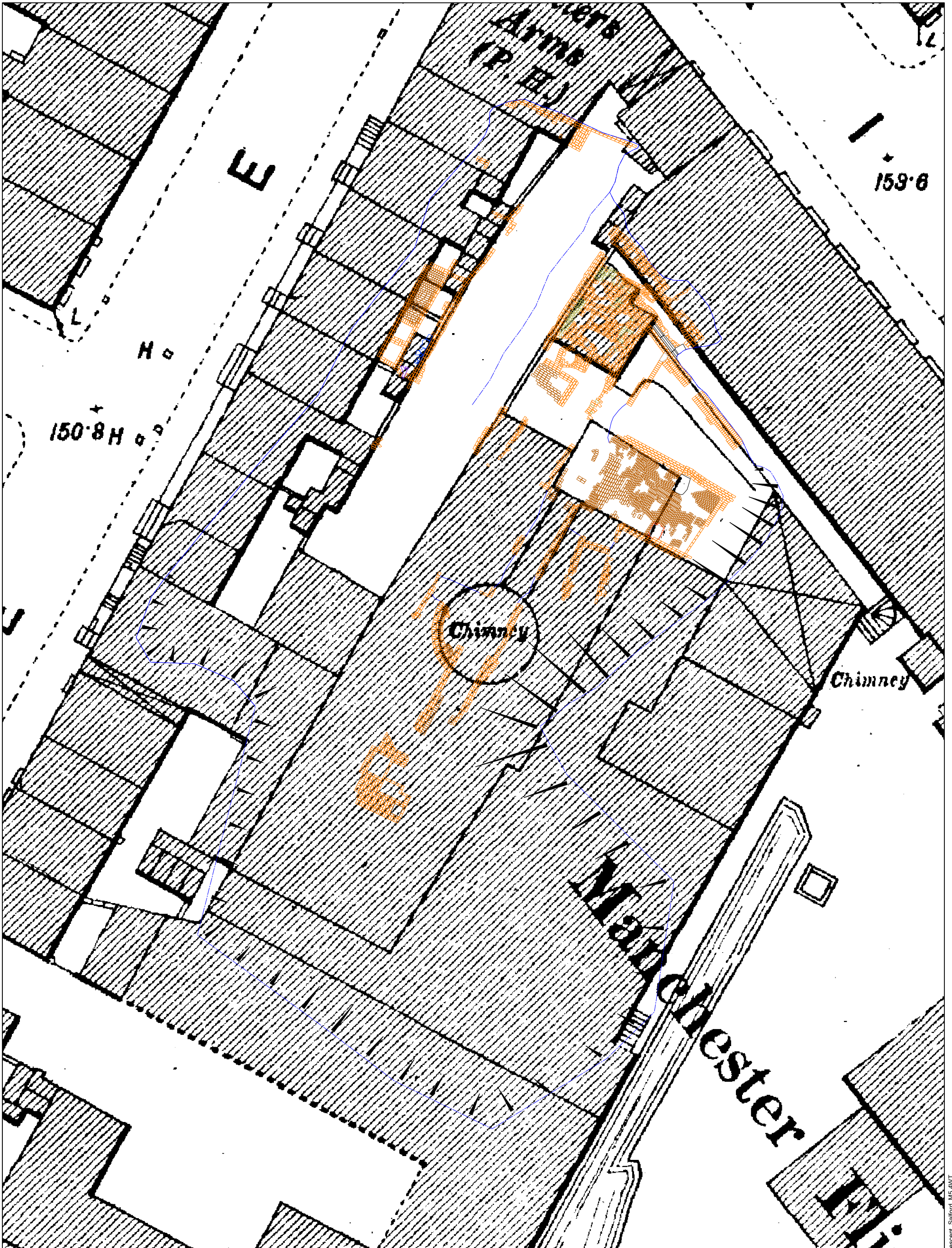


Figure 6:
Excavated remains superimposed onto the Ordnance Survey Town Plan of 1891

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	<p>Scale at A3 1:200</p>	Key:		
		<ul style="list-style-type: none"> █ Brick Wall █ Brick Surface █ Brick Structure 	<ul style="list-style-type: none"> █ Fire Brick █ Flags █ Stone 	<ul style="list-style-type: none"> █ Mortar █ Pipe

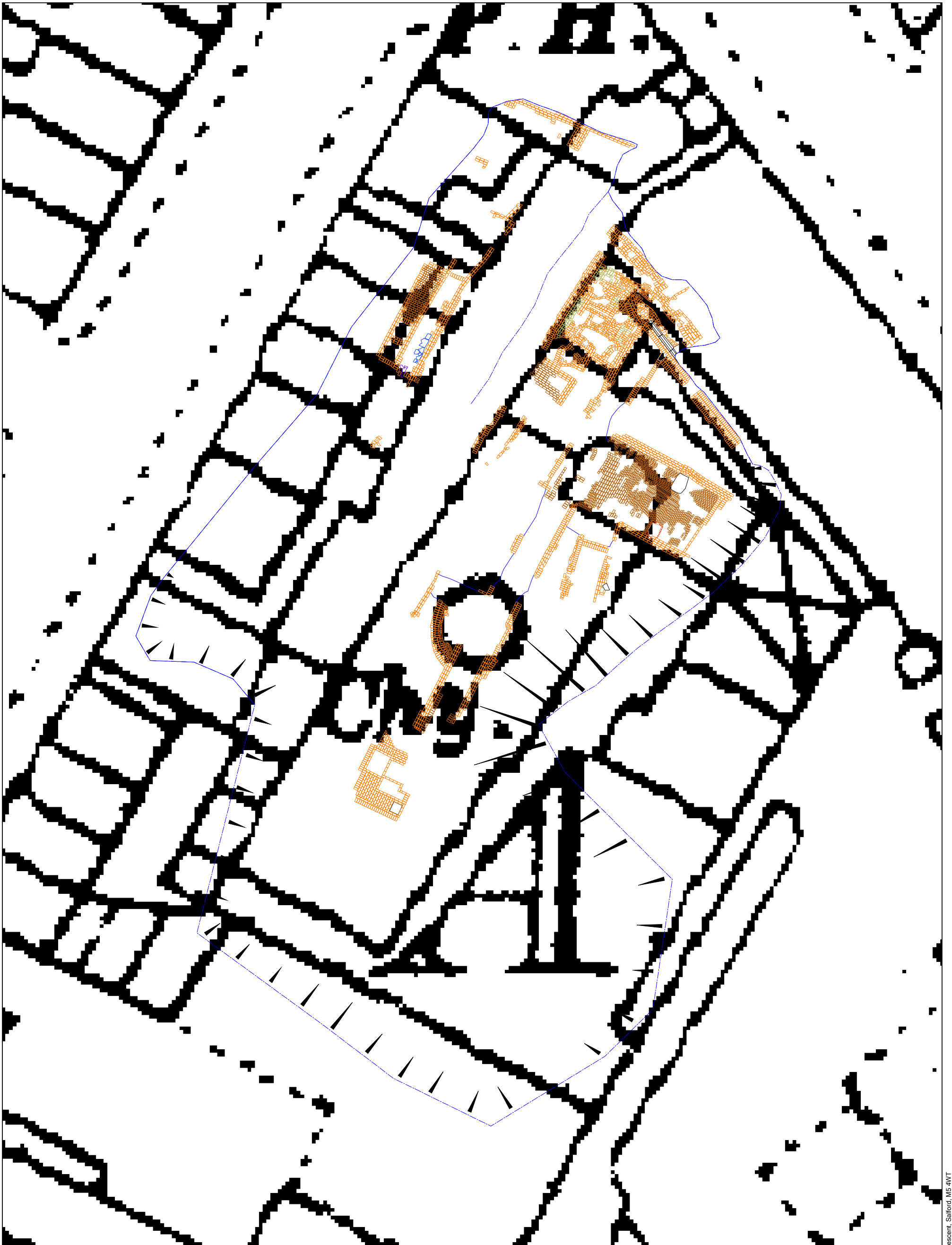


Figure 7:

Excavated remains superimposed onto the Ordnance Survey Town Plan of 1922

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Key:

- | | | |
|--|--|--|
|  Brick Wall |  Fire Brick |  Mortar |
|  Brick Surface |  Flags |  Pipe |
|  Brick Structure |  Stone | |

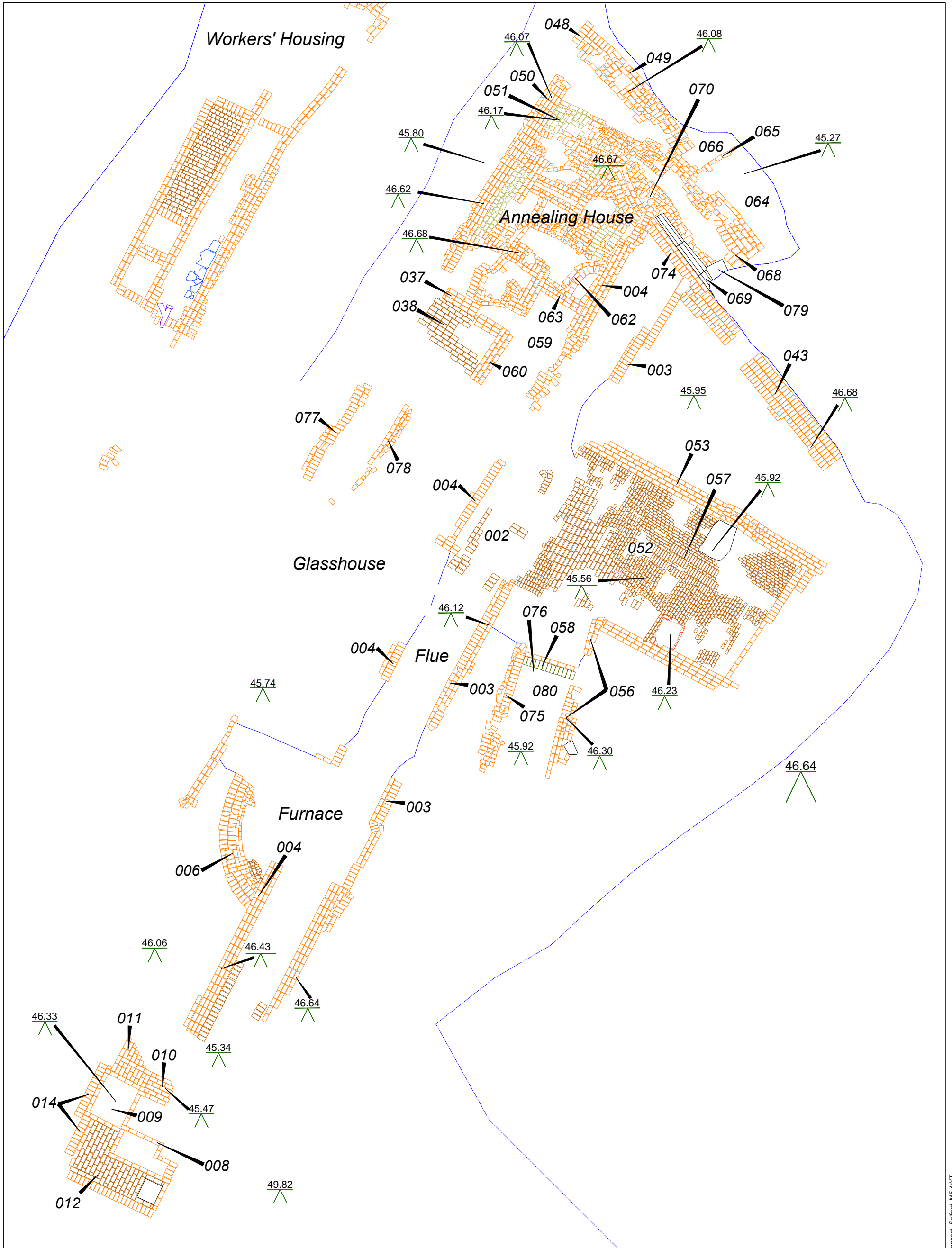


Figure 8:
Plan of the structural remains of the glassworks exposed in the excavation area



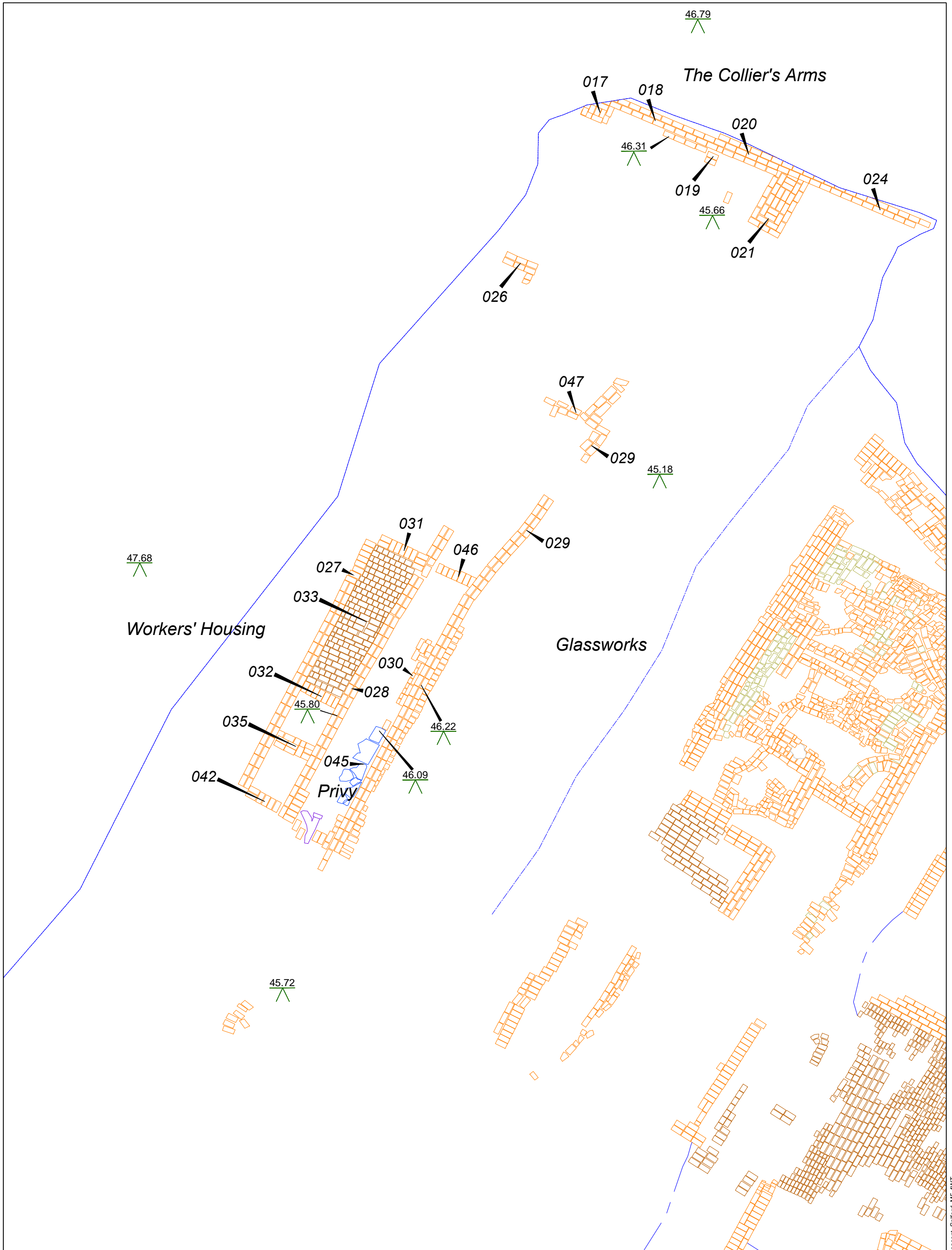


Figure 9:
Plan of the structural remains of the workers' houses exposed in the excavation area

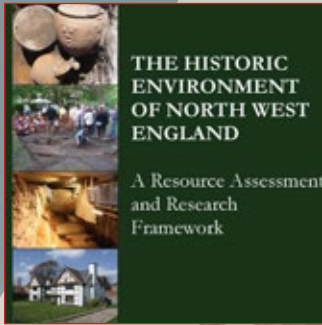


Key:

- Brick Wall
- Brick Surface
- Brick Structure
- Fire Brick
- Flags
- Stone
- Mortar
- Pipe



CONSULTANCY



DESK-BASED ASSESSMENTS



WATCHING BRIEF & EVALUATION



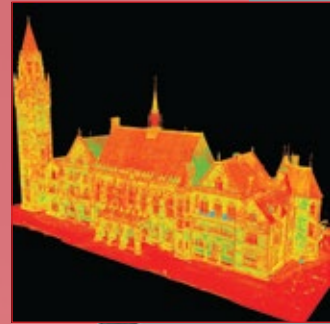
EXCAVATION



BUILDING SURVEY



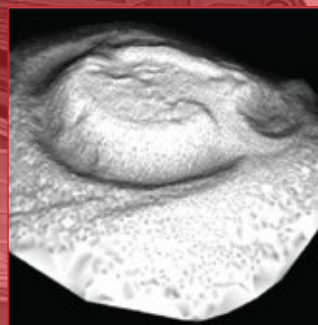
3D LASER SCANNING



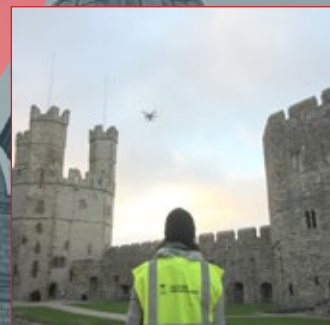
COMMUNITY INVOLVEMENT



LANDSCAPE SURVEYS



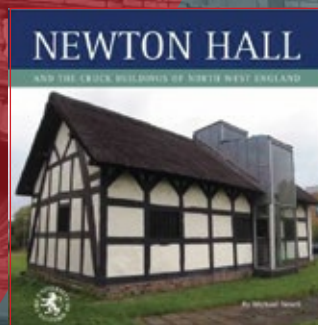
DRONE SURVEYS



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