

Smithfield Public Realm
Statement of Significance *Final draft*
Prepared for The City of London
January 2022



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Executive summary

This report has been commissioned by the City of London to support them in developing public realm improvements in and around Smithfield, as part of the Smithfield Public Realm Project, which aims to transform this part of the City into an exceptional civic space. The study area for the project encompasses the streets in and around the existing market buildings as well as those around the West Smithfield ramp, extending south towards Holborn Viaduct. The majority of the area is included in the Smithfield Conservation Area and includes several Grade I and Grade II* listed buildings as well as those listed at Grade II.

Historical development of Smithfield

Smithfield, particularly the area around the existing ramp, is a very old public space with a long history of trade and spectacular events dating back to the medieval period. Its historical development was influenced by its relationship to the City; immediately adjacent but not technically part of it (and therefore not subject to its rules of conduct). Smithfield's open space was preserved as the City developed around it in the sixteenth and seventeenth centuries and this initial development was largely saved from the Great Fire.

Smithfield was drastically altered in the mid-nineteenth century following the 1852 Smithfield Meat Market Removal Act (which authorised the removal of the livestock market to Copenhagen Fields in Islington) and the construction of the Central Meat Market in the 1860s to designs by the City Surveyor Sir Horace Jones. This, along with other infrastructure changes – the extension to the Metropolitan Railway (1860s) and the construction of Farringdon Road (1845–63) and Holborn Viaduct (1863–69) – imposed a linear, supra-structure on top of Smithfield's historic medieval public realm. This juxtaposition can still be experienced today.

In the twenty-first century the area south of Farringdon is being transformed by a series of large-scale projects; the launch of the Culture Mile in 2017, the opening of the new Crossrail interchange and the relocation of the Museum of London to the General Market site.

Historical development of street surfaces

Prior to the mid-Victorian period most streets were made up from gravel and dirt. On those busier and more important roads that did merit a surface, this took the form of irregular pebbles (cobble) with flat stone paths. Granite setts began to appear in the late eighteenth century but were not commonly found until the nineteenth century. These were often accompanied by York stone pavements with granite kerbs. Although granite setts were hard-wearing they had problems with noise and other roads surfaces – tarmacadam and wood blocks – were also used, although these had their own problems with durability, absorbency and were slippery when wet.

Smithfield's public realm today

The majority of the road surfaces within the study area are covered with asphalt with only Cock Lane, the Rotunda ramp and various entranceways at the eastern end of Charterhouse Street being visibly covered with granite setts. The pavements around the market buildings are predominantly asphalt (with granite kerbs) but those on other streets are generally York stone (with granite kerbs).

A ground-penetrating radar survey was carried out specially for this project, to investigate potential survival of older surfaces under the modern roadway. This survey indicates two locations near the General Market where historic setts appear to survive, both incomplete but up to approx. 60m in length.

Significance of Smithfield's public realm

Smithfield's public realm has two different but interlinked aspects to its significance. Firstly, the intrinsic heritage significance of the surviving historic fabric deriving from the quality of materials and the craftsmanship of how it was installed. Secondly, its contribution to the Smithfield Conservation Area, nearby listed buildings and the wider historic environment.

The granite setts on the West Smithfield ramp are statutorily listed at Grade II in their own right because of their aesthetic quality, extent of survival, high quality materials and craftsmanship. They have high intrinsic heritage significance and make a substantial contribution to the wider historic environment. Other areas of setts within the study area have moderate intrinsic heritage significance and make some contribution to the wider historic environment as, whilst they demonstrate some of these qualities they have either been re-laid with wider spacing (as on Cock Lane) or only fragments survive (as on Charterhouse Street). The other street surfaces in the study area – mainly asphalt but with several areas of modern granite setts – have no intrinsic heritage significance and make a neutral contribution to the wider historic environment.

Pavements across the study area have been consistently and substantially altered, so even though moderately significant historic fabric may survive (such as mid-nineteenth century York stone pavements with narrow granite kerbs), in almost all cases it is fragmentary in nature. Having said this, York stone is an historically appropriate material and the prevalence of it, particularly in the southern part of the study area, makes some contribution to the wider historic environment. Asphalt pavements, which dominate around the market buildings, variously make a neutral contribution or actively detract from the wider historic environment depending on their relationship with nearby heritage assets. For example, the asphalt pavement in the Central Avenue is considered to actively detract due to its current condition and the lack of distinction between the carriageway and the pavement.

Key principles for change

1. The character of historic surfaces comes from the intrinsic qualities of the materials and the way they are laid. Natural stone – particularly granite – is not only durable but has unique properties of texture and colour. Variation from one sett to the next – sometimes subtle – is part of this character.
2. The way that setts were laid created patterns. Patterns arise from the routes marked out and, at a smaller scale, from techniques of construction and drainage. In this way, the designed appearance is a reflection of practical matters and human use.
3. Surviving areas of historic surfaces contribute to the special character of the conservation area and should be retained where possible. The setted carriageway of the Rotunda is especially high in quality. Cock Lane is less well preserved but retains some historic character.
4. Most carriageways are now in asphalt and it would be beneficial to reintroduce more interesting surfaces based on historic character. These would be effective on older streets such as Hosier Lane, but would be most effective as a more extensive network of spaces.
5. York stone pavements and granite kerbs do not have the rarity value of granite setts but generally contribute positively to historic character. These elements range in date and can be quite recent. They are not precious individually, but in their totality help to reinforce historic character.
6. The Smithfield public realm is not just about surfaces, but incorporates individual elements, from the listed drinking trough to smaller ironwork goods. The cast iron covers of manholes, coal holes and drains are usually not significant individually, but have a robust character and patina that contributes positively.
7. The survival of high quality surfaces is usually threatened by the need for utilities companies to undertake works periodically. This affects new surfaces as well as old. This risk should be taken into account in the planning and design process, to consider whether there are any potential strategies to mitigate this problem.
8. The historic surfaces of the Smithfield public realm are not unique, but are part of a common language that was used across London. In developing ideas for enhancement, it is legitimate to look at other locations that are well preserved, such as Covent Garden or the mews streets of Kensington, to seek inspiration for ideas.

1.0 Introduction

1.1 Purpose and context

This report has been commissioned by the City of London to support them in developing public realm improvements as part of the Smithfield Area Public Realm Project, which aims to transform this historic part of the City into an exceptional civic space and new destination for visitors. The project aligns with other key developments in the area, namely:

- The redevelopment of the General, Annex and Poultry market buildings into a new Museum of London
- The redevelopment of the Central Smithfield Meat Market buildings into a new visitor destination
- The delivery of Culture Mile: a new destination and creative heart of the City, covering the Smithfield and Barbican areas
- The delivery of the City Transport Strategy, which includes a Healthy Street approach to Smithfield.

In order to inform the new public realms designs the City is undertaking a series of research activities to allow for a thorough understanding of the current area; of which this Statement of Significance is one.

1.2 Structure

This report is divided into six sections:

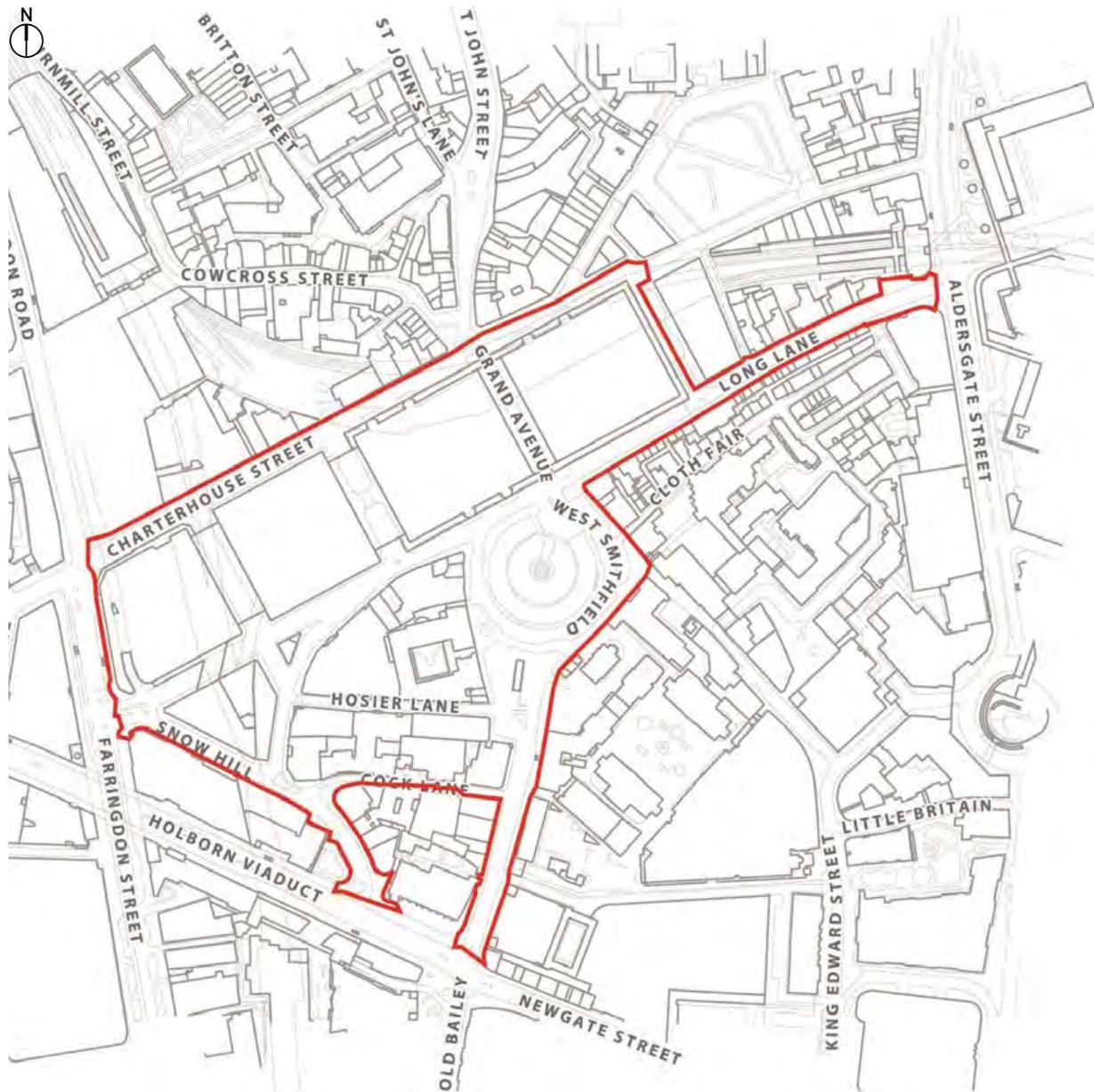
- The preceding executive summary
- This introduction (1.0)

- A summary of the current understanding of the public realm at Smithfield including a summary history of area, a summary of surfacing materials and a consideration of its character today (2.0)
- An assessment of significance including both the intrinsic significance of elements of the public realm as well as their contribution to nearby listed buildings and the Smithfield Conservation Area (3.0)
- Examples from different locations that illustrate broad issues relevant to Smithfield (4.0)
- Key principles for enhancement based on the findings of this report (5.0)
- Supporting information including sources, policy and guidance (6.0).

1.3 Methodology and limitations

This report is based on desktop research and site visits conducted in April 2021. It draws on Alan Baxter's previous work in the area including on the Central Meat Market. It does not deal explicitly with the question of below-ground archaeological interest or potential.

The conclusions and any advice contained in our reports — particularly relating to the dating and nature of the fabric — are based on our research, and on observations and interpretations of what was visible at the time of our site visits. Further research, investigations or opening up works may reveal new information which may require such conclusions and advice to be revised.



1.4 The study area

The study area for this project is shown in Figure 1. This includes the following streets:

- Charterhouse Street
- Long Lane/West Smithfield
- Lindsey Street
- Grand Avenue
- East Poultry Avenue
- West Poultry Avenue
- Hosier Lane
- Smithfield Street
- Cock Lane
- Giltspur Street
- Snow Hill

The boundary between the City of London and the London Borough of Islington runs down the middle of Charterhouse Street. However, the boundary for this study incorporates both sides of the street.

Fig. 1: Study area

1.5 Designations

There are many heritage assets both within and immediately adjacent to the study area. These are shown in Figure 2 and the most relevant are listed below.

1.5.1 Statutorily listed buildings

Grade I

- St Bartholomew the Great
- St Bartholomew's Hospital: The Gatehouse
- St Bartholomew's Hospital: North Block; East Block; West Block
- Church of St Sepulchre

Grade II*

- East building of Central Market (this covers the both the west and east buildings of the Central Meat Market)
- Gateway to Church of St Bartholomew the Great
- St Bartholomew's Hospital: Screen Wall and Colonnade
- St Bartholomew's Hospital: Church of St Bartholomew the Less

Grade II

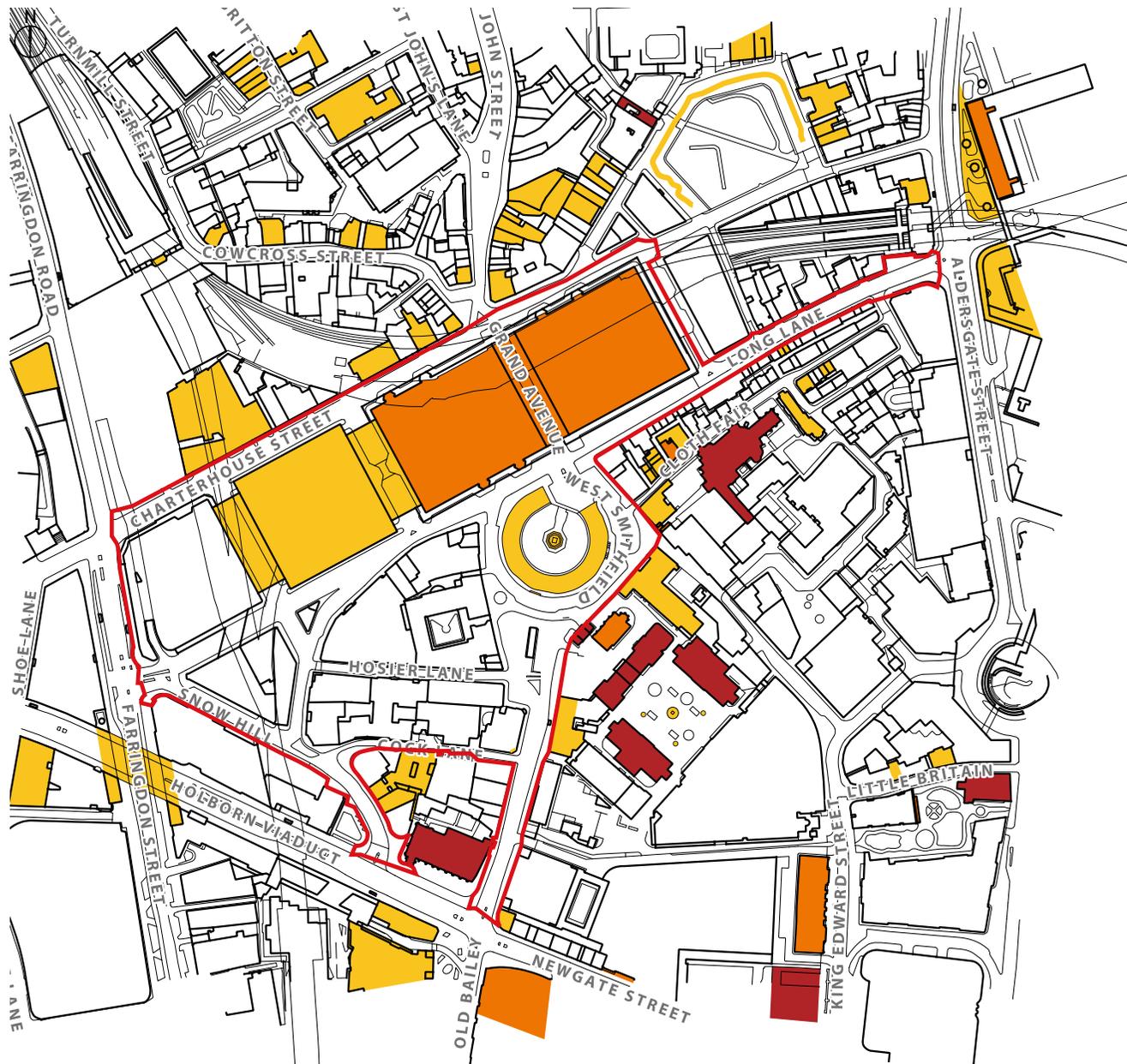
- Smithfield Poultry Market
- Nos. 74 & 75 Long Lane
- St Bartholomew House
- Drinking Fountain in the centre of gardens
- West Smithfield Ramp

- St Bartholomew's Hospital Medical School
- The Golden Boy of Pye Corner
- No. 4 Snow Hill
- Snow Hill Police Station
- The Viaduct Public House
- Double cattle trough
- Six telephone kiosks (three K2 and three K6)

1.5.2 Conservation areas

The following conservation areas are either include within the study area or are immediately adjacent to it:

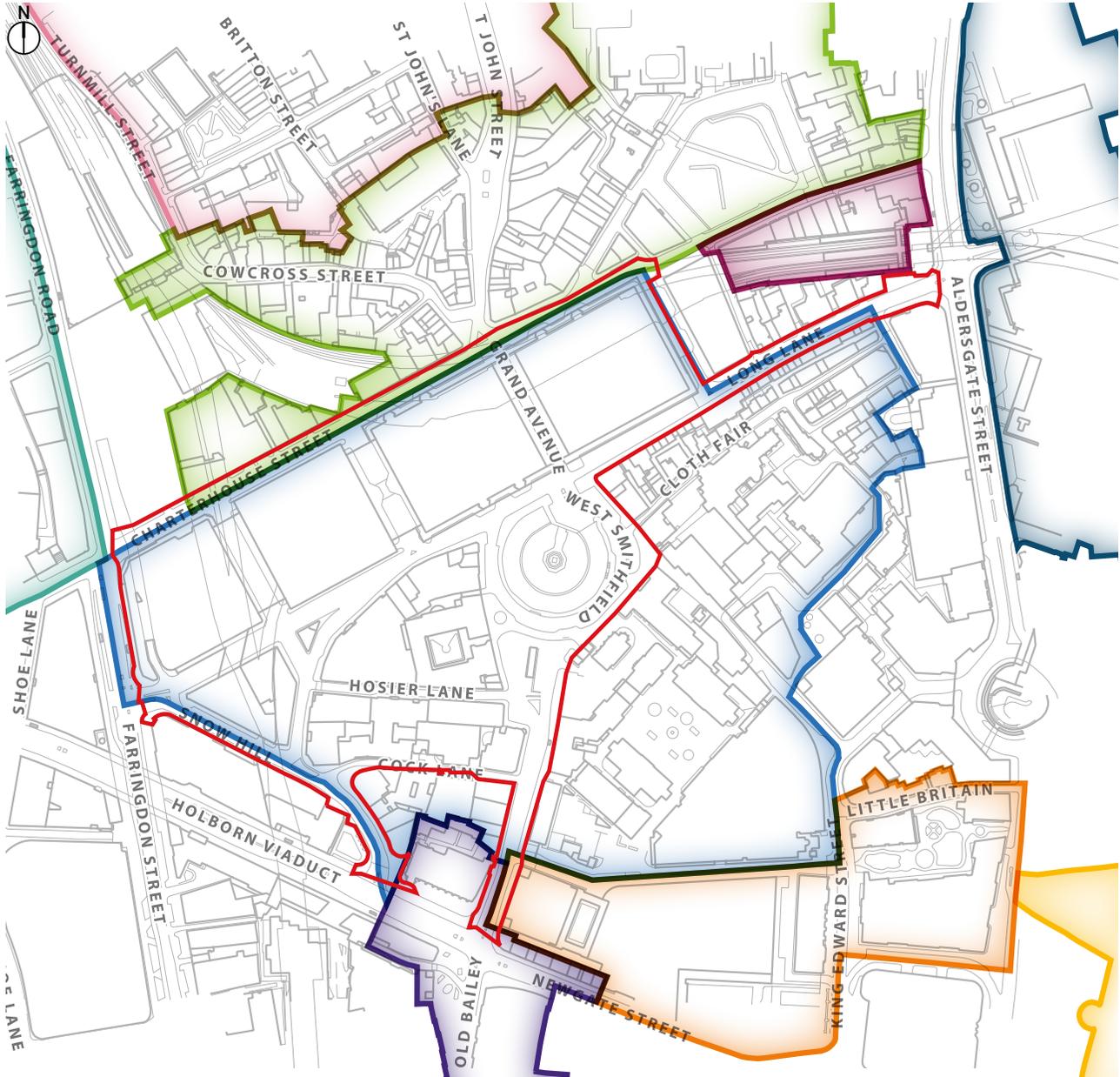
- Smithfield Conservation Area (City of London)
- Postman's Park (City of London)
- Newgate Street (City of London)
- Charterhouse Square (LB Islington)



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- Grade I listed
- Grade II* listed
- Grade II listed
- Site boundary

Fig. 2: Statutorily listed buildings



© Alan Baxter

- Smithfield
City of London
- Postman's Park
City of London
- New Gate Street
City of London
- Charterhouse Square
City of London
- Barbican and Golden Lane
City of London
- Foster Lane
City of London
- Charterhouse Square
Islington Borough
- Clerkenwell Green
Islington Borough
- Hatton Garden
Islington Borough
- Site boundary

Fig. 3: Conservation areas

2.0 Understanding Smithfield

2.1 Historical development of Smithfield

2.1.1 Introduction

There is a substantial amount of existing scholarship about the history of Smithfield, and about the history of the meat markets in particular. The following sections offer a brief summary, in order to set the context for the rest of the report, and they draw on the following documents, which should be consulted for a more in-depth history of the area:

- City of London *Smithfield Conservation Area – Character Summary & Management Strategy SPD* (September 2012)
- City of London *Smithfield Meat Market – Statement of Significance & Opportunities* (February 2019)
- Julian Harrap Architects *West Smithfield Market, London – Conservation Plan* (December 2019)

2.1.2 Historical development of Smithfield - key themes

Smithfield, particularly the area around the rotunda, is a very old public space with a long history of trade (of livestock, horses and cloth) and spectacular events (such as tournaments, pageants and executions). Its historical development and current character have been informed by this but also by two other key themes. The first is Smithfield's location; close to the City of London but outside of it. This has meant that its development is both intrinsically linked to the history and development of the City but also separate from it, as the fact that it was outside of the City walls allowed activities to take place here that were not allowed in the City proper. Finally, the area's public realm has a very unique morphology borne of the relationship between surviving layers of its history; the winding medieval alleyways associated with the livestock trade are intersected by the larger-scale and more linear Victorian road and railway infrastructure (see [Fig. 4](#)). These factors are singular to the Smithfield area and are what make it so unique and special.



Fig. 4: West Smithfield, corner of Hosier Lane, with cobbled streets (from J. T. Smith, Antient Topography of London, 1815)

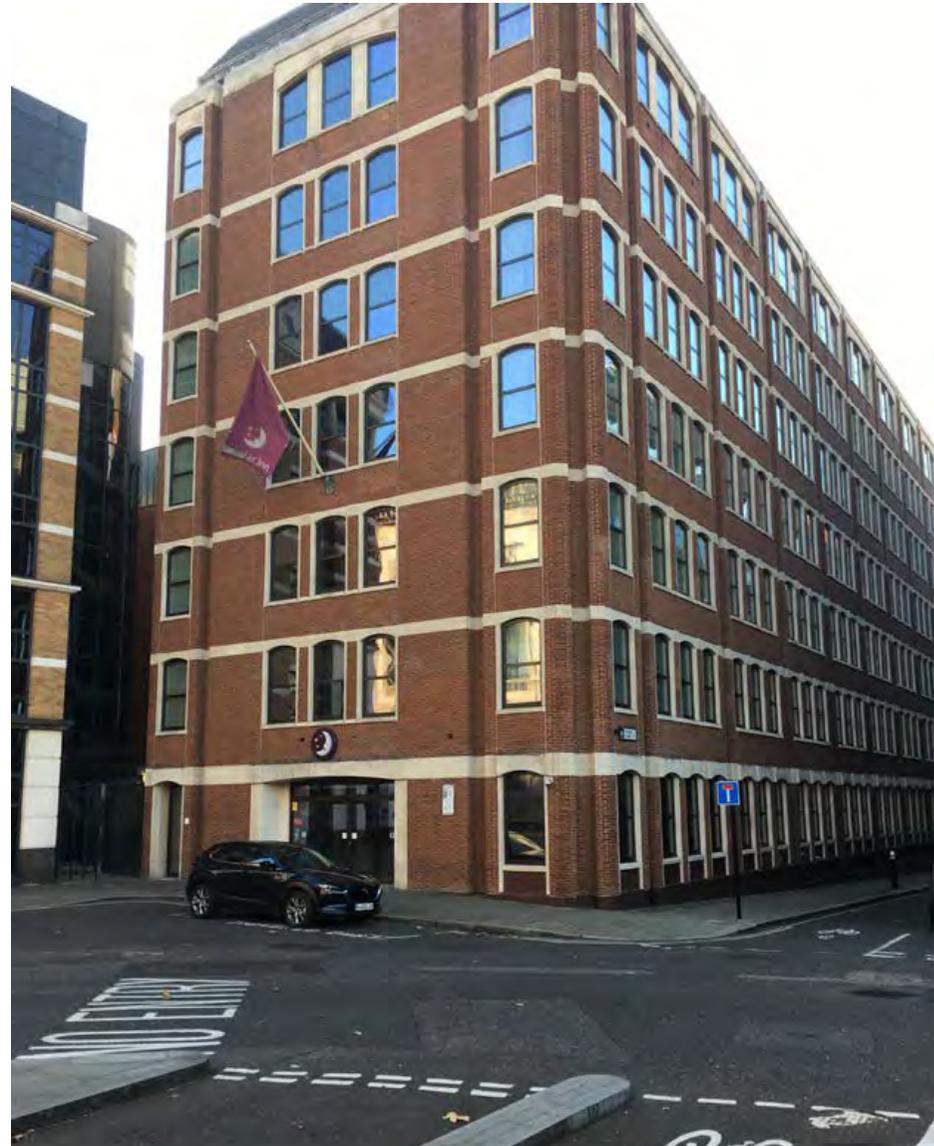


Fig. 5: The same location today, with kerbs for cycle routes

2.1.3 Medieval Smithfield

St Bartholomew's Priory and the Bartholomew Fair

- 1123 – priory and hospital founded at Smithfield.
- 1133 – Bartholomew Fair (annual three-day fair) established.

Livestock market

- Livestock trading is known to have occurred at Smithfield since at least the tenth century.
- A formal charter was granted for a weekly market in the fourteenth century.

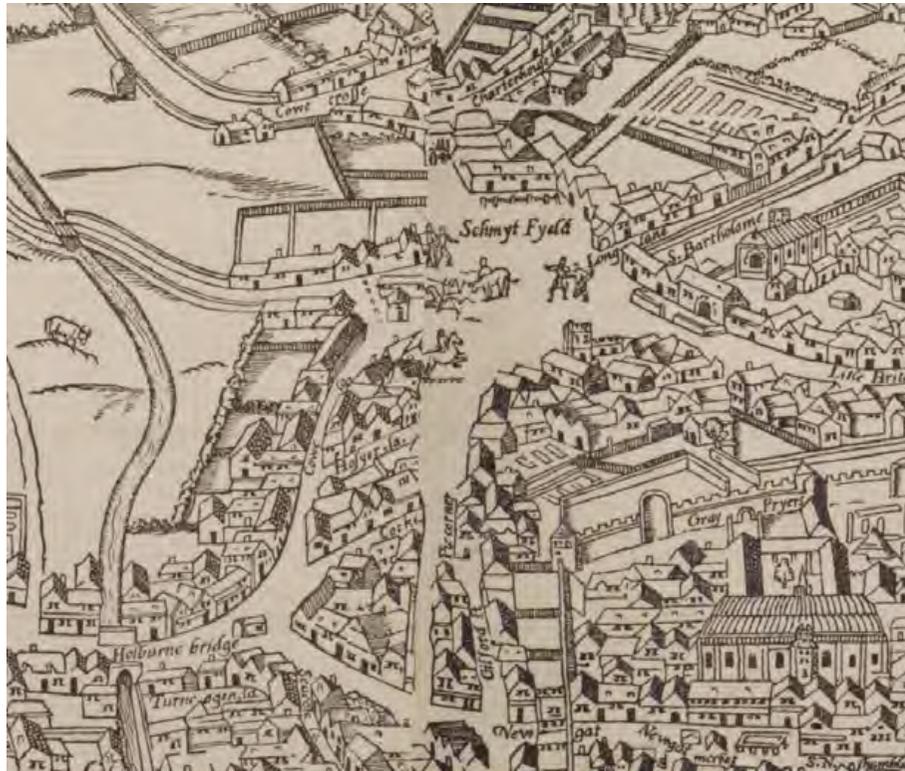


Fig. 6: 'Agas' Map map of London, c. 1561

- 1381 – slaughtering was banned within the City walls.
- Pre-existing tracks or drove ways (to transport livestock) influenced both the pattern and names of streets in the area i.e. Cock Lane, Cow Cross Street.

Executions and tournaments

- The open space of Smithfield was also used for executions and tournaments during the fourteenth and fifteenth centuries including the execution of Sir William Wallace in 1305.

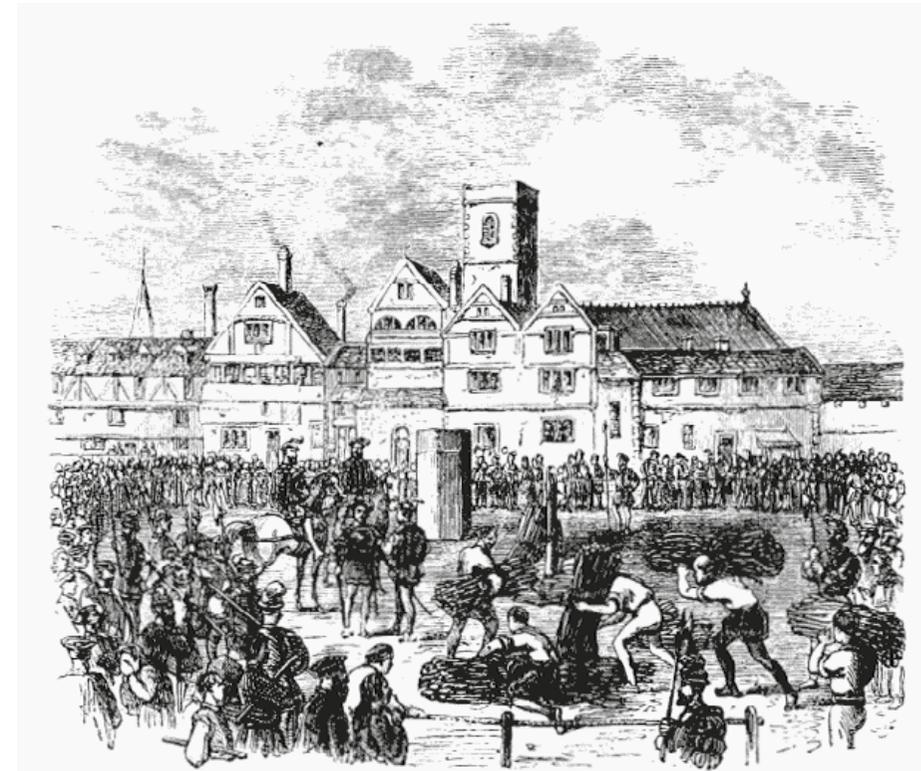


Fig. 7: Place of Execution in Old Smithfield (taken from Old and New Smithfield, 1878)

2.1.4 Smithfield from the sixteenth to the eighteenth century

- Smithfield remained an important open space as London developed around it in the sixteenth and seventeenth centuries.
- Smithfield was largely saved from the Great Fire by its proximity to the City Wall and a change in the wind direction when the Fire reached Holborn
- The Golden Boy of Pye Corner marks the spot where the Fire was finally extinguished.
- 1614–15 – the open space at the centre of Smithfield was paved and drainage provided for the first time.



Fig. 8: Wenceslaus Hollar's map of London, 1666 showing the extent of the Great Fire



Fig. 9: Old Smithfield Market (from Old and New London, 1878)



Fig. 10: Cattle pens of the old market, illustrated 1859 (Memoirs of Bartholomew Fair)

- This evocative image is taken from *Memoirs of Bartholomew Fair*, a compendium of stories of old Smithfield. It shows the market area at night, lit by gas lamps. St Bartholomew's Hospital is to the left and in the centre is the steeple of St Sepulchre-without-Newgate. The artist has depicted the repeating rows of timber bollards and fences, which kept the cattle penned in for inspection by prospective buyers. The surfaces appear to include irregular cobbles. This may have been artistic license. A photograph taken around this time shows regular setts instead (see [Fig. 13](#)).

2.1.5 Nineteenth century Smithfield

A new meat market

- 1849 – Royal Commission recommended the livestock market be removed from Smithfield.
- 1852 – Smithfield Meat Market Removal Act authorised the livestock market’s move to Copenhagen Fields (north of Islington).
- 1855 – Bartholomew Fair suspended.

- 1860s – Central Meat Market (for slaughtered meat) constructed to designs by City Surveyor Sir Horace Jones. The interior avenues of the market building were paved with wooden blocks. Stock from all over the country was brought in via the Great Western Railway’s goods depot (and through station) at basement level. However, meat only accounted for a fraction of the goods handled by this depot and a separate ramp was constructed for delivery vehicles to transport these other goods across London.
- 1873 – Meat Market enlarged to the west by the construction of Jones’ Poultry Market.



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Fig. 11: Ordnance Survey map, surveyed 1873



© Historic England

Fig. 12: West Smithfield, early C20th

- 1879 – General Market (selling fruit and vegetables) constructed, extending the market complex to Farringdon Street.

Infrastructure changes

- 1860s – Extension to the Metropolitan Railway constructed between Farringdon and Moorgate.

- 1866–1916 – Branch line south from Farringdon through Snow Hill Tunnel constructed (re-used by Thameslink in 1986).
- 1845–63 – Farringdon Road constructed
- 1863–69 – Holborn Viaduct constructed.
- c. 1870 – Present alignment of Snow Hill and Charterhouse Street constructed.



© Getty images

Fig. 13: Fences to separate cattle from people, before the works, c. 1860



© Historic England Archive

Fig. 14: Long Lane after the works, c. 1890

2.1.6 Twentieth century Smithfield

- There is evidence in the London Metropolitan Archives (LMA) of contracts for wood block carriageways on Charterhouse Street (1900; 1903), Snow Hill (1902), Central Avenue (1905), West Smithfield (1912) and Lindsey Street and West Smithfield (1933). There is also reference to the laying of York stone pavements on West Smithfield and Lindsey Street (1906) and a portion of West Smithfield being re-laid with granite setts (1912). Although it is unknown whether all or just some of these contracts were carried out, they offer a sense of the materials commonly used at the turn of the twentieth century.

- Smithfield General Market damaged by V2 rocket in 1945. Hart’s corner remodelled.
- Poultry Market was destroyed by fire in 1958. Replacement constructed by the Corporation to design of Sir Thomas Bennet in 1962–63.



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Fig. 15: Ordnance Survey map, 1914



© Historic England Archive

Fig. 16: West Smithfield, 1921

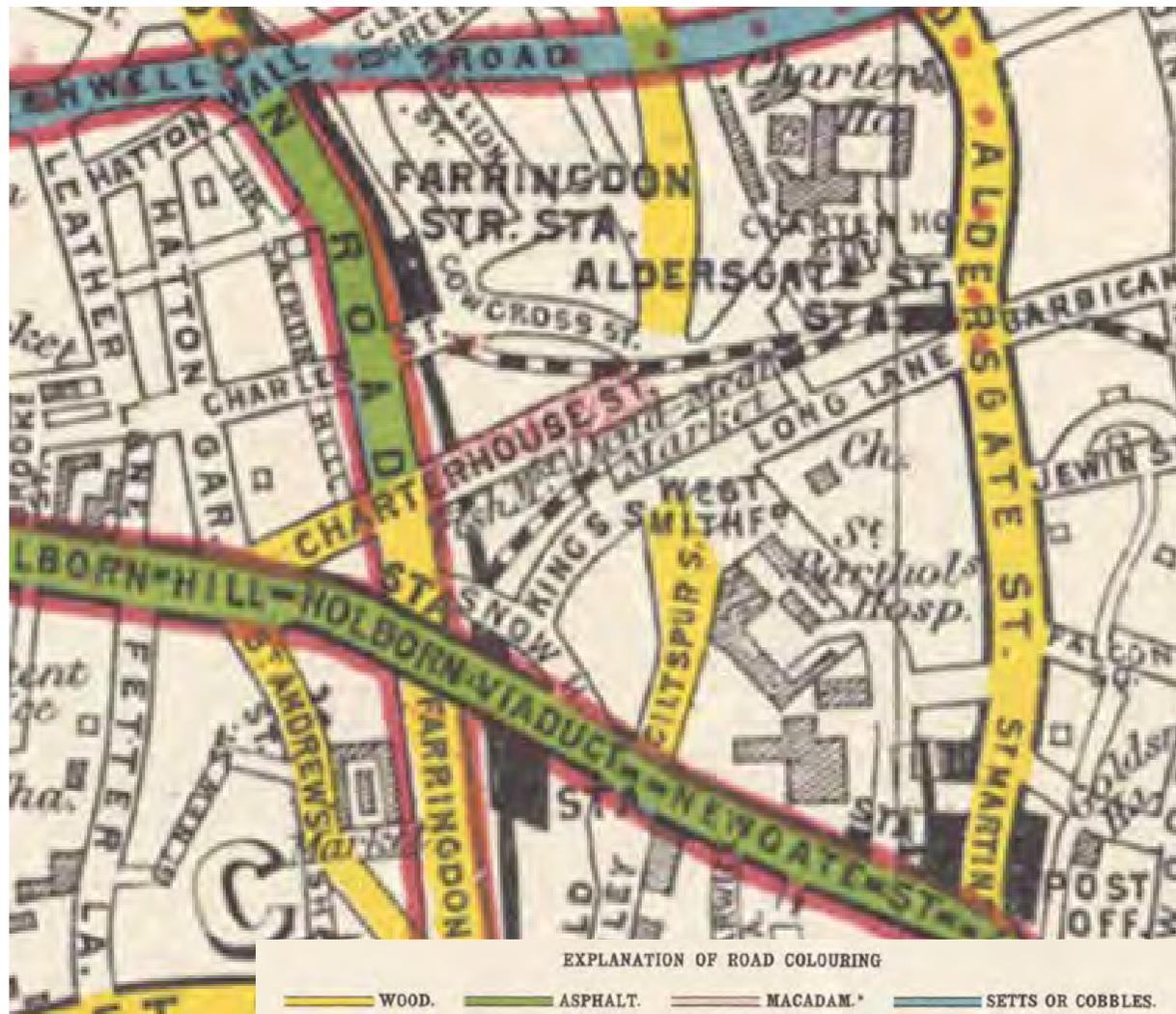


Fig. 17: Bartholomew's road surface map of London, 1906

- Bartholomew's Road Surface Maps also offer some insight into potential road surfaces in the first half of the twentieth century. The 1906 map suggests that Giltspur Street was paved with wooden blocks and the western end of Charterhouse Street was surfaced with tarmacadam. A subsequent map dating from 1928 suggests that the western end of Charterhouse Street had been resurfaced with wood blocks and the western end of West Smithfield into Snow Hill paved with granite setts.



Fig. 18: Charterhouse Street, 1920

2.2 Historical development of surfacing materials in London

In contrast to the history of Smithfield, which has a substantial amount of scholarship, relatively little is known about the history of public realm surfacing. This section offers a short summary of the broad development of road and pavement surfacing in London, drawn from two sources in particular:

- Roger Bowdler's *Granite Setts – Surviving Historic Street Surfaces in Charterhouse Square, L.B. Islington & Ballast Quay, L.B. Greenwich* (2000)
- Historic England *National Heritage List Entry – Setted Street Surface (1393770)* (2010).

2.2.1 Overview

Most streets prior to the mid-Victorian period were made up from gravel and dirt. On those busier and more important roads that did merit a surface, this took the form of round boulders or large, irregular pebbles (known as cobbles). The first regulation for street surfacing dates to after the Great Fire: for example, in 1671 *An Act of Common Council: together with certain orders, rules and directions touching the paving and cleansing the streets, lanes and common passages within the City of London, and liberties thereof: and other things relating thereunto* specified cobbles for main streets with flat stone paths. The eighteenth century saw a series of further Paving Acts including the 1766 London Paving and Lighting Act that authorised the City of London Corporation to establish footways of Purbeck stone raised above the street level and edged with kerbs. Granite kerbstones began to appear from the mid-nineteenth century onwards, pedestrians previously having been protected by simple posts positioned between them and the traffic.

Granite setts as a road surface began to appear in the later eighteenth century but was not commonly found until the next century. Although granite setts were hard-wearing they also had problems with noise and dirt collecting in the gaps between setts. To try and address these issues, two other methods of road surfacing were developed. From the mid-nineteenth century both tar (tarmacadam) and wood blocks were trialled to reduce dust and loose stones and to produce a quieter and smoother surface. The success of these innovations was mixed. Whilst they were successful in reducing dust and noise they were also less hard-wearing, slippery when wet and, in the case of wood blocks, absorbent of undesirable materials.

2.2.2 Materials

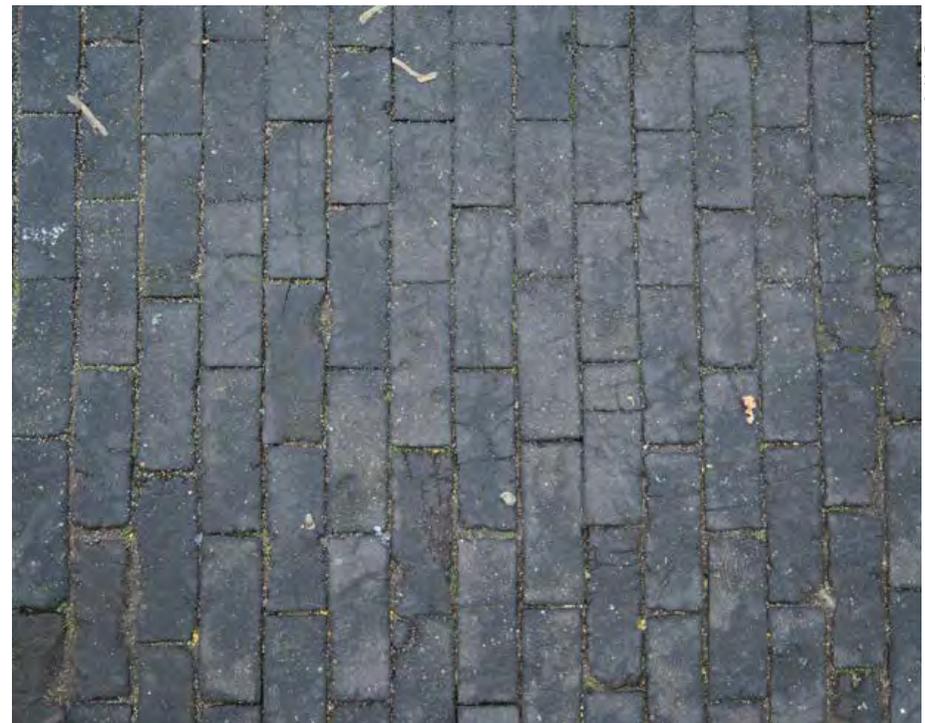
Road surfaces

Stone cobbles and later granite setts originated from a variety of locations both across the UK and abroad including the Channel Islands, Cornwall, Mountsorrel (Leicestershire), the Midlands, the Lake District, Lowland Scotland and Aberdeen (see Fig. 23; the red areas represent granite). The diversity of sources for granite setts resulted in a wide variety of colours and differences in visual appearance. The geographical spread of the trade was largely driven by improvements in transport during the nineteenth century although, shipping continued to remain the most important method of distribution and by the end of nineteenth century granite (as well as wood blocks) were being shipped from Scandinavia and Australia.



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Fig. 21: Granite setts dating to the 1860s (with potentially earlier examples), Charterhouse Square (2021)



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Fig. 22: Wooden blocks on Chequer Street (2021)

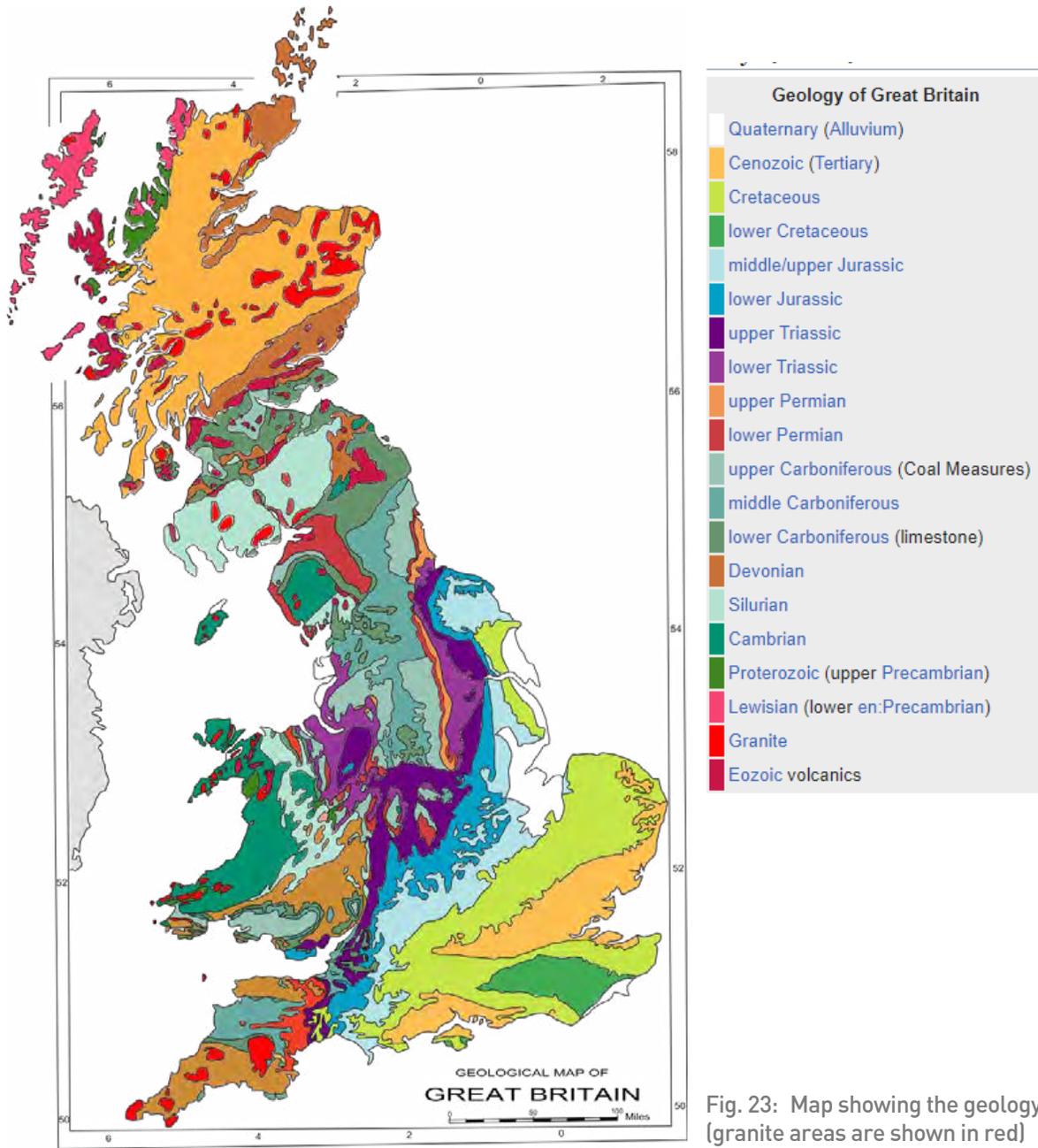


Fig. 23: Map showing the geology of Britain (granite areas are shown in red)

Pavements

Purbeck stone was used for pavements up until the early nineteenth century, with Kentish ragstone as a more locally available alternative. Both were usually bedded in gravel from the Thames basin. Canal-borne York stone became increasingly popular from the late eighteenth century onwards and by the 1830s had virtually replaced Purbeck as the principal paving material. Portland stone was also used for paving but it was considerably more expensive.



Fig. 24: York stone paving with granite kerbs dating to the 1860s, Charterhouse Square (2021)

2.2.3 Dimensions and construction

The nineteenth century saw the development of a more formalised process of carriageway and pavement surfacing. This was driven by both greater consistency of approach and the growth of large contractor firms of expert craftsmen.

Greater consistency in the approach to street surfacing was advocated by individuals such as engineer Thomas Telford who, in 1824, wrote a report advocating that roads should be laid on a foundation of broken stone or concrete upon which should be placed rectangular paving stones of granite, worked flat on the face and straight and square on the sides so as to join close, grouted with lime and sand (Historic England, 2010). Telford also suggested different sizes of stones for different classes of streets, ranging from four to seven inches wide and seven to thirteen inches long. The Metropolitan Board of Works used Telford's system in many streets laid out in the 1860s.

The mid-nineteenth century saw a major campaign to re-surface London's streets, triggered in part by the proliferation of metropolitan improvements. New arterial routes were generally surfaced with granite setts as the road surface needed to be highly durable to cope with the volume of traffic. Granite setts, as opposed to cobbles, required greater human input as they had to be squared off by hand. Although the length of individual setts could differ substantially, the width of the setts needed to be regular enough to be able to be laid close together in precise rows in order to create a smooth, durable street surface. This required a high level of skill and craftsmanship and the work was often undertaken by trained stonemasons. The growth of large infrastructure projects in the Victorian period went hand in hand with the increasing professionalism of the building trades and the appearance of large contractors capable of laying surfaces efficiently and to a high standard.

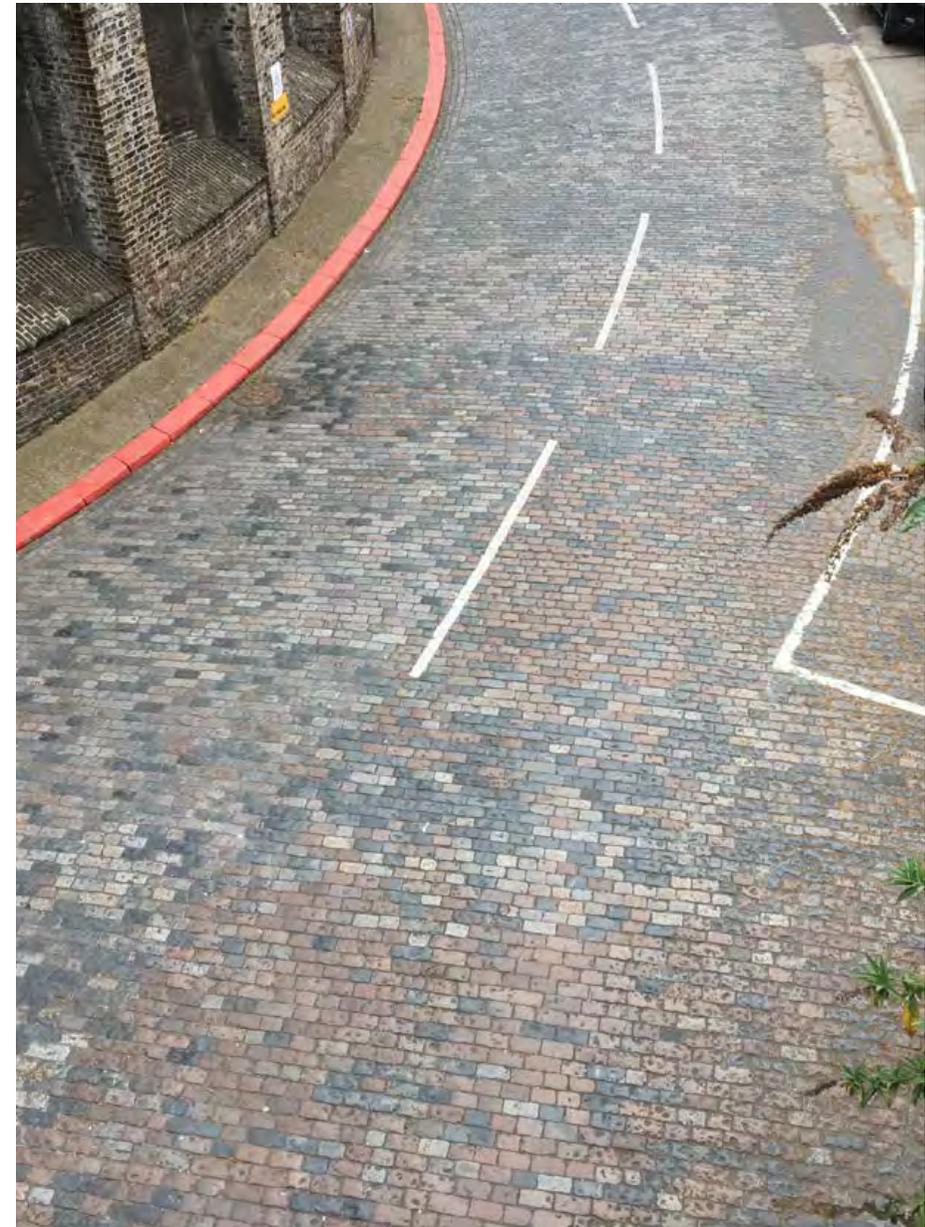


Fig. 25: Granite setts dating from the 1860s, West Smithfield rotunda (2021)

2.3 Smithfield today

2.3.1 Summary

The character of Smithfield's public realm today is a direct result of its historical development: Victorian, linear, large-scale infrastructure juxtaposed with the surviving, winding, narrow medieval street pattern (see [Fig. 26](#)). This is most obvious in two places: firstly, in the open space of West Smithfield and secondly, at the junction between Charterhouse Street, Cowcross Street and St John's Street. West Smithfield has, as set out in [Section 2.2](#), historically always been an urban open space. However, its northern end was transformed with the construction of the Central Meat Market and now the prevailing experience of West Smithfield is as a utilitarian appendage to the market complex rather than the social and commercial centre of the surrounding streets (as it was when the livestock market and Bartholomew Fair were present). The central focus of this space is the view north from Little Britain towards the Central Meat Market – across the surviving open space – rather than the open space itself. The view looking south from the northern end of historic Smithfield has also been dramatically altered by the construction of the Central Meat Market buildings. The winding, medieval lanes of Cowcross Street and St John's Street would historically have opened out onto the open space of West Smithfield but this view is now terminated by the architectural focus of the Grand Avenue.

The construction of the Meat Market buildings over the second half of the nineteenth century did not just alter the streetscape but also what was underneath it and the proliferation of railway tunnels and sidings, as well as the basements of the Meat Market buildings themselves, survive today. This means that Smithfield's existing public realm is not entirely formed on solid ground but is part of a wider cross-section that incorporates the Meat Market buildings above, the public realm fabric at street level, and a complex arrangement of basement vaults and railway tunnels below. Therefore, the public realm that this report is concerned about is, in reality, only a very thin slice of Smithfield's built fabric.

2.3.2 Road surfaces

[Fig. 27](#) maps the current road surface treatments in the study area, the majority of which is asphalt. However, this may hide previous, older treatments such as granite setts (see [Section 2.3.6](#)).

- Historic granite setts survive in three areas:
- West Smithfield Rotunda ([Fig. 25](#))
- Cock Lane ([Fig. 30](#))

Various entranceways at the eastern end of Charterhouse Street ([Fig. 26](#))

Those on the Smithfield rotunda and the various entranceways along Charterhouse Street likely date to the opening of the market and the associated reconfiguring of the public realm. Those on Cock Lane and the section further along Charterhouse Street (Location A on [Fig. 27](#)) may date to later in the nineteenth-century. More modern granite setts are also present in five locations (see [Fig. 29](#); [Fig. 27](#) for locations).

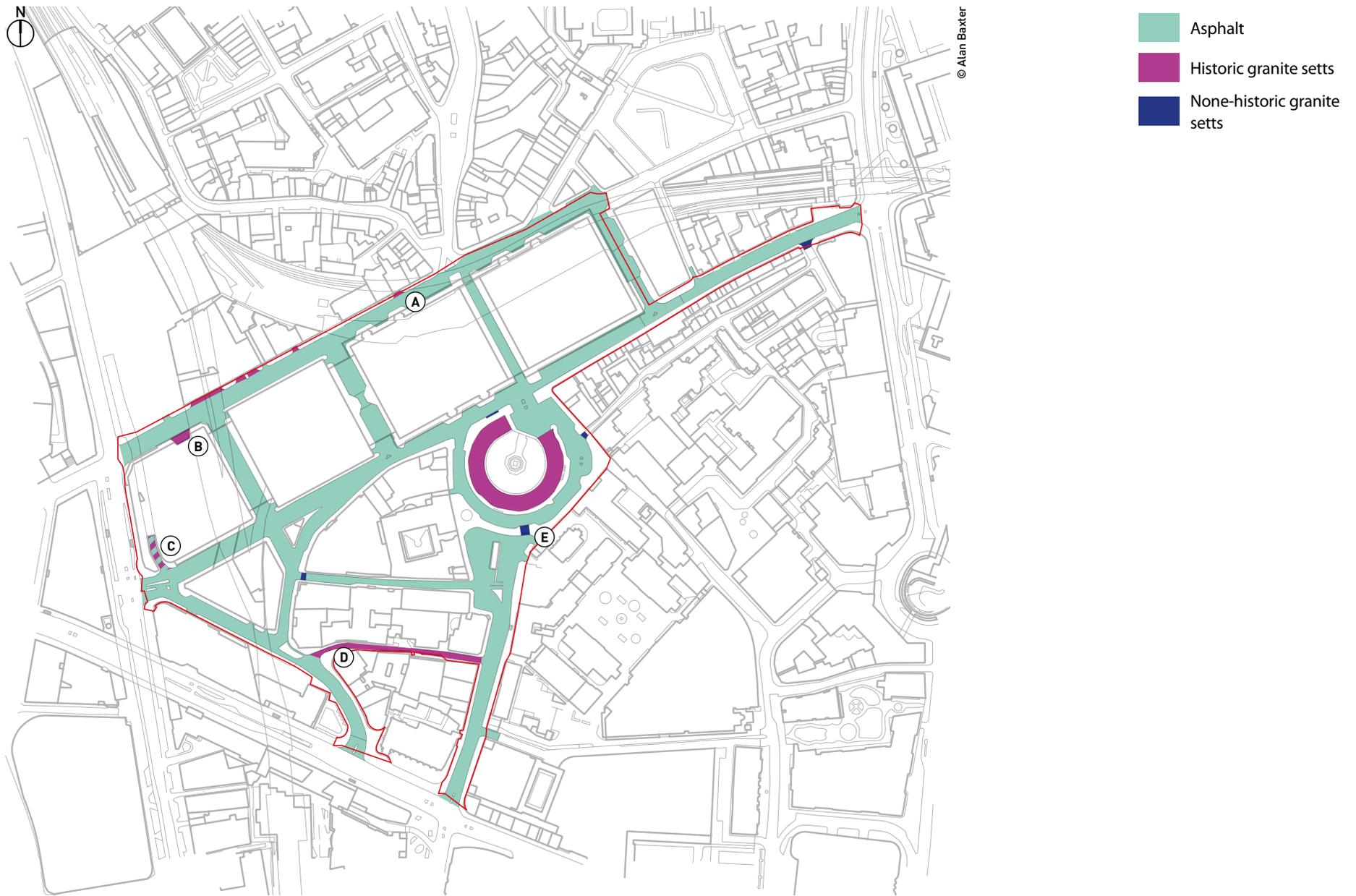


Fig. 27: Existing road surfaces in the study area



Fig. 28: North side of Charterhouse Street (Location A on Fig. 27)



© Alan Baxter

Fig. 31: Granite setts adjacent to northern entrance to the General Market (Location B on Fig. 27)



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Fig. 29: Granite setts hidden under later asphalt surfacing (Location C on Fig. 27)

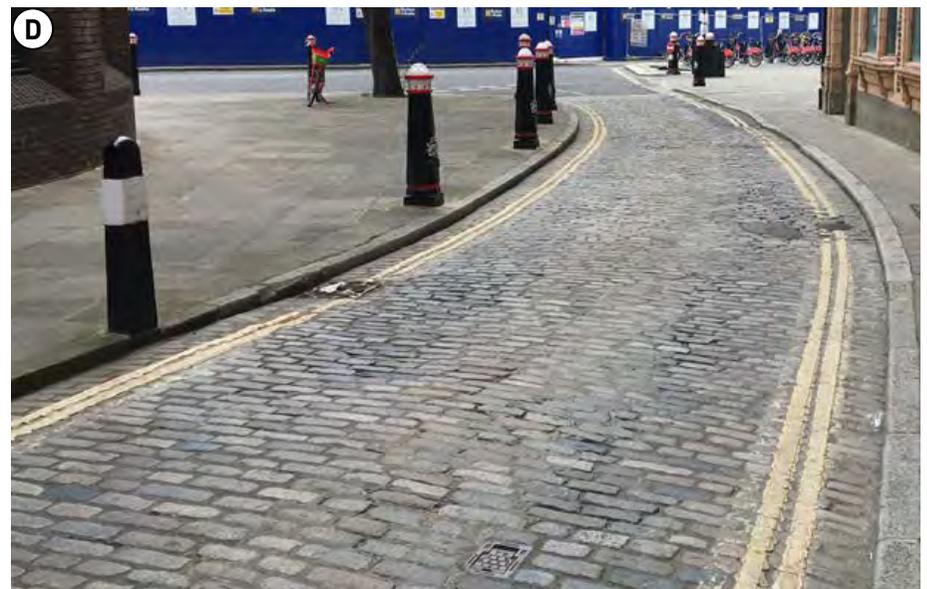


Fig. 30: Historic granite setts on Cock Lane (Location D on Fig. 27)



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2.3.3 Pavements

Pavement surfaces across the study area are either asphalt, which is largely confined to the pavements around the market buildings, or York stone, which predominates in the streets south of Long Lane/West Smithfield (see [Fig. 33](#)). There are many variations in the York stone used across the study area – in terms of size, shape, colour and arrangement – demonstrating the fact that pavements, or sections of pavement, are continually being repaired and resurfaced (see [Fig. 34](#)). Older surviving sections tend to have a more weathered look and texture.

Fig. 32: More modern granite setts, West Smithfield (Location E on [Fig. 27](#))

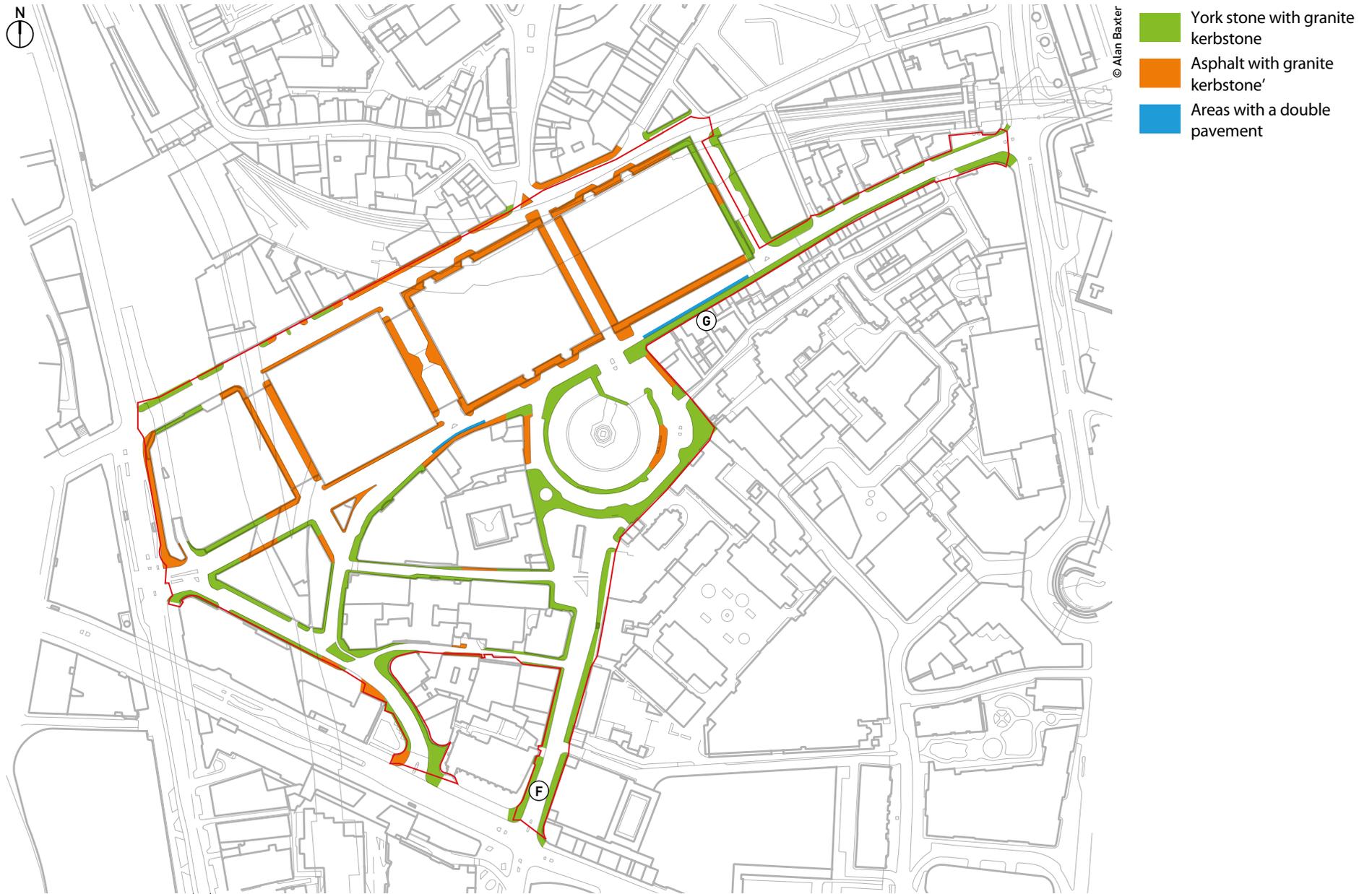
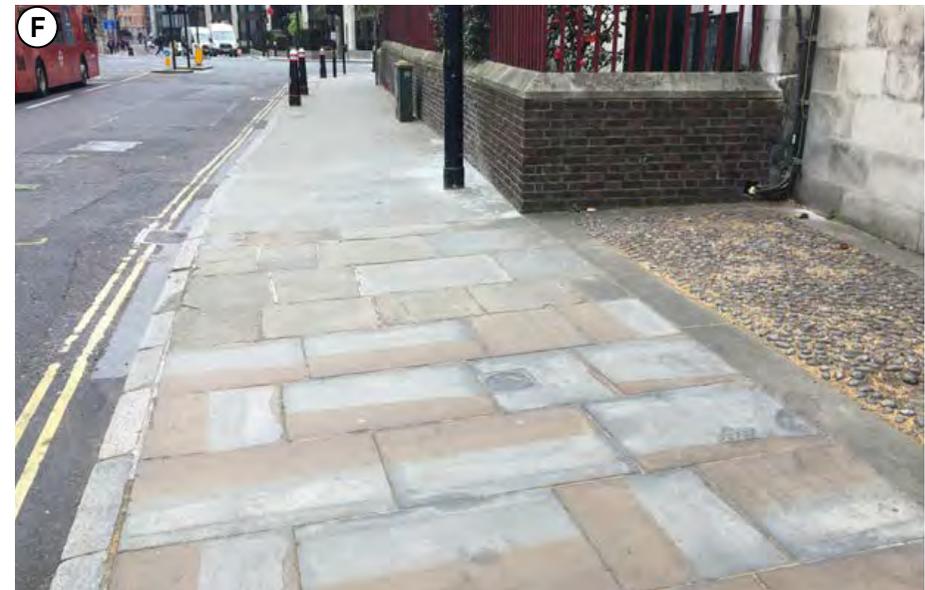


Fig. 33: Existing pavement surfaces in the study area

Both asphalt and York stone pavements across the study area are bounded by granite kerbs. As with the paving material, these kerbs have often been replaced and repaired with different sizes and colours (see [Fig. 35](#)). The shallower kerbstones (around five and a half inches in depth/140mm) are likely to be older than wider ones (see the kerbstones in Charterhouse Square; [Fig. 24](#)).

There are two sections along the southern side of Long Lane/West Smithfield that have double pavements (see [Fig. 36](#)). Although the precise reason for this is unclear it is likely to do with the relationship between the level of road, street and the basements of the adjacent properties.



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Fig. 34: Three different types of York Stone paving present at the southern end of Giltspur Street (Location F on [Fig. 29](#))



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Fig. 35: Granite kerbstones of different widths



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Fig. 36: Double pavement along Long Lane (Location G on [Fig. 29](#))

2.3.4 Elements set within pavements and road surfaces

There are many different elements that have been inserted into or painted onto road and pavement surfaces. These include drain grilles, man-hole covers, coal holes and road/parking outlines. Across the study area these have a variety of ages, forms and styles. One distinctive element is the slim, narrow drain, designed to fit within two rows of setts (see below). A unifying factor is the common use of ductile cast iron.

Coal holes, set within the pavement above underground coal vaults, are typical features of historic pavements in the eighteenth and nineteenth century. They allowed deliveries of coal directly into the vaults beneath without entering a house. As these are usually found in domestic settings there are not many surviving examples within the study area. However, four examples survive at the southern end of Giltspur Street and Snow Hill (see overleaf).



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Fig. 38: Manhole cover on the western side of Snow Hill.



© Alan Baxter

Fig. 37: Different elements (including drain and man hole covers) set within the road and pavement of Cock Lane



© Alan Baxter

Fig. 39: A common type of drain cover (Giltspur Street)

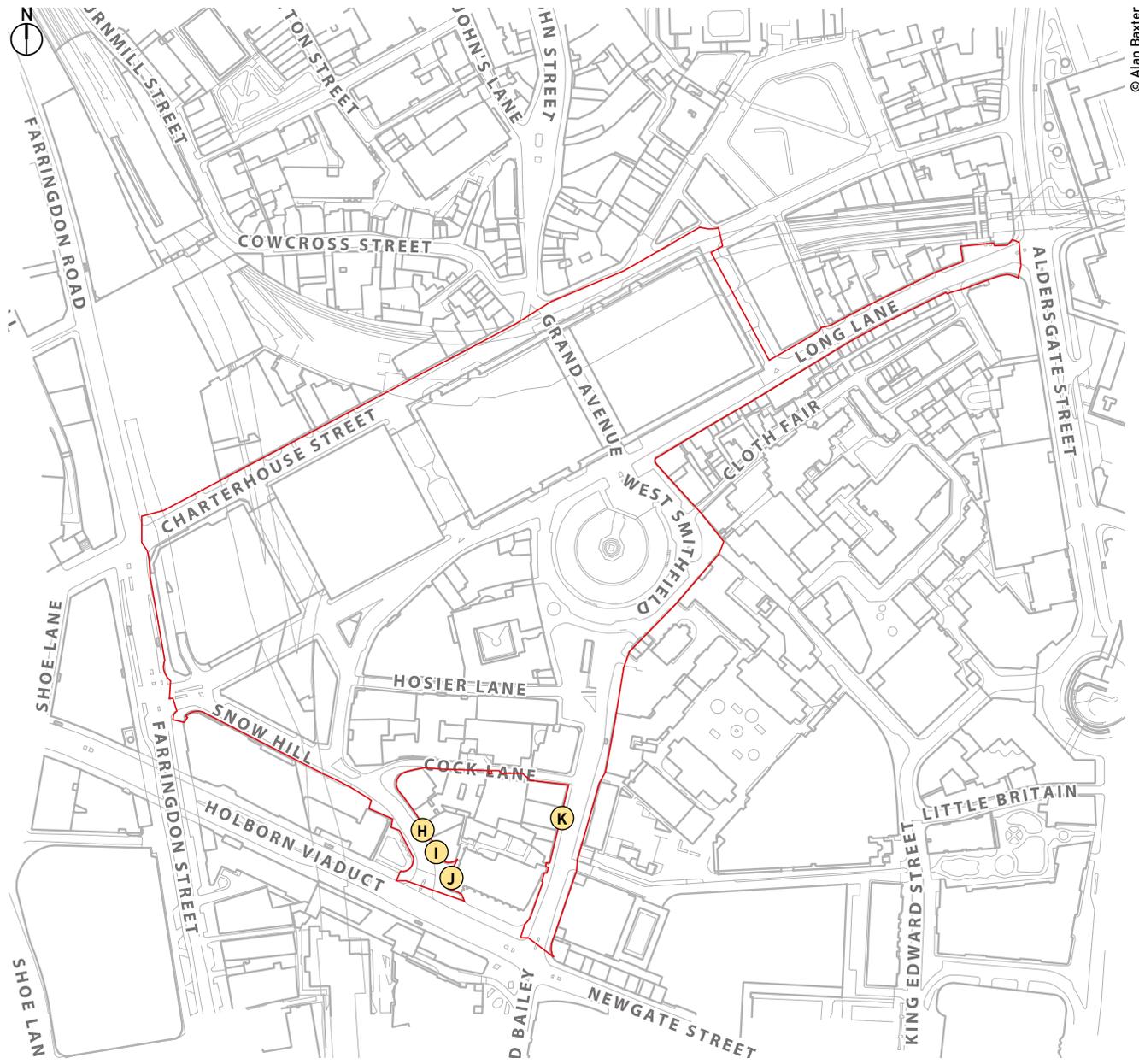


Fig. 40: Location of surviving cole holes



© Alan Baxter

Fig. 41: Cole hole over at the southern end of Snow Hill (Location J on Fig. 40)



© Alan Baxter

Fig. 42: Cole hole cover at the southern end of Snow Hill (Location 2 on Fig. 40)



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Fig. 43: Cole hole cover at the southern end of Snow Hill (Location 2 on Fig. 40)



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Fig. 44: Cole hole cover outside Giltspur House (Location 4 on Fig. 40)

2.3.5 Other public realm elements

The public realm is not composed of street and road surfaces but also of other elements such as street lighting and furniture, green space and trees as well as public art. These have been mapped in the City of London *West Smithfield Public Realm Baseline Research Report* (see 6.4). An important addition to the public realm is the historic drinking fountain and trough (Grade II), located south of the rotunda. This was erected in 1881, combining a drinking fountain for people with troughs for animals. It acts as a reminder that humans once shared the city with horses and other animals.



Fig. 45: A drinking trough in use (Burke's Peerage, 1879)



Fig. 46: Double cattle trough on the south side of the West Smithfield rotunda

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2.3.6 Potential for survival of buried surfaces

The Ground Penetrating Radar (GPR) survey was designed to search for stone setts and significant structural features within 0.50m of the surface.

Carried out in May 2021, the survey indicates the survival of a range of different structures underneath the modern road surfaces, as summarised in [Fig. 47](#).

In two locations, north and south of the General Market building, the survey indicates the survival of setted surfaces (locations 1 and 5 on the map). These do not extend to the full width of the roadway. This suggests historic partial removal of the setts, for roadworks/services.

Both features appear to extend for up to approx. 60m in length. There is therefore strong potential for the survival of granite setts in these two locations.

Locations highlighted on the map:

1. Possible layer of **setts**, Charterhouse Street, 0.07-0.14m deep
2. Structure detected (undetermined), Charterhouse Street, 0.35m deep
3. Possible cellars, Charterhouse Street
4. Construction layer at 0.20m deep
5. Possible layer of **setts**, West Smithfield, 0.07-0.10m deep
6. Possible tie/dowel bars, 0.20m deep

See section [6.3](#) for the full survey report setting out the methodology and results.

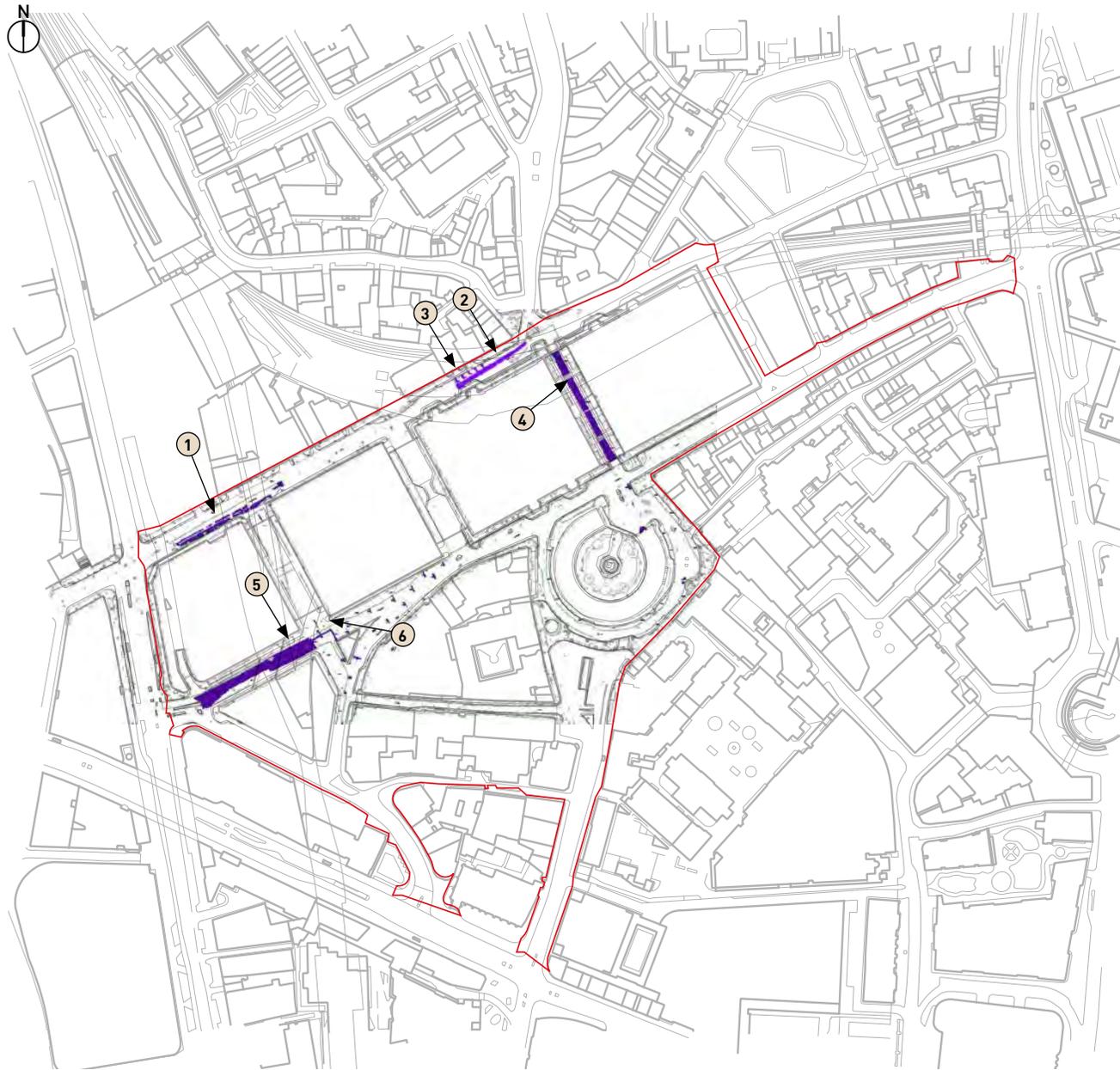


Fig. 47: GPR survey

3.0 Assessment of significance

3.1 Assessing significance

Assessing significance is the means by which the cultural importance of a place and its component parts is identified and compared, both absolutely and relatively. The purpose of this is not merely academic, it is essential to effective conservation and management because the identification of elements of high and lower significance, based on a thorough understanding of a site, enables owners and designers to develop proposals that safeguard, respect and where possible enhance the character and cultural values of the site. The assessment identifies areas where no change, or only minimal changes should be considered, as well as those where more intrusive changes might be acceptable and could enrich understanding and appreciation of significance.

3.1.1 Definitions

Statutory designation is the legal mechanism by which significant historic places are identified in order to protect them. The designations applying to the study are listed in Section 1.5.1. The *National Planning Policy Framework* (NPPF, 2019) places the concept of significance at the heart of the planning process. Annex 2 of the NPPF defines significance as:

The value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting.

The Planning Practice Guidance defines the types of heritage interest that make up significance as follows:

Archaeological interest: *As defined in the Glossary to the National Planning Policy Framework, there will be archaeological interest in a heritage asset if it holds, or potentially holds, evidence of past human activity worthy of expert investigation at some point.*

Architectural and Artistic Interest: *These are interests in the design and general aesthetics of a place. They can arise from conscious design or fortuitously from the way the heritage asset has evolved. More specifically, architectural interest is an interest in the art or science of the design, construction, craftsmanship and decoration of buildings and structures of all types. Artistic interest is an interest in other human creative skill, like sculpture.*

Historic Interest: *An interest in past lives and events (including pre-historic). Heritage assets can illustrate or be associated with them. Heritage assets with historic interest not only provide a material record of our nation's history, but can also provide meaning for communities derived from their collective experience of a place and can symbolise wider values such as faith and cultural identity [sometime called 'communal value'].*

Any assessment of significance is usually an amalgam of these different interests, and the balance between them will vary from one case to the next. What is important is to demonstrate that all these interests have been considered. This is achieved by assessing the significance of the whole site relative to comparable places, and the relative significance of its component parts.

3.1.2 Assessing the significance of Smithfield’s public realm

There are two main aspects to consider when assessing the heritage significance of elements of the public realm:

1. Their intrinsic significance, based primarily on craftsmanship, quality of materials, aesthetics and rarity. It must be noted that even if the intrinsic significance of a street surface is exceptional it is unlikely to have the same level of significance as say, a Grade II* or Grade I listed building.
2. The contribution that they make to the wider historic environment and particularly to the setting of nearby statutorily listed buildings. Often historic surfacing materials, such as granite setts or York stone, add grain and detail to an otherwise plain or homogenous area of streetscape (much like bricks do on the elevation of a building). This is often particularly noticeable in larger areas of public space.

These two aspects of significance, in conjunction with the architectural and historic interest described in Section 3.1.1 will be used to assess the significance of Smithfield’s public realm. The following table outlines different levels of each type of significance which will be used to categorise different elements of Smithfield’s public realm.

Significance level	Definition: intrinsic heritage significance	Definition: contribution to the wider historic environment
High significance	Demonstrates one or more of the following: <ul style="list-style-type: none"> • Coverage of a relatively large, continuous area • High quality of workmanship • High quality of materials • High aesthetic quality • Exceptionally rare 	Makes a substantial contribution to the significance of one or more nearby heritage assets and/or appreciation of the wider historic environment of an area.
Moderate significance	Demonstrates one or more of the following: <ul style="list-style-type: none"> • Smaller or disjointed areas • Quality workmanship • Quality of materials • Aesthetic quality • Rare 	Makes some contribution to the significance of one or more nearby heritage assets and/or appreciation of the wider historic environment of an area.
Neutral significance	Demonstrates one or more of the following: <ul style="list-style-type: none"> • Inoffensive appearance • Widespread materials 	Make little/no contribution to the significance of one or more nearby heritage assets and/or appreciation of the wider historic environment of the area but does not actively detract from it.
Detracts	Poor quality materials used in an unsightly or inappropriate manner	Actively detracts from the significance of one or more nearby heritage assets and/or appreciation of the wider historic environment of an area.

3.2 Significance by element

3.2.1 Road surfaces

Asphalt

Asphalt is the primary road surface across the study area. This is both easy to install and remove and as such is often replaced frequently. Asphalt is ubiquitous material that is relatively non-descript in the context of the public realm. It has **no intrinsic heritage significance** and make a **neutral contribution to surrounding heritage assets and the wider historic environment**.

Historic setts

The large, relatively intact expanse of setts on the West Smithfield rotunda ramp have been statutorily listed at Grade II in their own right because of their materials and craftsmanship, historic interest and group value with the adjacent market buildings. The aesthetic quality of these setts – a combination of different colours and sizes organised in regular rows – is high. Therefore, these setts have both **high intrinsic heritage significance** and make a **substantial contribution to surrounding heritage assets and the wider historic environment**.

There are several other areas of historic setts within the study area, namely along Cock Lane and smaller patches at the eastern end of Charterhouse Street. Whilst the setts along Cock Lane are continuous along its length they do not have the attractive and smooth surface area that those on the rotunda and Charterhouse Street do, suggesting they have been taken up and re-laid at some point. Therefore, they have **moderate intrinsic significance and make some contribution to surrounding heritage assets and the wider historic environment**. The sections of granite setts along the eastern end of Charterhouse Street are more fragmentary but exhibit a higher quality of craftsmanship and aesthetic quality that suggests that are contemporary with the market and have been relatively undisturbed. These sections therefore also have **moderate intrinsic significance** and make **some contribution to surrounding heritage assets and the wider historic environment**.

Modern setts

There are several areas of more modern granite setts within the study area, often to denote crossing points or laybys. These have **no intrinsic heritage significance** and make a **neutral contribution to surrounding heritage assets and the wider historic environment**. However, as they emulate the character and appearance of modern setts they help to add a finer grain to the streetscape (in contrast to say, asphalt) and therefore improve the general appearance of the public realm.

3.2.2 Pavements

Asphalt

The majority of pavements around the market buildings are asphalt. Similarly to where asphalt is used on the road, asphalt pavements are also installed and removed frequently and as such they have **no intrinsic heritage significance**. In terms of their contribution to nearby heritage assets and the wider historic environment this largely depends on both their condition as well as their relationship with nearby heritage assets. For example, an asphalt kerb immediately adjacent to a timber-framed building would actively detract from its significance. Therefore across the study area asphalt pavements make a **neutral contribution or actively detract from surrounding heritage assets and the wider historic environment** depending on the context. The asphalt pavements around the outside of the market buildings are considered to be **neutral** whereas the asphalt pavement in Central Avenue is considered to **actively detract** due to its current condition and the lack of distinction between the carriageway and the pavement.

York stone

There are many different types of York stone pavements across the study area reflecting different dates and materials. Older examples tend to exist over smaller areas and display more variety and a greater, more attractive patina of age when compared to their more modern counterparts (see Fig. 48 and Fig. 49). These have **moderate intrinsic heritage significance** compared to more modern sections which have neutral intrinsic heritage significance. However, the contribution of old and newer York stone paving to surrounding heritage assets and the wider historic environment is less clear cut. Very few, if any, continuous areas of historic paving survive of a reasonable size, and it is all but impossible (and arguably not that useful) to distinguish between paving dating from the 1860s and 1920s. Therefore all areas of York stone paving within the study area are considered to make **some contribution to surrounding heritage assets and the wider historic environment** by virtue that the use of York stone is historically appropriate and, that it contributes, no matter what its age, to the fine grain and detail of the streetscape.



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Fig. 48: Older York stone pavements display an attractive patina of age (south end of Cock Lane)



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Fig. 49: Large expanse of modern York stone paving (junction of West Smithfield and Little Britain)

Granite kerbs

Both the types of pavement surfacing described above have granite kerbstones. Historic kerbstones tended to be narrower, contributing to the finer grain of the historic streetscape often engendered by the contribution of kerbs, setts and paving stones. These have **moderate intrinsic heritage significance**. More modern examples are wider and as such have less contrast with the adjacent paving stones and have **neutral intrinsic heritage significance**. However, across the study area there is few, if any, discernible areas of continuous historic (or modern) paving as sections have been replaced repeatedly. Therefore in general, granite kerbs across the study area make a **neutral contribution to surrounding heritage assets and the wider historic environment**.



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Fig. 50: Historic granite kerbstones on Cock Lane

3.2.3 In combination

Part of the interest of historic surfaces is the way they are used in combination. The distinction between York stone and granite setts relates essentially to civil engineering requirements. York stone is fine for pedestrians, but can fracture under wheeled traffic. Hence, the use of smaller, harder granite setts for carriageways. This is not particular to Smithfield but found throughout the UK. There is an aesthetic and historic interest in this use of materials as chosen based on these requirements

The traditional street scene of paviers and setts divided by kerbs is also a distinctive combination in visual terms. As buildings tend to dominate townscape views, the subtler role of surfaces can be overlooked. But, the visual transition from building to pavement to carriageway is part of the interest of historic townscape, made distinctive due to the contrast between large paviers and smaller setts.

The kerbs that divide pavement from carriageway lead the eye, especially in a perspective view along the street. These receding perspectives are so commonplace that they are hardly noticed until they are gone, as happens in public realm schemes where the pavement is eliminated (e.g. Narrow Way, Hackney).



Fig. 51: Cock Lane, looking east

3.2.4 Other elements

Coal holes

Four historic coal hole covers survive within the study area, at the southern ends of Giltspur Street and Snow Hill. These have visual interest and serve as a reminder of the residential history of the streets in the study area. They have **moderate intrinsic heritage significance and make some contribution to surrounding heritage assets and the wider historic environment.**

Road markings associated with the modern use of the market

Painted on the asphalt around the historic market buildings are a plethora of practical road markings associated with the modern use of the market. Although these are purely functional and have **no intrinsic heritage significance** in themselves, those that directly reference the meat market (using the letters MMKT) demonstrate the changing nature of the market's operations and make a **little contribution to surrounding heritage assets and the wider historic environment.**



Fig. 52: Modern painted markings on the asphalt around the meat market (MMKT) denoting parking and loading bays

3.3 Significant spaces and views

3.3.1 Introduction

Having assessed the significance of the different aspects of Smithfield's public realm, this section takes a broader overview and analyses the significant spaces and associated views within the study area. This does not include an assessment of the relative significance of the medieval and Victorian street patterns – they are both equally significant for different reasons – however, it does identify and qualify those areas where the juxtaposition of these elements creates highly significant spaces and views that are unique to Smithfield.

3.3.2 West Smithfield

As set out in Section 2.3.1, this area was historically an open, urban space used for a variety of activities from the medieval period to the nineteenth century. Its open character would have been in direct contrast to the densely packed, winding streets surrounding it and it would have been full of life and movement due to the livestock and cloth market. With the construction of the Meat Market buildings, the northern end was remodelled and the Rotunda ramp was inserted into the heart of the open space. Today, West Smithfield is a quiet, ancillary, utilitarian space. The medieval openness of the area remains intact, as does its relationship to the surrounding medieval streets, particularly Cloth Fair, Little Britain and Giltspur Street. It also allows impressive views of the Central Meat Market and Grand Avenue, particularly across West Smithfield from Little Britain. These twin characteristics mean that West Smithfield continues to be a highly significant space in the context of the surrounding historic environment, and this significance and is best experienced in the view of the Meat Market buildings across.

3.3.3 View south from the junction between Charterhouse Street, Cowcross Street and St John Street

The other key view within the study area is that looking south towards Grand Avenue from the junction between Charterhouse Street, Cowcross Street and St John's Street. As with the view from Little Britain north, this view encapsulates the juxtaposition between the medieval and Victorian street patterns: walking along the winding Cowcross Street there is a moment of surprise when the architectural centrepiece of the Grand Avenue abruptly comes into view.



Fig. 53: View looking south towards the Central Meat Market from the eastern end of Cowcross Street



Fig. 54: View looking north across West Smithfield from the northern end of Little Britain.

4.0 Conservation issues

This chapter includes examples of historic surfaces in other parts of London. These are included to illustrate particular issues that in broad terms are also relevant to Smithfield.

4.1 How setts are laid

Laying setts is a labour intensive process. Whereas an asphalt road can be created in a day, a setted roadway can take weeks. The process is summarized overleaf. When setts vary slightly in size, they are individually selected and laid on a prepared bed so that they tessellate satisfactorily. They must be evenly

bedded to achieve a smooth surface and carefully tessellated to fit closely together. Traditionally, a high quality setted surface would minimize the size of the joints between setts. Once the setts are laid satisfactorily, a grout mixture is poured on top and brushed over, to fill the open joints.



Fig. 56: Setts waiting to be laid, Holborn Viaduct, 1869 (London Picture Archive)

Traditional method of laying setts



1 Setts are individually selected and laid on a specially prepared sandy bed



2 Setts are laid to tessellate with each other which can be time consuming



3 Once setts are laid, a grout mixture is poured on top and brushed over



4 If the work is good, the finished result should have a relatively even surface

4.2 Disturbance

A widespread conservation issue is that historic surfaces are frequently disturbed. Roads are excavated for the laying of services, from new water pipes to the latest broadband cables. This can happen every 5-10 years. Utility companies are usually required to reinstate surfaces as they find them. However, because setts are painstaking to lay, it is difficult to ensure quality control over the long life span of the road. Most setted surfaces show signs of having being re-laid, often with wider joints and a reduction in quality.



Fig. 58: The same location after setts are re-laid



Fig. 57: A road in Shoreditch dug up for services



Fig. 59: The special qualities of setted surfaces are vulnerable to repeated relaying

4.3 Patterns

Patterns can be observed in historic surfaces at two scales: firstly, at the broader scale of roads and paths, secondly, at the smaller scale of details of construction. In both cases, patterns resulted from practical reasons, rather than being imposed.

Some of London's earliest pavements were in Purbeck stone. Examples can be seen in the Inns of Court. The cost of transporting stone to London meant it was used sparingly. The paths were laid with flagstones, but the areas between paths were given smaller (cheaper) stones or gravel. The paths were laid along the main desire lines. Therefore the different patterns and textures were simply a reflection of human use. Aspects of this practice continued into the nineteenth century. Larger setts were sometimes reserved for the busier routes (Fig. 61).

The practicalities of laying setts also creates patterns on a smaller scale. Setts are laid in a staggered grid. Where this interacts with a curved alignment, the edges to the kerbs must be resolved one way or another. This was sometimes done with a row of setts at right angles (Fig. 65), or with special longer stones (Fig. 62), or with an elaborate tessellation (Fig. 63). Drainage gullies were another practical necessity that were often visually prominent (Fig. 64 and Fig. 67). In each case, the patterns created simply reflect practicalities of construction.



Fig. 60: Stone paths on desire lines (Hare Court, City of London, c. 1700)



Fig. 61: Setts in the foreground are larger than those (right) on the less trafficked route (Thornhill Road, Islington)



Fig. 62: Cloth Fair, undated (EP 3172_022) detail



Fig. 63: Corner detail (Idol Lane, City of London)



Fig. 64: Drainage gully (Tower Wharf, City of London)



Fig. 65: Kerb detail, Rotunda



Fig. 66: An unusual arrangement at Woodfield Road, Westbourne Park (Google)



Fig. 67: Drainage gully, Charterhouse Mews



Fig. 68: Flagstones for cartwheels, Charterhouse Mews



Fig. 69: Four-way junction, Blossom Street, Shoreditch

5.0

Key principles for change

5.1 Introduction

This report investigates the heritage interest of the Smithfield public realm. With the exception of the Rotunda, historic surfaces are not well preserved. This means that there is ample opportunity for enhancement.

The public realm has a key role to play in revealing and celebrating the rich historic environment of Smithfield. Exciting new ventures in and around the old market buildings, including the Museum of London and Elizabeth Line, demand an improved public realm that embraces these opportunities.

The focus of this report is in providing a baseline study. It is not intended to be overly prescriptive. Nevertheless, the findings set out in this report do point toward some broad principles, as set out below.

5.2 Key principles

1. The character of historic surfaces comes from the intrinsic qualities of the materials and the way they are laid. Natural stone – particularly granite – is not only durable but has unique properties of texture and colour. Variation from one sett to the next – sometimes subtle – is part of this character.
2. The way that setts were laid created patterns. Patterns arise from the routes marked out and, at a smaller scale, from techniques of construction and drainage. In this way, the designed appearance is a reflection of practical matters and human use.
3. Surviving areas of historic surfaces contribute to the special character of the conservation area and should be retained where possible. The setted carriageway of the Rotunda is especially high in quality. Cock Lane is less well preserved but retains some historic character.
4. Most carriageways are now in asphalt and it would be beneficial to reintroduce more interesting surfaces based on historic character. These would be effective on older streets such as Hosier Lane, but would be most effective as a more extensive network of spaces.
5. York stone pavements and granite kerbs do not have the rarity value of granite setts but generally contribute positively to historic character. These elements range in date and can be quite recent. They are not precious individually, but in their totality help to reinforce historic character.
6. The Smithfield public realm is not just about surfaces, but incorporates individual elements, from the listed drinking trough to smaller ironwork goods. The cast iron covers of manholes, coal holes and drains are usually not significant individually, but have a robust character and patina that contributes positively.
7. The survival of high quality surfaces is usually threatened by the need for utilities companies to undertake works periodically. This affects new surfaces as well as old. This risk should be taken into account in the planning and design process, to consider whether there are any potential strategies to mitigate this problem.
8. The historic surfaces of the Smithfield public realm are not unique, but are part of a common language that was used across London. In developing ideas for enhancement, it is legitimate to look at other locations that are well preserved, such as Covent Garden or the mews streets of Kensington, to seek inspiration for ideas.

6.0 Supporting information

6.1 Sources

City of London, April 2020, *West Smithfield Public Realm Baseline Research Report*.

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6.2 Policy and guidance

Most roads and pavements are managed by the local highway authority, in this case the City of London. The exceptions include the Transport for London Road Network (TLRN), also known as red routes, which are managed by Transport for London, including Farringdon Street. These bodies have powers to maintain and improve highways under the Highways Act 1980. Improvements to roads and pavements do not usually require a planning application. However, changes to the traffic orders do require public consultation. Individual local highways authorities can create guidelines for their areas. The City of London has its own manual of guidelines for surfaces and street furniture, as does Transport for London.

Under highways legislation there is no protection for historic surfaces, such as granite setts. Historic surfaces are usually only protected if they are listed (which is rare), or if they are within a conservation area. Local planning authorities have a duty to designate conservation areas 'of special architectural or historic interest the character or appearance of which it is desirable to preserve or enhance' (Act 1990, para. 69). However, conservation area designation does not introduce planning controls for the removal of historic surfaces (whereas demolition of unlisted buildings in conservation areas does require consent). Local planning authorities can introduce an Article 4 direction if they wish in order to introduce additional controls to protect specific elements within a conservation area.

6.3 Survey Report

**GPR Survey
Survey Report**

Ultra-Wide Band High Density Array Ground Probing Radar

Smithfield 3D Radar Investigations
Document ref: **MSLP211599_Smithfields GPR SURVEY REPORT**

Date of Survey: May 2021

Approved By: Craig Simmonds FCInstCES




www.macleodsimmonds.com

 Smithfield Market
GPR Survey Report

May 2021

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1

1. Introduction and Scope

1.1. Project Specific Introduction

Macleod Simmonds Limited were commissioned to carry out GPR survey to locate and map the position of buried stone setts within the survey boundary.

The data provided by this survey is focussed on the detection and positioning of historical stone setts known to be present around the market place. The project objectives were as follows:

1. To locate, position and map all detectable areas of buried stone setts and significant structures within 0.50m of the surface.
2. To minimise any disruption to local pedestrian and vehicular traffic during the data acquisition phase.
3. To deliver a 2D Model in CAD and PDF formats together with a Written Report.

This report is to be read in conjunction with Macleod Simmonds GPR survey, drawing number 'MSLD211599_01 Smithfield GPR- 2d.dwg'.

1.2. Survey Area

Smithfield Market, Grand Avenue, London, EC1A 9PS



1.3. Control

All data is referenced to OSGB36.

1.4. Deliverables

	Reference/Name	Type/Content	Date Issued	Authorised
No.1	MSLD211599_01 Smithfield GPR- 2d	2d digital CAD file	02/06/21	CMS
No.2	MSLD211599_01 Smithfield GPR- 2d x 23 Sheets	Digital PDF file	02/06/21	CMS
No.3	This Report Reference: MSLP211599_02 Smithfield GPR SURVEY REPORT	Digital PDF file	02/06/21	CMS

2. Survey Notes

2.1. Ground Penetrating Radar Survey Method

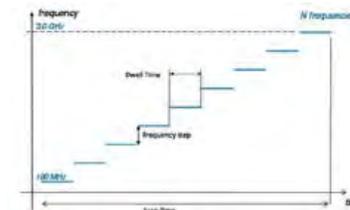
All data was acquired using a vehicle towed 24 channel 3D-Radar Ultra-Wide Band Ground Probing Radar system. The towing vehicle used is a sign written, Chapter 8 compliant, survey vehicle with flashing Amber Lights, which were active for the duration of the acquisition. 5 passes were required to cover the first lane and the hard shoulder to achieve a comprehensive coverage, across the full width. The towed solution travelled along one trajectory, slowed to 15 Mph (as required under the 'mobile works' protocol) and record data as it travelled over the structure. The speed was kept constant to the next junction, where the system then turned around perform the measurements in the opposite carriageway. This process was repeated, until full coverage was achieved.

2.2. General Notes on Ultra-Wide Band GPR

The 3D-Radar HDAGPR is the fastest step-frequency radar available at the current time. By using a digital frequency source instead of traditional phase-locked loop technology, the 3D-Radar can generate waveforms from 100 MHz up to 3 GHz with as much as 1500 frequencies with waveform lengths of 0.5-10 milliseconds. This 'step-frequency' radar has a coherent receiver which means that the whole waveform length (typically a few milliseconds) is used as 100% efficient integration time. By comparison, impulse GPRs use stroboscopic sampling with significant loss of energy.

What Is Step-Frequency Radar?

Step-frequency is a radar waveform consisting of a series of sine waves with linearly increasing frequency. The radar measures the phase and amplitude on each frequency and used an inverse Fourier transform of these data to build a time domain profile (A-scan). Thus, the step-frequency radar collects data in the frequency domain and converts the data to time-domain data through computer processing.



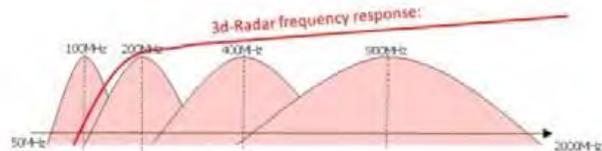
The step-frequency waveform gives optimum source signature with a uniform frequency spectrum. The computer control allows the user to set the dwell time on each frequency as well as the start and stop frequencies as shown to the right.

How Does Step-Frequency Data Differ from Data from Impulse Radars?

Impulse radars transmit very short pulses (impulses) with a fixed pulse repetition rate (PRF) and uses stroboscopic sampling to build the time domain trace from several subsequent pulses. Hence, the impulse radar data is the direct reading of the time-domain reflection from the underground. The step-frequency radar data can either be stored as frequency domain data or as time domain data after inverse Fourier transform. The time-domain data from a step-frequency radar are equivalent to time-domain data from an impulse radar. However, the frequency data allows a much wider range of frequency domain processing possibilities.

In opposition to traditional octave-band GPR antennas the ultra-wideband bow-tie monopoles have continuous frequency coverage from the 100 MHz range up to 3 GHz as illustrated below. In practice this allows the user to collect data from 100 MHz to 3 GHz without changing antennas. By comparison, a similar survey using impulse GPR would require use of 200 MHz, 400 MHz, 800 MHz and 1600 MHz antennas. The antenna elements are arranged in a linear array where the transmitting and receiving antennas are displaced to each other. During the survey, the radar combines the transmit/receive antennas sequentially to obtain several profiles (or channels).

Wideband frequency coverage of the antenna array compared with traditional GPR antennas.



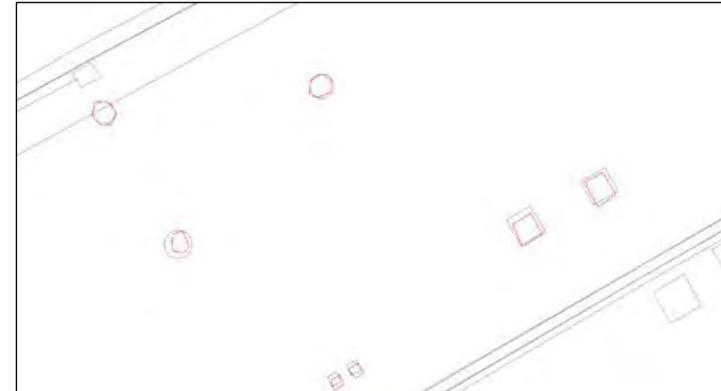
In less technical terms, our 24 channel UWB HDAGPR system can scan faster and reach greater depths, whilst also providing clear high-resolution data at shallow depths. In practice, this means that a single acquisition can be used to obtain details on utility networks, buried structures and pavement condition. Usually this would require the deployment of many different systems to achieve, decreasing efficiency and increasing disruption and data alignment issues.

2.3. Quality Control

2.3.1. Planimetric Accuracy

As metallic utility covers are impenetrable to GPR, their positions are clearly visible within the GPR data and are used to check the accuracy of the radar data's positioning.

The utility cover positions found within the radar are directly compared to those shown on the topographical data to ensure that there are no positional errors present and that the GPR data has been recorded to the correct survey grid.



2.3.2. Vertical Accuracy

The depths defined within our survey results are based on a calculated signal velocity through the ground. Different construction materials and variations in the moisture content present will all affect the accuracy of this calculation; however, multiple 'calibration' measurements are taken around the site to minimise such errors. The methodology used to 'calibrate the data is based on the accepted practice of 'hyperbola fitting' which relies on the shape of a detected target changing according to the velocity of the EM energy within that area. As a general guide, calculated depths should be within 10% of actual depth; however, experience has shown that interpreted depths are often considerably more accurate than 10%.

3. Appraisal of GPR Survey Results

3.1. Site Specific Survey Notes

This GPR survey is searching for historical stone setts and significant structural features within 0.50m of the surface, therefore specific parameters have been set at the acquisition and analysis stage to refine the data at this depth range.

A number of areas could not be accessed on site at the time of survey, due to obstructions present. These areas are annotated on the supplied drawing along with the outline of the GPR coverage.

Examples of obstructions encountered at this site location are shown below along with an explanation:

Construction site in Charterhouse street:



Parked vehicles in West Smithfield:



Parked vehicles in West Smithfield:



3.2. Calibration Data

The radar waves velocity can be calculated using the simple equation below, where c is the speed of light (30 cm/ns) and ϵ is the dielectric constant. Typical velocity values are between 8 and 12 cm/ns.

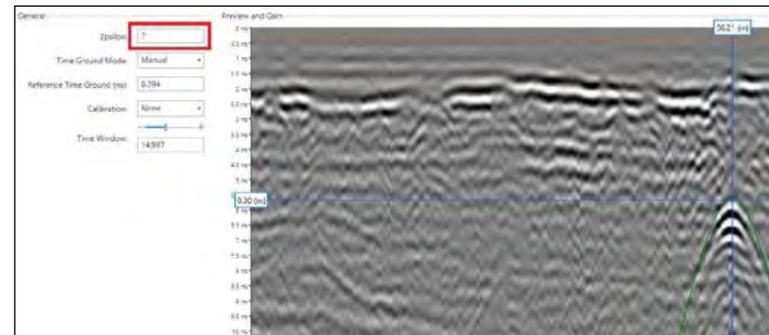
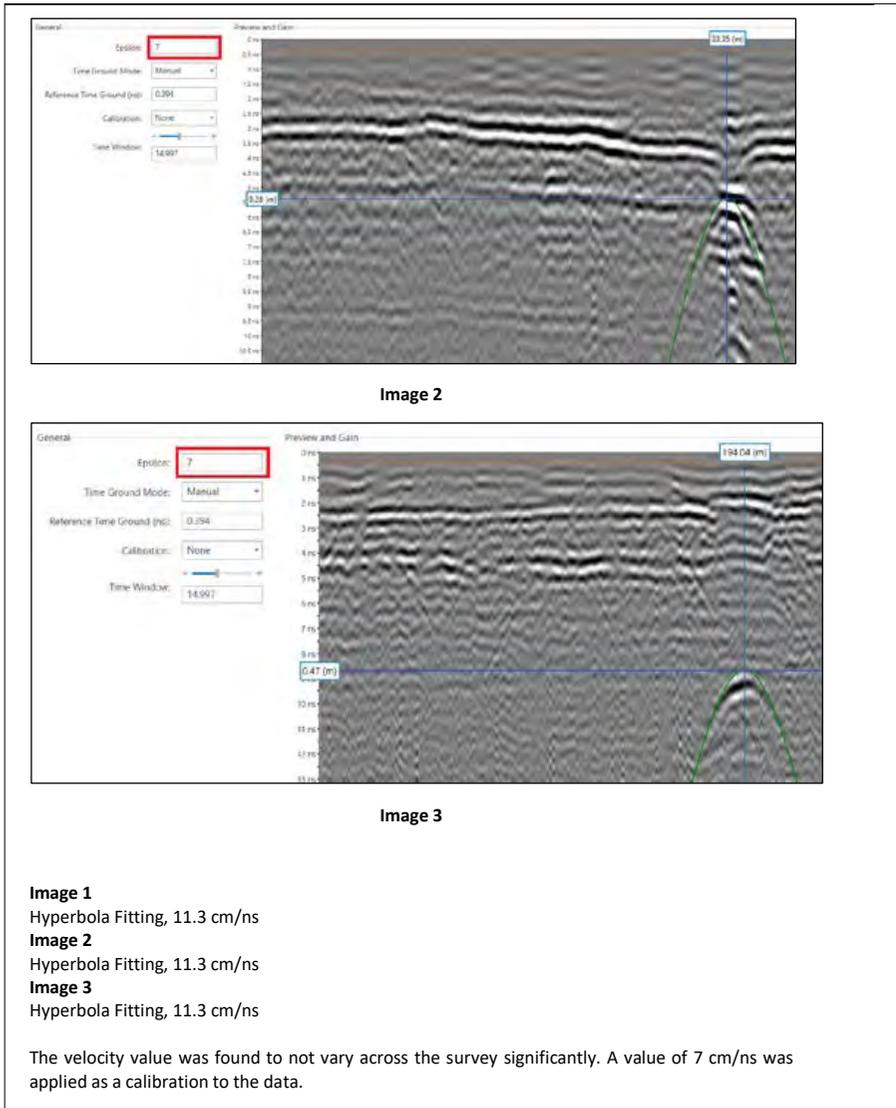


Image 1



3.3. Interesting Results & Data Examples

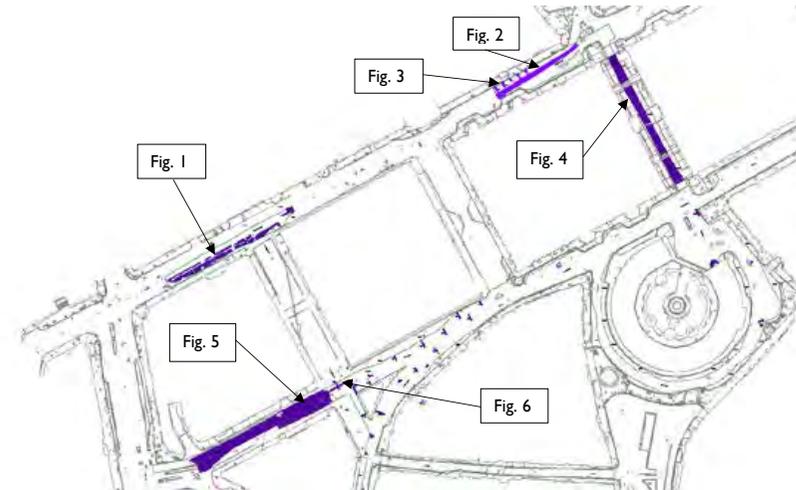


Figure 1:

Possible cobble sett layer detected between 0.07-0.14m deep.

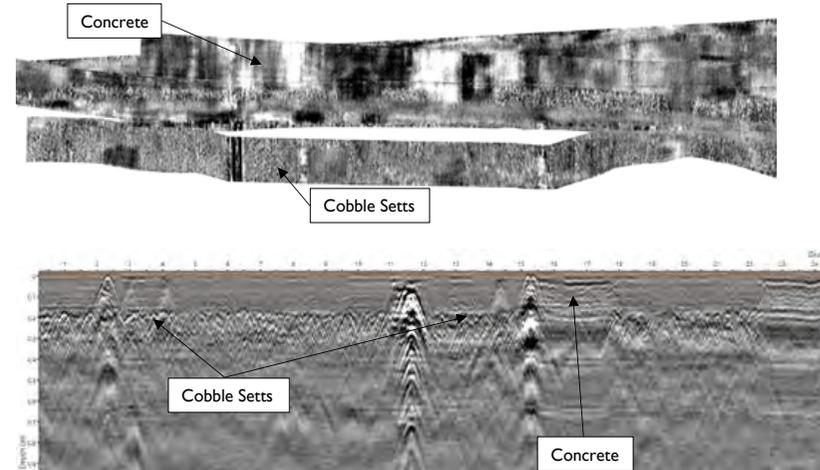


Figure 2:
Structure detected at 0.35m deep.

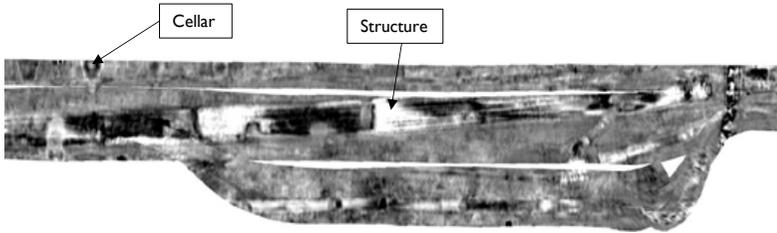


Figure 3:
Possible Cellars.

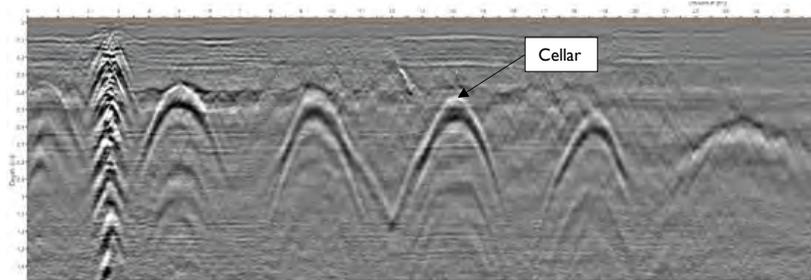


Figure 4:
Construction layer at 0.20m deep.

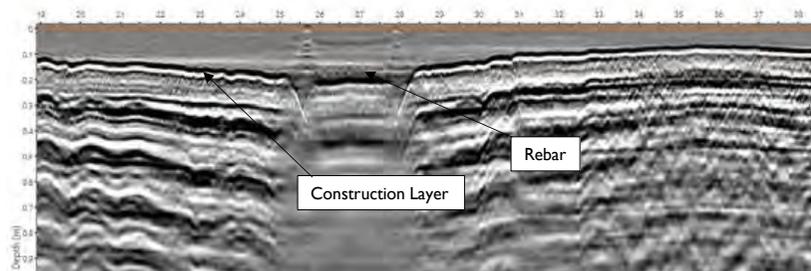


Figure 5:
Cobble setts layer detected between 0.07-0.10m deep.

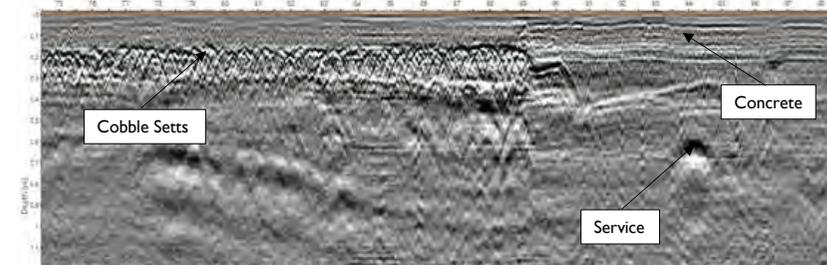
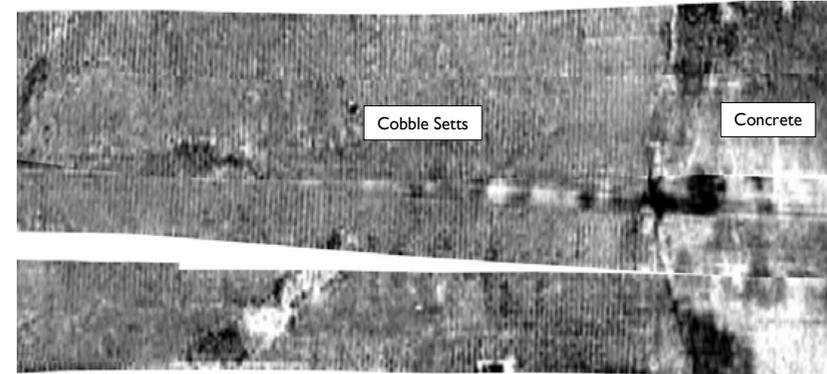


Figure 6: Possible Tie/Dowel bars at 0.20m deep.



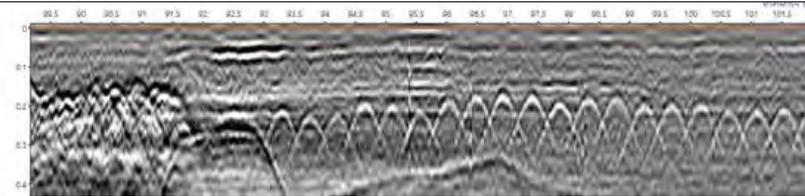
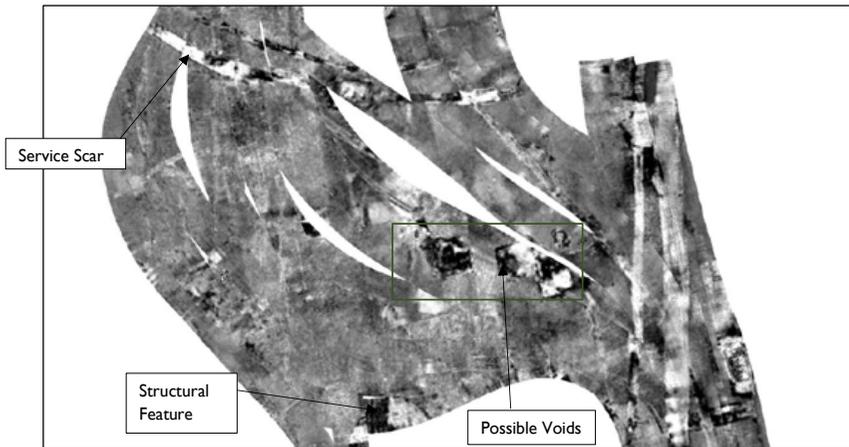


Figure 6: Possible voids and multiple service scars.



Smithfield Market
GPR Survey Report

May 2021

4. Conclusions

The results shown on the CAD model accompanying this written report accurately depict the features detected using Ground Penetrating Radar technology at this location.

A concrete layer is visible in the data across much of the survey area. Where this is visible it is reasonable to assume the absence of the cobble setts layer.

Most of the area appears to have been re-constructed over the years and much of the historical cobbles appear to have been removed. Where they are visible within the data, they are extremely clear which provides an added layer of confidence to the results generated.

There are many anomalies, structures and services present within the data, down to an effective depth of 1.3-1.5m in places. It is possible to re-visit this data in the future should more information be required.

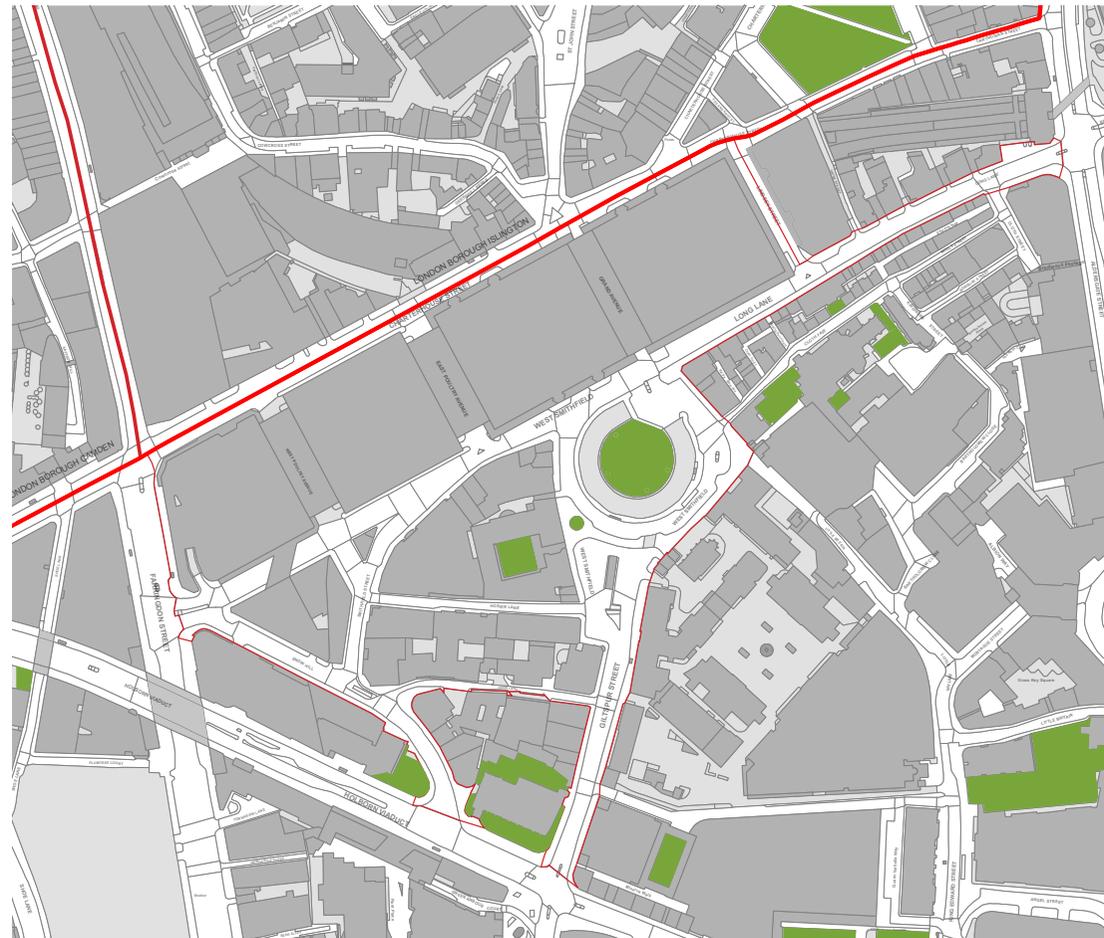
****End of Report****

3.2 Trees and Greening

GREEN SPACES

The map opposite shows the green open spaces in the project area, both public and private. The main locations are Smithfield Rotunda Garden, and the churchyard of St Bartholomew the Great. In addition, just on the boundaries of the project area are the churchyards of Holy Sepulchre without Newgate and Christchurch Greyfriars, along with Postman's Park.

On the page opposite is more detail of the Smithfield Rotunda Garden, and the churchyard of St Bartholomew the Great, along with key issues and opportunities. This information was produced by Fluid and Arup as part of the Look and Feel Strategy research.



Green spaces in Smithfield area - map

3.10 Historic Interpretation and Public Art

OVERVIEW

Smithfield is one of the oldest and most historic parts of London, many notable events have occurred there, and significant characters have passed through. The layers of the area's history can be considered when looking at the architecture of the area. However, there is relatively little in terms of historic interpretation on the street, and very few public art installations.

The sites of interpretation and public art are shown on the map opposite and images are given on the following pages. The data shows that what does exist often takes the form of memorials, including memorials to highly significant events such as the Fire of London, and individuals of national importance such as William Wallace.

There are also art and sculptures in the area that are housed in local buildings that can be visited by the public, such as the collection in the Haberdasher's Hall, items that form part of the Barts Hospital heritage collections and a Damian Hirst statue in St Bart's the Great Church



Locations of public art and monuments

3.10 Historic Interpretation and Public Art



1 Peace memorial fountain - Smithfield Rotunda



2 Saint Bartholomew Gate



3 The Great Rising of 1381 memorial



4 Smithfield Martyrs' memorial



5 William Wallace memorial



6 Charles Lamb memorial



7 Site of Saracen's Head



8 Lord Mayor of London Sir Frederick Alfred Hoare memorial



9 Reopening the East Meat Market 1997



10 People who lost their lives in conflict since Great War 1914-1918



11 Reopening OF London Central Markets 2001



12 Golden Boy of Pye Corner - Fire of London memorial 1666

Alan Baxter

Prepared by Victoria Bellamy

Reviewed by Gemma Fowlie, Robert Hradsky and William Filmer-Sankey

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Final draft issued January 2022

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