OVG Manchester:

Appendix 2.1 – EIA Screening and Scoping Request

Deloitte.
Real Estate



Environmental Impact Assessment (EIA) Screening and Scoping Report

Project Bradford, Manchester

November 2019 – FINAL

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1 Introduction

Introduction

1.1 This Environmental Impact Assessment (EIA) Screening and Scoping Report (the "Report") has been prepared in respect of the potential redevelopment of an existing surface level car park on land bound by Sportcity Way, Alan Turing Way, Ashton Canal, and Joe Mercer Way, which forms part of the Eastlands Regeneration Framework (ERF) in the ward of Ancoats and Beswick, Manchester ("the Site"). If an application for Planning Permission came forward the Applicant would be OVG Europe Limited.

1.2 OVG Europe Limited is considering the potential of the Site and the prospect of submitting a planning application which seeks Full Planning Permission for a new indoor arena, together with associated retail and leisure facilities, back-of-house and support functions, public realm, cycle parking, access and associated works (referred to hereafter as the 'Proposed Development').

1.3 In order to inform OVG Europe Limited's decision-making, this Screening and Scoping Report is submitted to Manchester City Council as a request for a Scoping Opinion under Regulation 15 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017. In accordance with Regulation 15, paragraph 2, this report contains:

- A plan sufficient to identify the land (included at Appendix 1); and
- A brief description of the nature and purpose of the Proposed Development and of its possible effects on the environment.

EIA Requirements

1.4 The EIA process is the mechanism by which development proposals are appraised in terms of environmental criteria, in addition to socio-economic, engineering and technical considerations. The EIA process defines the context of the proposed development and examines the issues considered pertinent.

1.5 The purpose of the EIA is to establish the nature of the development and the environment on which it is likely to take place to identify likely significant effects on the environment that may arise, by comparing the existing situation at the start of the work (baseline) with the situation once the proposals are in place.

1.6 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 require that any proposed development falling within the description of a 'Schedule 2 development' within the meaning of the Regulations, will be subject to an EIA where such development is likely to have 'significant' effects on the environment by virtue of such factors as its nature, size or location (Regulation 4(2)).

1.7 The Proposed Development falls under the category of "Infrastructure Projects – Urban Development Projects" (Schedule 2, 10, (b)) as described in the Regulations. The applicable threshold above which EIA is likely to be required is (i) the development includes more than 1 hectare of urban development which is not dwellinghouse development; or (ii) the development includes more than 150 dwellings; or (iii) the overall area of the development exceeds 5 hectares.

1.8 The indicative thresholds and criteria state that:

"In addition to the physical scale of such developments, consideration should be given to the potential increase in traffic, emissions and noise. EIA is unlikely to be required

for the redevelopment of land unless the new development is on a significantly greater scale than the previous use, or the types of impact are of a markedly different nature or there is a high level of contamination".

1.9 The Site covers an area of approximately 4.46 ha, which exceeds the threshold in relation to parts (i) listed in Schedule 2, 10, (b) of the Regulations. In addition, given that the Proposed Development may result in development of a greater scale than the existing use as a surface car park, an EIA is therefore considered appropriate to test the likely significant effects of the Proposed Development.

1.10 Should an application for planning permission be submitted, the Applicant would submit an Environmental Statement ('ES') (in relation to topic areas where there is likely to be a significant effect of the environment) in relation to the Proposed Development.

Purpose of the Report

1.11 The process of identifying likely significant effects on the environment which should be addressed by the EIA is termed 'scoping' and the results are presented as a Scoping Report.

1.12 Regulation 15 of the EIA Regulations sets out the requirements for obtaining a Scoping Opinion from the relevant planning authority.

1.13 This Scoping Report sets out the framework within which an ES would be produced and the topic areas and information that would be contained within the document. Statutory consultees are invited to express their views on the proposed scope of the EIA, or suggest additional issues which may be considered to be of significance. The views expressed by statutory consultees will then be used by the LPA to inform the formal EIA Scoping Opinion.

1.14 The LPA is requested to respond to the formal request for an EIA Scoping Opinion within five weeks of registering receipt.

1.15 Should the proposed scope of the EIA be accepted by the LPA, the intention would be that any future application relating to the Proposed Development would be accompanied by an EIA which would be produced by the team as set out in Table 1.1 and coordinated by Deloitte Real Estate (IEMA EIA Quality Mark registered). The consultants have provided technical input to this initial EIA Scoping Report.

Table 1.1: EIA Team

Note: although Deloitte Real Estate has read the input of Buro Happold, ME Engineers, Populous, Vanguardia and Planit-ie (together "the Consultant Inputs") for consistency and provide observations based on our knowledge and experience, we accept no liability or responsibility for the Consultant's Inputs and will not be responsible for the technical content.

Topic	EIA Consultant	Qualifications
Air Quality and Dust	Buro Happold	Member of IES (MIEnvSc) and IAQM, and Chartered Scientist. Air quality specialist with experience in numerous EIAs for developments in London and the UK.
Ground Conditions	Buro Happold	Chartered Institute of Water and Environment Management and

Topic	EIA Consultant	Qualifications
		Chartered Engineer with Institution of Civil Engineers.
Socio-Economic Impacts	Buro Happold	BA Geography, MSc Spatial Planning. Associate economic consultant with experience in preparing over 15 socio-economic ES chapters throughout the UK.
Lighting	ME Engineers, with input from Populous and Vanguardia	MSc Electrical and Computer Engineering, NTUA, Athens Greece; MSc Light and Lighting, UCL, London UK. 5 years' experience in the field of architectural lighting design, including the production of EIA.
Noise and Vibration	Buro Happold, with input from Vanguardia	Full member of the Institute of Acoustics. More than 5 years' experience in noise and vibration consultancy.
Townscape and Visual Impact	Planit-ie	Member of the Landscape Institute.
Traffic and Transport	Buro Happold	Civil Engineer and Transport Planner with more than 5 years' experience in transport planning field.
Water Quality, Drainage and Flood Risk	Buro Happold	MEng in Civil Engineering and Chartered Engineer with the Institution of Civil Engineers. More than 5 years' experience in flood risk management and hydraulic modelling.
Wind Microclimate	Buro Happold	PhD in Mechanical Engineering, with more than 30 years' experience on the built environments. Board member of the Wind Engineering Society UK.

1.16 Sustainability and the impact of the Proposed Development on climate change would be an integral part of the design process and would also be considered throughout the EIA within the technical chapters as relevant. Further standalone reports explaining the approach to sustainability policy objectives, including Manchester City Council's draft Manchester Zero Carbon Framework 2020-2038, would accompany any future application for Full Planning Permission.

1.17 Section 2 of this report provides a site description and outlines the nature of the Proposed Development. Section 3 sets out the proposed scope and structure of that an ES would take and who might need to be consulted. Section 4 provides details of the proposed EIA methodology, which would be used in assessing the Proposed Development. Section 5 sets out the key issues that would be addressed by the EIA.

2 Site Description and Development Proposals

Site Description

2.1 The Site is approximately 4.46 ha. It is bound by Sportcity Way to the north, Alan Turing Way to the east, Ashton Canal to the south, and Joe Mercer Way to the west, in the ward of Ancoats and Beswick, Manchester. Please refer to the Site Location Plan at Appendix 1.

2.2 A planning history search was undertaken using Manchester City Council's public access system. There have been no recent applications of interest on the Site. However, in 2007, planning permission was granted on part of the Site for the construction of a temporary Olympic Standard BMX track, ramp and associated parking for the use of British Cycling as a training facility ahead of the Beijing Olympics. A subsequent time extension was granted, with the temporary BMX track, ramp and associated parking being permitted until 31 December 2010. It is unknown when the site was cleared of these facilities but they would have become defunct for Olympic Training purposes when the purpose built BMX Complex opened in July 2011.

2.3 The Site is currently used as an over-spill surface level car park for those attending events associated with the Etihad Stadium, it is estimated to have capacity for 500 car parking spaces. The perimeter of the Site is populated with informal, dense shrubbery and trees and secured with a tall mesh fence. There are no existing buildings on the Site.

2.4 The Site is in a highly accessible location by a choice of transport including the Metrolink, car, and bus. It is approximately 1.5 mile walk from the City Centre; people frequently walk from the Etihad Stadium to the City Centre and Manchester Piccadilly after match-days or concerts. The Site is also well connected via bicycle with National Cycle Route 60 along Alan Turing Way and National and Regional Route 86 along the Ashton Canal Tow-Path.

Site Specific Environmental Designations

Air Quality

2.5 The Site is situated in the Greater Manchester Combined Authority Air Quality Management Area (AQMA).

Ecology

2.6 The Site is not within, nor does it contain, any ecological designations including sites of specific scientific interest (SSSI), sites of biological importance (SBI) or special protection areas (SPA). However, the Ashton Canal to the south of the Site boundary is a non-statutory designated SBI, protected under national and local planning policy.

Flood Risk and Drainage

2.7 The Site is located within Flood Zone 1, a low probability of flooding. It is situated within the Manchester, Salford and Trafford Critical Drainage Area (CDA), as designated in 2011.

Heritage

2.8 The Site is not within a Conservation Area and there are no listed buildings on the Site. However, there are 6 designated heritage assets within 250m of the Site, these are:

- Ashton Canal Lock Keepers Cottage on South Side of Lock Number 7 of Ashton Canal – Grade II
- Ashton Canal Bridge Number 9 Over Ashton Canal (Mill Street Bridge) at West End of Lock Number 7 – Grade II
- Ashton Canal Lock Number 6 Immediately East of Forge Lane – Grade II
- Ashton Canal Lock Number 7 with Roving Bridge Immediately East of Mill Street Bridge – Grade II
- Philips Park – Grade II
- Philips Park Cemetery – Grade II

2.9 These are shown on Figure 2.1:

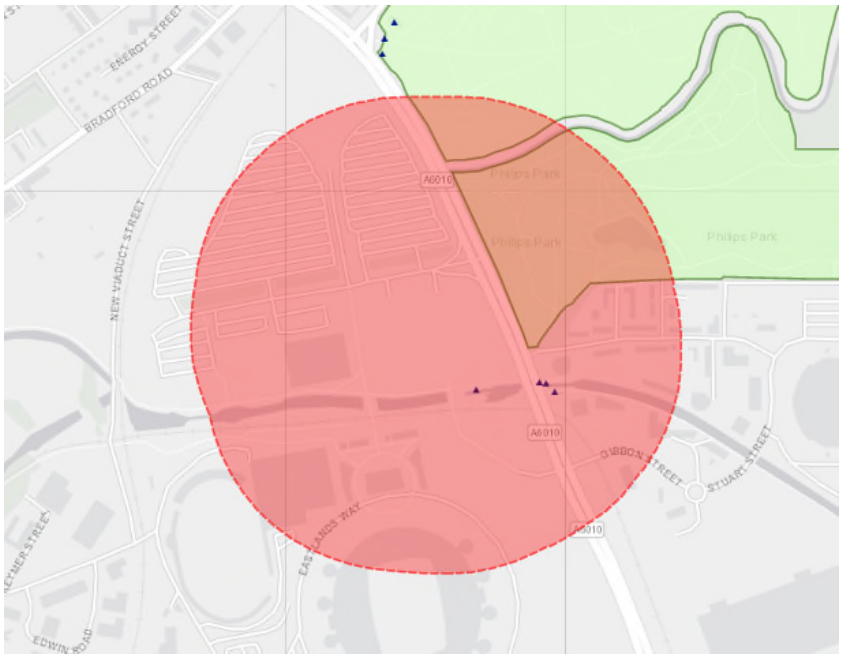


Figure 2.1: 500m radius of the Site with blue triangles indicating heritage assets (Source: Historic England Map Search Tool, Accessed July 2019)

Site Context

2.10 The Site is situated in East Manchester, an area that has been a long term regeneration priority and which has witnessed significant positive physical, economic, social and environmental transformation over the last three decades.

2.11 At the heart of the renaissance of East Manchester has been the Etihad (formerly City of Manchester) Stadium and the complex of sporting assets on the Etihad Campus which were developed for the 2002 Commonwealth Games. Since this time, the Etihad Campus has consistently acted as a major economic driver and successive regeneration frameworks have identified it as a place to drive forward the development of a globally competitive sport, leisure and recreation offer.

2.12 Since March 2010, the Council has been working in partnership with the owners of Manchester City Football Club to develop a transformational plan for East Manchester focused on the area in and around the Etihad Stadium. This work has been guided by the Eastlands Regeneration Framework (ERF), which was approved by the Council's Executive Committee in July 2011.

2.13 In December 2017, the Council's Executive Committee approved a further version of the Regeneration Framework for the Eastlands area, which encompassed both the Etihad Stadium environs and along the Ashton Canal into both Holt Town and into the Lower Medlock Valley. It set out the intent to create a new economic focus around the Etihad Stadium and developing a business park with a focus on promoting a sport, leisure and recreation economic cluster. Beyond the Etihad Stadium, the 2017 ERF proposed new residential and commercial development in new neighbourhoods of choice to encourage the increasing Manchester population to live and work in the area and capture the benefits of growth.

2.14 Since the 2017 ERF was approved, economic growth momentum in the city has continued to grow at pace and the impacts of the positive dynamic are now clearly flowing into East Manchester and in particular the areas between the Etihad Stadium and Great Ancoats Street. There is a significant demand for new commercial floorspace, homes and sport, leisure and recreation offer of a national scale.

2.15 A new draft ERF was therefore prepared in response to these opportunities and presented to the Council's Executive Committee in March 2019 for consultation; it was endorsed at the Executive Committee meeting in July 2019.

2.16 The 2019 ERF identifies the Site as being part of the Etihad Campus Commercial Zone (Figure 2.2). There is an ambition to maximise the destination role of the Etihad Campus, driving investment and job creation. As part of this, there is an identified opportunity to develop a new Sport Tech cluster and create an enhanced leisure offer. This offer includes the provision of a new large indoor arena (with a capacity in excess of 20,000 spectators), a multiplex cinema, hotel development and an expanded food and beverage offer.

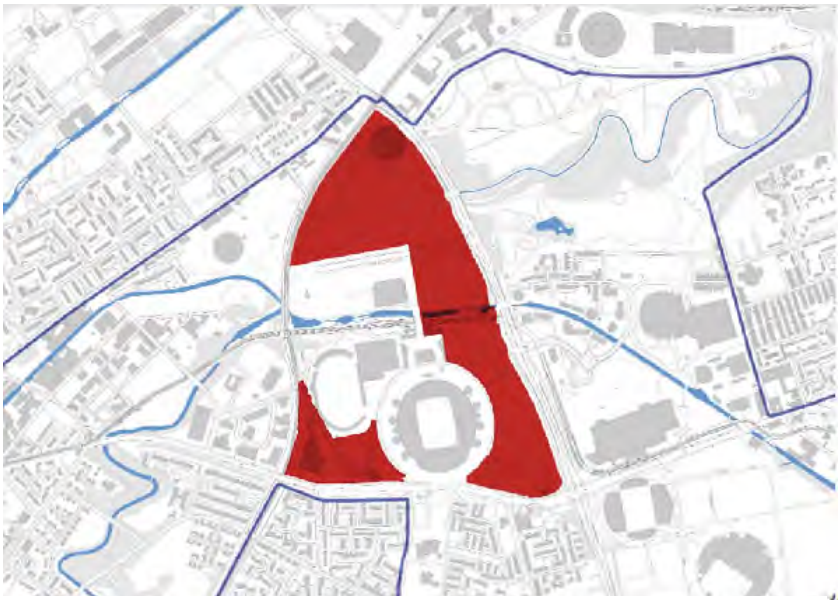


Figure 2.2: Etihad Campus Commercial Zone (Source: ERF, 2019)

Proposed Development

2.17 The proposals are at a feasibility stage of development and the final design, mix of uses and quantum of floorspace has not yet been fixed. This EIA Scoping Request is therefore issued on the basis of the potential parameters of the Proposed Development and will be used to inform OVH Europe Limited's decision-making about the potential for a future planning application. It is submitted at this stage to facilitate early engagement with technical stakeholders on the scope of the EIA that would be required in the event a planning application is submitted. Should the parameters of a future planning application change, then further scoping would be undertaken.

2.18 The Proposed Development would include the construction of a new indoor arena, utilising the majority of what is an existing brownfield site which has been identified as a development opportunity in successive versions of the Eastlands Regeneration Framework as well as within Manchester's Core Strategy. It would comprise of up to 65,000 sq. m. GIA of new floorspace within a building height of up to 40m AOD. These maximums could deliver a total capacity of up to 23,500 people; however, it should be noted that the maximum capacity that is ultimately possible would only be reached for a small number of events, and would only be possible when a centre stage configuration is used. The maximum quantum and scale parameters that are ultimately identified, and the maximum capacity (not to exceed 23,500), will be utilised as the most robust scenario basis for assessment in each of the technical chapters from a potential impact point of view.

2.19 Within these parameters, the intention is that the layout would be flexible to accommodate events of different nature and scale, which could include music, sport, performances, awards and other live entertainment. Events could be held during the day and evening, throughout the year.

2.20 The Proposed Development would accommodate supporting uses and functions. This would include food and beverage units, retail units and potentially a microbrewery. It is proposed that circulation spaces may have retail concessions and pop-ups to support events. Opportunities for the arena's amenity offer to be used outside of arena events, to support activity levels and the wider amenity offer of the Etihad Campus, for example on match days, will also be explored as part of the development of the proposals.

2.21 The Proposed Development would also include a full suite of supporting spaces and functions to support the effective operation of the arena, including for artists, security, venue operation and logistics, WCs and cycle parking.

2.22 The Etihad Campus is well served by public transport and the Proposed Development will be supported by a sustainable transport strategy including a Framework Travel Plan, which will set out measures for the promotion and enhancement of sustainable transport modes.

2.23 A suggested car parking strategy is under development, however the use of cars would actively be discouraged and no additional car parking is proposed at the Etihad Campus to serve the arena as part of the Proposed Development.

2.24 New greenspace and enhanced public realm is proposed which will include external seating areas and terraces which overlook the Ashton Canal, thus improving the visual amenity of the canal and also increasing passive surveillance. Consideration is being given to the potential for events and pop-up activity in the public realm to bring further vibrancy to the area.

2.25 The ambition is to create a form of design which is recognisable as an iconic Manchester building and as Manchester's second arena, rather than a generic arena design

configuration such as a box or a bowl. The intention is also to deliver a high quality façade treatment which is likely to use integrated LED technology, allowing a range of modes / options for the illumination and activation of the elevations.

2.26 The intention would be that the Proposed Development would be delivered in one phase; the potential construction programme has not yet been confirmed.

3 Scope, Structure and Consultation

Scope

3.1 A scoping exercise has been carried out in order to determine the likely significant effects on the environment that may arise as a result of the Proposed Development. This process has enabled the team to determine which technical disciplines are pertinent to the Proposed Development and the scope of assessment required in order for any likely significant effects on the environment to be addressed as part of a future EIA process.

3.2 This process has taken account of the proposed construction activities, relevant planning policy, knowledge of the Site, and the professional opinion of the project team.

3.3 The information presented in the ES will be provided in accordance with Schedule 4 of the EIA Regulations and will include:

- A description of the Proposed Development;
- An outline of the main alternatives studied;
- A description of the aspects of the environment likely to be significantly affected by the Proposed Development;
- A description of the likely significant effects of the Proposed Development on the environment;
- A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment;
- A non-technical summary; and
- An indication of any difficulties encountered by the applicant in compiling the required information.

3.4 The introductory chapters of the ES will provide the following information:

- An introduction to the ES in a legislative and site specific context;
- Description of the Site and Proposed Development;
- Alternatives considered and project design evolution;
- EIA methodology;
- Construction methodology and programme;
- Stakeholder engagement;
- ES structure; and
- Details of the EIA project team.

3.5 The geographical coverage of the EIA will be determined by a number of factors including:

- The physical extent of work;
- The nature of the baseline environment, including the location of sensitive receptors;
- The distance over which effects will be significant; and

- The presence and type of "pathways" along which impacts may be spread.

Environmental Disciplines to be Scoped Out of the EIA

3.6 It is considered that the following disciplines will not give rise to likely significant effects on the environment and would therefore not require inclusion in the ES. An explanation for each discipline is given below.

Agricultural Circumstances

3.7 The Site is entirely on brownfield land so there would be no likely significant effects with respect to agriculture. This discipline can therefore be scoped out of the EIA.

Archaeology

3.8 The wider East Manchester area has been subject to a series of archaeological desk-based assessments and investigative work dating back to 2000, in support of the on-going regeneration of the area.

3.9 The Site was the subject of an Archaeological Desk-Based Assessment prepared for Sports City, Eastlands Manchester by the University of Manchester Archaeological Unit in April 2000. A copy of the report is provided at Appendix 3.

3.10 The report notes that there are no potential below-ground archaeological remains within the boundary of the Site (see Fig. 1 at page 17) and therefore no further archaeological work is required.

3.11 The report identified the possibility for remains of regional importance in respect of the medieval moated site of Bradford Old Hall, located a short distance to the south of the Site. The recommendation was for recording of this area through trial trenching and if required treatment of any organic finds and analysis of palaeo-environmental material.

3.12 Excavation work in relation to Bradford Old Hall was undertaken in 2002, which revealed some remains of the medieval moat and its stone-built revetment at depth in the immediately adjacent area. Further work was undertaken in 2010 and no further remains were identified.

3.13 A Sportcity, Bradford, Manchester Final Excavation Report (see Appendix 3) was prepared by Oxford Archaeology in March 2011, which summarised these findings (in addition to the findings of excavation work in the wider area) and concluded that the construction of a modern sewer system along the northern edge of Philips Park Road had destroyed any buried remains of the moat. Further to the north, the construction of Bradford Mill in the early 1840s had completely destroyed any buried remains of the medieval hall.

3.14 There have also been a number of sizable excavations around the Etihad Campus between 2010 and 2013, including the eastern and southern parts of the stadium; these works did extend upwards to incorporate the Site as part of the 2013 archaeological works.

3.15 As part of the 2013 application to extend the Etihad Stadium an Archaeological Desk Top Assessment was undertaken, and subsequently a watching brief was in place during the remediation of the Etihad Stadium expansion site. During these remediation works it was found that there was no buried archaeological remains, as confirmed by Salford Archaeology on 7 October 2019.

3.16 On the basis of the archaeological work completed to date, as summarised above, it was considered that there is already a complete understanding of the archaeological position on the Site and adjacent area, that no further archaeological work is required in advance

of the redevelopment of the Site and that the Proposed development would therefore not give rise to potential significant environmental effects in respect of archaeology.

3.17 This positon was confirmed through consultation undertaken by the Applicant with Greater Manchester Archaeological Advisory Service ('GMAAS') in August 2019.

3.18 This discipline can therefore be scoped out of the EIA.

Aviation

3.19 At a maximum of 38m AOD, the Proposed Development does not exceed the 90m AOD aviation safeguarding threshold. Nor is it considered from professional experience of similar scale developments that the Proposed Development would give rise to aviation conflicts, which could not be resolved via appropriate mitigation. Therefore it is considered that the aviation discipline will not give rise to likely significant effects on the environment and would therefore not require inclusion in the ES.

3.20 This discipline is therefore scoped out of the EIA

Built Historic Environment

3.21 The potential impact of the built historic environment has been considered in light of the Proposed Development.

3.22 As outlined in Section 2, there are no designated heritage assets on the Site itself, nor is it within a designated conservation area. There are six listed structures within 500m of the Site.

3.23 The Proposed Development will not result in any physical impacts to the identified designated heritage assets. There is potential for an impact to the setting of the assets; however, from an initial analysis, it is considered that the Ashton Canal features to the south of the Site are principally enjoyed from a lower topography than that of the Site and appreciated looking inwards, away from the Site.

3.24 Similarly, the extensive perimeter planting indicates that Philips Park and Philips Park Cemetery are intended to be best viewed facing inwards. In addition, as a result of the mature planting, the Proposed Developed is likely to obscured from Phillips Park when looking towards the Site.

3.25 The current use of the Site could also be considered to detract from the setting of the identified designated heritage assets and the Proposed Development represents an opportunity to enhance the setting through the introduction of a high quality new development.

3.26 On this basis it is considered that the proposals are unlikely to result in significant environmental effects in relation to the Built Historic Environment, and should be scoped out of the EIA.

3.27 A Heritage Statement that fully considers the impact of the Proposed Development on the identified heritage assets will be submitted as a standalone technical report with the application for Full Planning Permission. The visual impact of the Proposed Development will also be assessed as part of a Townscape and Visual Impact assessment, which is proposed to form part of the EIA.

Climate Change

3.28 The Proposed Development will have an impact on climate change during the operational phase of the development through the emission of greenhouse gasses. Sustainability

measures will inform the design process from the outset, including climate change mitigation and energy usage.

3.29 An Energy Strategy and Environmental Standards Statement will be submitted alongside the planning application, outlining this process in greater detail including an assessment of the energy efficiency of the buildings and use of low carbon technologies. This will include consideration of how the Proposed Development will contribute towards the draft Manchester Zero Carbon Framework 2020-2038.

3.30 It is not considered that the Site or the Proposed Development is particularly vulnerable to climate change.

3.31 Any impacts of climate change on the wind microclimate will be considered as part of the wind assessment, which will form part of the EIA.

3.32 A Flood Risk Assessment and Drainage Strategy will be prepared and submitted as technical appendices to the EIA; these documents will fully consider the impacts of climate change with regard to potential for flooding and surface water drainage.

3.33 It is not considered that the Proposed Development will result in any likely significant environmental effects in respect of climate change. Effects on climate change and climatic factors for individual topics will be considered within the relevant chapters of the ES.

Daylight and Sunlight

3.34 Daylight, sunlight and overshadowing assessments are generally carried out in the context of BRE guidance contained in report BR209, Site Layout Planning for Daylight and Sunlight 2011 (BR209), which provides guidance on achieving good daylighting and sunlighting within a Proposed Development and safeguarding daylight and sunlight at existing properties.

3.35 Given the scale of the Proposed Development, Buro Happold have undertaken an initial review of the likely effects relating to daylight, sunlight and overshadowing. The relationship between the maximum parameter massing of the Proposed Development and its separation distance from adjoining properties is such that BR209 guidance for acceptable loss of daylight and sunlight at existing properties is expected to be fully met as follows:

- The nearest residential property on Stuart Street, to the east of the Site, meets BR209 guidance as it has no view of the Proposed Development above a 25° angle struck from the centre of ground floor windows;
- Philips Park, to the east of the Site, meets BR209 guidance as only the western part of the Park is expected to be overshadowed by the Proposed Development in late afternoon, leaving more than 50% of the Park continuing to receive at least two hours of direct sunlight on the March Equinox; and,
- The Manchester Regional Tennis Centre, to the west of the Site, will receive shadow from the Proposed Development mainly on non-daylit buildings and a car park. Outdoor playing surfaces will only be overshadowed by the Proposed Development in early mornings and will continue to receive over two hours of direct sunlight on at least 50% of their area on the March Equinox.

3.36 The guidance of BR209 is not applicable to the consideration of effects arising from the Proposed Development to receptors within the Proposed Development, as non-domestic buildings are generally not considered by BR209 to have a particular requirement for daylight.

3.37 Due to the expected negligible impact and effect of the Proposed Development on daylight and sunlight access to adjoining properties and the absence of permanent dwellings within the Proposed Development, it is proposed that a daylight, sunlight and overshadowing assessment is scoped out of the ES and is provided as a standalone report with the planning application.

Ecology

3.38 An Ecological Appraisal has been conducted for the Site, with an extended Phase 1 Habitat Survey carried out on 21 June 2019 by Buro Happold (see Appendix 4). The survey, alongside a desk study of records commissioned from Greater Manchester Ecology Unit (GMEU) and an assessment of the site context, identified that the Site has limited potential for ecology with the following identified as potential important ecological features:

- A single record for little ringed plover (Schedule 1 species) and northern lapwing (red listed Bird of Conservation Concern) on or near to the Site;
- The Ashton Canal to the south of the Site boundary is a non-statutory designated Site of Biological Interest (SBI), protected under national and local planning policy. The canal corridor was also identified as offering suitable foraging and commuting opportunities for bats; and,
- The recolonised areas of neutral grassland could be considered to meet the criteria for SBI under GMEU guidance for species assemblage for Semi-Natural Grasslands (Gr2).

3.39 However, it is considered that ecology can be scoped out of the EIA as no significant effect on the identified ecological features is anticipated from the proposed construction activities or during operation of the Proposed Development.

3.40 Breeding birds, their nests and young are protected by law. Where possible, site clearance and groundworks including vegetation clearance should be undertaken outside of the breeding bird season (March – August inclusive). Where this cannot be achieved, a pre-works check for the presence of breeding birds should be undertaken by an experienced ecologist no more than 48 hours before the start of works.

3.41 The Proposed Development does not directly impact or alter Ashton Canal. To meet best practice during site clearance and construction, potential indirect impacts will be addressed in a Construction Environment Management Plan (CEMP). The CEMP will identify control measures to minimise and avoid potential risks to the canal and will detail how airborne dust, run-off, waste, noise/vibration and light spill will be managed during site clearance and construction activities. Controls will follow national standards and best practice to ensure that these risks are minimised and that they do not affect the canal including retained adjacent habitats or species associated with these habitats.

3.42 Whilst the neutral grassland on the Site was identified to meet the GMEU SBI criteria for neutral grassland due to the plant species assemblage observed during the Phase 1 habitat survey, the criteria are only applicable if the grassland is considered to be likely to remain on the Site in the long-term. As noted within the Ecological Appraisal, the areas of neutral grassland that have recolonised the Site are showing encroachment by young self-seeded trees and scrub, indicating that, without management, the neutral grassland would be unlikely to remain in its current form. In addition, this grassland is not associated with notable species/species assemblages, such as characteristic invertebrates of waste or disturbed ground, thus removing it from meeting SBI criteria. Therefore, the grassland is considered to have value at a site level. Under CIEEM Ecological Impact Assessment (EcIA) guidance, loss of a feature of site value will not result in a likely significant effect, and so does not need to be considered within an EIA.

3.43 The above considerations would result in a negligible impact from the Proposed Development on ecology and therefore ecology has been scoped out of the EIA.

3.44 Ecology will still input into the design of the Proposed Development, in terms of identifying opportunities to enhance biodiversity and the recommendations outlined in the Ecological Appraisal, such as protecting the Ashton Canal from light spill during operation to ensure that the canal corridor continues to provide suitable foraging and commuting habitat for bats.

Television, FM Radio and DAB Radio Reception

3.45 A Television, FM Radio and DAB Radio Reception Pre-construction Survey has been completed by SCS Technologies during September 2019. A copy of the survey is included at Appendix 5.

3.46 The results of the desktop and field survey have enabled the identification of an approximate area where digital terrestrial reception may be affected by the Proposed Development; however, due to the height of most of the existing buildings in this zone, it is not envisaged that a major significant impact to the digital terrestrial signal will be experienced with the introduction of the Proposed Development. Any potential impacts could be addressed through introduction of mitigation measures and as a result there are no anticipated significant impacts on TV signal strength in properties surrounding the Site.

3.47 Buildings located directly to the north are a sufficient distance from the Site so as not to experience any impact to satellite television reception; any minor impacts identified post-construction could be mitigated.

3.48 It is not anticipated that FM and DAB Radio signals in the vicinity of the Site will be affected by the Proposed Development.

3.49 The presence of tower cranes on the Site during construction could cause interference on a greater scale than the completed Proposed Development. This interference would be for the duration of time that the tower cranes are present and therefore for a short-term, limited period only.

3.50 On the basis of this information, it is considered that TV, FM Radio and DAB Radio Reception can therefore be scoped out of the EIA.

Human Health

3.51 The Proposed Development is not anticipated to have any likely significant effects in relation to human health during either the construction or operational phases.

3.52 During the construction phase, there are likely to be some temporary short-term impacts in relation to the generation of air quality and noise and vibration impacts. These are an unavoidable aspect of construction works and are controlled through legislation governing pollution control. Construction phase impacts will be mitigated to acceptable levels by the implementation of a Construction Environmental Management Plan (CEMP), which will include measures to minimise any impacts on both on-site workers, local residents and visitors to the Etihad Campus. Impacts on air quality and noise and vibration will be assessed within the ES, and any additional specific, non-standard mitigation measures identified as a result of these assessments will be incorporated into the CEMP. The CEMP would be expected to form a condition of planning permission.

3.53 During the operational phase, the Proposed Development is not expected to give rise to any likely significant effects on human health. The impact of operational traffic movements related to the Site will be assessed within assessments of noise and air

quality effects. Similarly, effects as a result of light spill would be considered as part of that ES chapter. Should these assessments identify the requirement for any mitigation to protect human health then this would be expected to be incorporated into the Proposed Development or required as a condition of planning permission; however, this is considered unlikely as significant effects in terms of human health are not expected to arise.

3.54 In summary, the potential for pollution and other environmental effects with the potential to impact on human health will be accounted for within other ES chapters and assessments, and within the planning application submission documents. The Proposed Development is not of a type or scale which is likely to give rise to significant effects on human health. This topic is therefore scoped out of the ES.

Scoping Summary

3.55 Table 3.2 provides a summary of the scoping exercise undertaken and what disciplines will be considered within the EIA and which are proposed to be scoped out of the EIA (and subject to a standalone technical report).

Table 3.2: EIA Scoping Summary

Discipline	ES Chapter	Non EIA Assessment	Consultant
Agricultural Circumstances	×	×	n/a
Air Quality and Dust	✓	×	Buro Happold
Archaeology	×	×	n/a
Aviation	×	×	n/a
Built Historic Environment	×	✓	Deloitte Real Estate
Climate Change	×	×	The potential effects in relation to climate change will be addressed within individual chapters (including wind and water resources), as well as the suite of technical reports that address sustainability
Daylight, Sunlight and Overshadowing	×	✓	Buro Happold
Ecology	×	✓	Buro Happold
Electronic Interference	×	✓	ME Engineers
Ground Conditions	✓	×	Buro Happold
Light Spill	✓	×	ME Engineers

Discipline	ES Chapter	Non EIA Assessment	Consultant
Noise and Vibration	✓	×	Buro Happold, with input from Vanguardia
Socio-Economic Issues	✓	×	Buro Happold
Townscape and Visual Impact	✓	×	Planit-ie
Traffic and Transport	✓	×	Buro Happold
Water Resources, Drainage and Flood Risk	✓	×	Buro Happold
Wind Microclimate	✓	×	Buro Happold
Human Health	×	✓	Potential effects in relation to human health will be addressed within individual chapters (including noise, ground conditions and wind) and a standalone technical report

Cumulative Effects Assessment

3.56 An assessment of the cumulative effect of the Proposed Development and other committed developments within a defined radius of the Site, including those with recent Planning Permissions and reasonably foreseeable to come forward in the near future will be undertaken as part of the EIA.

3.57 There is no agreed / standard threshold for how far the assessment should go; therefore a professional judgement has been taken regarding which schemes to highlight, taking into consideration the surrounding context of the Site.

3.58 Where the construction of schemes is well progressed these will be treated as part of the baseline and not as committed developments.

3.59 Full details of the committed developments to be included as part of the cumulative effects assessment are set out at Appendix 2.

3.60 The Applicant seeks the agreement from the Local Authority to the scope of committed developments and invites guidance on any additional schemes not listed.

Consultation

3.61 The following statutory consultees should be consulted through the EIA Scoping process:

- Manchester City Council (MCC) – Contaminated Land, Environmental Health, Flood Risk, Highways, Tree Officer (Technical Officers);
- Transport for Greater Manchester (TfGM);
- Environment Agency (EA);

- Canal and River Trust;
- Greater Manchester Police Secure by Design;
- Historic England;
- Greater Manchester Archaeological Advisory Service;
- Natural England;
- Greater Manchester Ecological Unit;
- Health and Safety Executive (in relation to the adjacent gasholders); and,
- United Utilities.

4 EIA Methodology

4.1 The EIA would assess both the construction and operational phases of the Proposed Development.

4.2 The ES would comprise two volumes, the first of would set out the findings with respect to each of the environmental disciplines that have been examined as part of the EIA. Volume 2 would include all the supporting documents and technical appendices relating to the chapters. A Non-Technical Summary (NTS) would be produced and form a standalone document.

4.3 Each ES chapter would follow the headings set out below to ensure the final document is transparent, consistent and accessible.

- Introduction;
- Legislative and Policy Context;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Identification and Evaluation of Key Effects;
- Mitigation Measures;
- Cumulative Effects;
- Residual Effects; and
- Summary.

4.4 Each chapter sub-heading is explained in further detail below.

4.5 A reference list will also be provided as relevant with each ES chapter.

Introduction

4.6 This section will introduce the assessment discipline and the purpose for which it is being undertaken.

Legislative and Policy Context

4.7 This section will include a summary of national, regional and local policies of relevance to the environmental discipline and assessment. Relevant legislation will be summarised where applicable.

Assessment Methodology and Significance Criteria

4.8 This section will provide an explanation of methods used in undertaking the technical study with reference to published standards, guidelines and best practice. The application of significance criteria will also be discussed.

4.9 It will also outline any difficulties encountered in compiling the required information.

Baseline Conditions

4.10 This will include a description of the environment as it is currently and as it is expected to change given the project were not to proceed (i.e. ‘do-nothing’ scenario). The method used to obtain this information will be clearly identified. Baseline data will be collected in

such a way that the importance of the particular subject area to be affected can be placed in its context and surroundings so that the effects of the proposed changes can be predicted.

Identification and Evaluation of Likely Significant Effects

4.11 This section will identify the likely significant effects on the environment resulting from the Proposed Development.

4.12 The significance of an environmental effect is determined by the interaction of magnitude and sensitivity, whereby the effects can be positive or negative. The criteria to be used in carrying out this process are detailed below; it should be noted that these tables provide a standardised set of criteria, which may not be applicable to all technical disciplines considered within the EIA – where relevant, individual consultants may use a variation of the criteria and this will be clearly explained within the methodology.

Prediction of Impact Magnitude

4.13 The methodology for determining the scale or magnitude of change caused by the impact is set out in Table 4.1.

Table 4.1: Methodology for Assessing Magnitude of Change

Magnitude of Change	Criteria for assessing magnitude of change caused by an impact
Major	Total loss or major/substantial alteration to key elements/features of the baseline (pre-development) conditions such that the post development character/composition/attributes will be fundamentally changed.
Moderate	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of the baseline will be materially changed.
Minor	A minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible/detectable but not material. The underlying character/composition/attributes of the baseline condition will be similar to the pre-development circumstances/situation.
Negligible	Very little change from baseline conditions. Change barely distinguishable, approximating to a 'no change' situation.

Prediction of Receptor Sensitivity

4.14 The sensitivity of a receptor is based on the relative importance of the receptor using the scale set out in Table 4.2.

Table 4.2: Methodology for Determining Sensitivity

Sensitivity	Examples of receptor
High	The receptor/resource has little ability to absorb change without fundamentally altering its present character, or is of international or national importance.

Sensitivity	Examples of receptor
Moderate	The receptor/resource has moderate capacity to absorb change without significantly altering its present character, or is of high importance.
Low	The receptor/resource is tolerant of change without detriment to its character, is of low or local importance.

Assessment of Effect Significance

4.15 Effect significance will be calculated using the matrix in Table 4.3. This illustrates the interaction between impact magnitude and receptor sensitivity.

Table 4.3: Effect Significance Matrix

Magnitude	Sensitivity		
	High	Moderate	Low
Major	Major Adverse/Beneficial	Major - Moderate Adverse/Beneficial	Moderate - Minor Adverse/Beneficial
Moderate	Major - Moderate Adverse/Beneficial	Moderate – Minor Adverse/Beneficial	Minor Adverse/Beneficial
Minor	Moderate – Minor Adverse/Beneficial	Minor Adverse/Beneficial	Minor - Negligible
Negligible	Negligible	Negligible	Negligible

Mitigation Measures

4.16 Adverse effects will be considered for mitigation and specific mitigation measures put forward, where practicable. Mitigation measures considered may include modification of the project, compensation and the provision of alternative solutions as well as pollution control. The extent of the mitigation measures and how these will be effective will be discussed. Where the effectiveness is uncertain or depends upon assumptions about operating procedures, data will be introduced to justify the acceptance of these assumptions.

4.17 The approach to mitigation will follow best practice guidance, which suggests a hierarchical approach. The UNEP EIA Training Resource Manual (2002) advises that impacts should ideally be:

- Avoided; if not
- Minimised; and/or
- Compensated.

4.18 Three ‘types’ of mitigation are characterised in IEMA’s Special Report – The State of Environmental Impact Assessment Practice in the UK (2011):

- EIA influence at design stage;

- Standard construction practices for minimising effects; and
- Follow-up actions for implementation post-consent.

4.19 Clear details of when and how the mitigation measures were carried out, or will be carried out, are to be given within the Environmental Statement. When certainty of impact magnitude and/or effectiveness of mitigation over time exists, monitoring programmes will be proposed to enable subsequent adjustment of mitigation measures, as necessary.

4.20 The opportunity for enhancement measures will also be considered where appropriate.

Cumulative Effects

4.21 Two types of cumulative effect will be assessed:

- Type 1 - Cumulative effects are the interactions between effects of the construction and development works on a single receptor.
- Type 2 - Cumulative effects are those that arise from incremental changes caused by other past, present or reasonably foreseeable actions together with the construction and development works.

4.22 The cumulative effects of the Proposed Development and the identified committed developments will be assessed. A list of known committed developments is set out at Appendix 2. The Council are requested to review and comment on this list in their Scoping Opinion.

Residual Effects

4.23 The residual effects, i.e. the effects of the Proposed Development assuming implementation of proposed mitigation, will be determined. The residual effects represent the overall likely significant effect of the Proposed Development on the environment having taken account of practicable/available mitigation measures.

5 Environmental Statement Chapters

5.1 The list of proposed technical ES Chapters are set out as follows:

- Air Quality and Dust
- Ground Conditions
- Socio-Economic
- Lighting
- Noise and Vibration
- Townscape and Visual Impact
- Traffic and Transport
- Water Quality, Drainage and Flood Risk
- Wind Microclimate

Air Quality and Dust

Assessment context

Topic Purpose

5.2 An assessment of the likely air quality and dust effects associated with the Proposed Development, which has the potential to impact local air quality during both construction and operational phases. During construction, site activities will give rise to dust and particulate matter (PM_{10}) emissions, predominantly in the form of construction dust arising from construction activities. Operational impacts will largely be due to traffic increase as a result of the Proposed Development and related car parking facilities, the emissions from the additional traffic will likely be nitrogen oxides (NO_x) and particulate matter ($PM_{10/2.5}$) both of which are pollutants of concern in the UK. Additionally, the use of on-site combustion plant would give rise to emissions which may have potential effects on local air quality. It will also be necessary to consider the exposure of future site users to poor air quality where there is relevant exposure to national air quality objectives, in line with local air quality management technical guidance (LAQM TG(16)).

Legislative Context

5.3 Part IV of the Environment Act 1995 requires local authorities to regularly and systematically review and assess air quality within their boundaries against a series of health-based air quality objectives, and appraise development and transport plans against these assessments. Where an air quality objective is unlikely to be met, the local authority must designate an air quality management area (AQMA) and draw up an Air Quality Action Plan setting out the measures it intends to introduce in pursuit of the objectives within its AQMA.

5.4 The National Planning Policy Framework (NPPF) notes that planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of AQMAs and Clean Air Zones, and the cumulative impacts on air quality from individual sites in local areas. It also states that planning decisions should ensure that any new development in an AQMA and Clean Air Zone is consistent with the local air quality action plan. The Site is located in close

proximity to areas of the Greater Manchester AQMA which has been declared for exceedances to the long term nitrogen dioxide (NO_2) objective.

Baseline conditions

5.5 In line with other cities in the UK, Greater Manchester Combined Authority have declared AQMAs along key arterial roads within the borough due to previously monitored exceedances of the NO2 annual mean air quality objectives, as a result of this the Council have created an Air Quality Action Plan (AQAP) which was most recently updated in 2016.

5.6 The Site is located to the north east of Manchester city centre on the premises of the Etihad Stadium.

5.7 The Site is bordered by Alan Turing Way and Ashton Road, both of which are key arterial links to the city centre, and areas of the declared AQMA are located along these roads in close proximity to the Site. Any site generated traffic will impact these roads, and in turn impact the air quality within the declared AQMA's.

5.8 The nearest air quality monitoring site is an urban background diffusion tube site MAN14 (located on Pioneer Street, 400m east of the site boundary) which monitored an annual mean concentration of 22.4 µg/m3 in 2017, which is well below the air quality objective (40µg/m3). It is possible that actual conditions on site may be greater than this value due to the proximity to major roads. A roadside site located 2km east on Ashton New Road (T17) monitored an annual mean of 36.9 µg/m3 in 2017. This data is confirmed by Buro Happold to be robust and appropriate for use in the assessment.

5.9 As well as non-automatic monitoring sites, Greater Manchester is well covered by automatic monitoring sites that monitor levels of PM10/2.5 and NO2. The automatic site situated the closest to the Site is 2.5km to the west, within Manchester City Centre; it exceeded the NO2 objective in 2016. At this distance, and due to its location, it is not deemed to be representative of the Site.

5.10 The Department of Environment, Food and Rural Affairs (DEFRA) maintain background maps, which predict background pollutant concentration at a 1km gridded resolution across the UK. The table below outlines the pollutant concentrations predicted in the grid square the Site resides in.

Table 5.1: DEFRA Background Maps Predicted Concentrations 2018

Development Site Coordinates (x, y)	Annual mean background concentration ($\mu g/m^3$)		
	NO_2	PM_{10}	$PM_{2.5}$
386810, 398492	21.7	11.9	7.8

Nearby receptors

5.11 Adjacent to the Site are a number of residential areas, namely: Newcombe and Havana Close to the south; Stuart Street to the east and; Bradford Road to the north. There are also a number of commercial properties located to the east, as well as the Etihad Stadium to the south. Ecological receptors in the vicinity of the site include Clayton Vale LNR, Rochdale Canal SSSI and Hollinwood Branch Canal SSSI. Philips Park and Philips Park Cemetery are also located near to the Site.

Potential construction effects

5.12 The construction activities that will take place on the Site may lead to the following air quality effects:

5.13 Effects of the emissions from heavy duty vehicles associated with construction work;

- Construction dust emission from activities associated with high dust generation such as piling, excavation; and,
- Emissions of sand, cement of any other fine aggregates that may be stored in bulk on site.

Potential operational effects

5.14 The operational phase of the Proposed Development may lead to the following air quality effects:

- Degradation of air quality from emissions from on-site power generation facilities impacting on existing ecological or residential receptors;
- Generated road traffic as a result of the Proposed Development leading to increased emissions from the surrounding minor roads;
- Effects associated with existing sources of emissions on future receptors that will be newly introduced to the area through the development scheme.

Assessment methodology

Technical scope

5.15 The assessment will consider existing and future baseline air quality conditions on and around the Site, as well as the potential impact and effect associated with construction activities and development operation. The technical assessment will utilise traffic flow data provided as part of the transport assessment and combustion plant data in line with the proposed energy strategy.

Baseline assessment

5.16 The baseline assessment will consider the air quality both on and around the Site. This assessment will include a review of the recent air quality monitoring data and a cursory review of existing traffic data to supplement supplied traffic data where necessary. Baseline data will be gathered from the following sources:

- Greater Manchester Combined Authorities local air quality review and assessment reports and monitoring data;
- DEFRA air quality background maps; and
- Traffic count data from the Department of Transport.

Construction assessment

5.17 The potential impacts from dust emissions generated during the construction phase will be assessed qualitatively in accordance with the Institute of Air Quality Management (IAQM) construction guidance[1]. This document provides a qualitative methodology for assessing the potential air quality impacts from various site construction activities (demolition, earthworks, construction and trackout) and provide site specific mitigation measures to minimise these potential impacts. Construction impacts can occur up to 350 metres from a site boundary, and therefore all receptors within this distance will be considered in the assessment.

Operational assessment

5.18 Operational impacts will be assessed by considering both traffic-related emissions and emissions from any proposed combustion plant. The air dispersion model ADMS-Roads

[1] Holman *et al (*2014) IAQM Guidance on the assessment of dust from demolition and construction, institute of Air Quality Management, London. https://iaqm.co.uk/text/guidance/construction-dust-2014.pdf

extra will be used to predict the impacts of emissions on pollutant concentrations at nearby receptors as a result of the Proposed Development.

5.19 In line with Environmental Protection UK (EPUK) and IAQM air quality planning guidance[2], a detailed dispersion modelling assessment will be carried out where there is a predicted increase in annual average daily traffic (AADT) of more than 100 light duty vehicles per day or 25 heavy duty vehicles per day, as a result of the proposed development.

5.20 Concentrations of pollutants will be modelled at both existing and future proposed receptors where there is relevant exposure to air quality objectives. In order to provide a robust assessment, appropriate worst-case assumptions will be made regarding improvements in vehicle emissions for future assessment years. A number of different background concentration sources will be reviewed and the most appropriate values will be used, sources will include DEFRA background maps and monitored background concentrations. Meteorological data from Manchester Airport meteorological station will be used for the dispersion modelling study.

Scenarios

5.21 The following scenarios will be assessed as part of this model;

- Baseline. 2018 data will be used for model verification;
- "Do Nothing" – Future baseline year of development opening with committed development without the proposed development; and
- "Do Something" - Future baseline year of development opening with committed development and the development in place.

5.22 Baseline model outputs will be verified against relevant existing monitoring data and a verification factor will be calculated in order to adjust the model results accordingly. The verification process will follow the methodology set out in LAQM TG(16)[3].

5.23 The 2018 data is the most up-to-date available as air quality concentrations are measured on an annual average basis, therefore data from the most recent full calendar year will be used to assess the baseline.

Effect prediction and assessment of effect significance

5.24 The concentrations predicted by the model will be compared against the appropriate air quality objectives and any exceedances will be highlighted. Significance levels will be reported using the criteria set out in the IAQM and EPUK air quality planning guidance. Mitigation measures for both the operational and construction phase impacts of the development will be dependent on the level of risk and significance of the impacts: construction mitigation will follow the IAQM construction dust guidance document; operational mitigation measures will follow industry best practice and will be informed through professional experience and relevant guidance.

Ground Conditions

Assessment context

5.25 The ground conditions assessment will address issues relating to existing geo-environmental conditions at the Site, with the aim of ensuring that suitable and safe conditions are achieved for the proposed end-use. Consideration will be given to the Site's conceptual model including geology, hydrology, hydrogeology and the

[2] Moorcroft and Barrowcliffe *et al.* 2017. Land-use Planning & Development Control: Planning for Air Quality v1.2 IAQM. London. http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf
[3] DEFRA. 2018. Part IV of the Environment Act 1995. Local Air Quality Management Technical Guidance (TG16) https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf

geoenvironmental conditions (including issues associated with soil gases, chemicals within site soils and groundwater). A range of impacts associated with the design, construction and operation of the Proposed Development will be considered.

5.26 An initial understanding of the likely baseline has been obtained from a review of published mapping and existing reports on the Site and of neighbouring land. This presents an initial appreciation of the baseline ground conditions but it must be recognised that this is subject to revision as more detail becomes available.

5.27 The ground conditions are likely to comprise Made Ground (Fill), typically between 5.8m to 15m thick. Typically, Made Ground was recorded to greater depths in the eastern part of the site. The variations can be attributed to the development history (e.g. Bradford Road Gas Works), treatment to mine workings and numerous phases of enabling works across the site. This overlies the sequence of natural geological strata of; Alluvium and/or River Terrace Deposits (<0.5m to 2m thick) and Glacial Till (0.5m to 3m thick) forming the superficial deposits, possible Boulder Clay (0.5m to 7.5m thick where present), followed sequentially by the Pennine Upper, Middle and Lower Coal Measures (>11m to >100m thick, base not proven). The Coal Measures form a Secondary [A] Aquifer and the superficial deposits a Secondary [undifferentiated] Aquifer. The particular conditions at the site will be determined by reference to data available from the British Geological Survey (maps and borehole logs) and to any existing site investigation reports.

5.28 The site history has been determined with reference to published Ordnance Survey mapping (dating back to the mid 1800s) and to other accessible information and reports (via internet searches). These recent and any historic uses of the land at the Site (summarised below) will then be interpreted to determine the likely location, nature and scale of any ground contamination.

5.29 Until the mid-1800s, the Site and surrounding area was occupied by agricultural land with the River Medlock meandering through the north-west of the Site. The Ashton Canal and lock formed the southern boundary and Mill Lane the east. Victoria Gardens were located to the north and in part occupied the north of the Site. By 1848 the River Medlock had been straightened and diverted further north, away from the area. Industrial works began to occupy the land south of the Ashton Canal during the early 1890s and residential development occupied the eastern part of the Site. During the early 1900s the River Medlock was diverted into a culvert, Forge Lane was constructed running centrally through the Site (north/south) and other residential roads connecting Forge Lane to the residential developments. The largest change at this time was the development of Bradford Road Gas Works, which included tanks, gas holders, tramways and large buildings (some within the Site boundary).

5.30 By the early 1930s there was further development to these gas works and developments to the industrial works to the south, beyond the canal. There were no further significant changes to the Site and its surroundings until late 1970s whereby the majority of these works were cleared, including most buildings associated with Bradford Road Gas Works.

5.31 Between the late 1980s and late 1990s there were changes to the land use east of Forge Lane within the Site boundary and by 1995 Mill Lane developed into Alan Turing Way. By 2002, construction of the Etihad Stadium (formally Manchester Stadium) to the south was underway and road layouts in the surrounding area developed. By 2010 the Site was cleared of all buildings.

Potential construction effects

5.32 Assessment during the construction period will consider the impact and associated effects of the construction on areas of potentially contaminated land within the spatial scope of the Site. The construction activities that could give rise to effects are related to any

below ground activities, including excavation, construction of basements, piled or other foundations, construction of below ground services or other infrastructure, dewatering and groundwater control, waste treatment and disposal. The potential effects arising from such activities could be relevant to both human (construction workers, neighbours) and environmental (flora, fauna, groundwater and surface waters) receptors.

Potential operational effects

5.33 The operational assessment will consider the effect that any residual contamination could have on the end users of the redeveloped Site, the environment and/ or the materials used in the construction of the project. The operational activities that could give rise to effects are related to the presence of any residual contamination (in solid, liquid or gaseous form) and the potential for exposure to both human (site occupiers and visitors, neighbours) and environmental (flora, fauna, groundwater and surface waters) receptors.

Assessment methodology

Technical scope

5.34 Land contamination is regulated under several regimes, including environmental protection, pollution prevention and control, waste management, planning and development control, and health and safety legislation. The primary regulatory regimes under which contaminated land are managed in the UK are: under the planning process described in the NPPF and under Part 2A of the Environmental Protection Act.

5.35 The framework for the assessment of potential land contamination adopted in this assessment will be based on current guidance documents regarding the implementation of these regimes and the assessment of potentially contaminated land, with particular reference to: the Environment Agency Model Procedures and their Guiding Principles on Land Contamination; and the relevant British Standard (BS10175:2011). Reference will also be made to local planning policy, namely Manchester's Local Development Framework - Core Strategy Development Plan Document.

5.36 A conceptual model of the Site will be developed that describes its environmental features together with the expected interaction of potential contamination sources with the environment. Assessment of the potential interactions will then be undertaken by means of a Source – Pathway – Receptor analysis of the Site in accordance with the guidance documents referred to above.

5.37 Where a source, relevant pathway and receptor are present, or could be created as a result of the Proposed Development, a "contaminant linkage" is present. The presence (or potential presence) of such a linkage gives rise to a circumstance through which some level of environmental harm could occur which requires assessed and the identification of mitigation, as appropriate.

Baseline assessment

5.38 Baseline conditions will be assessed for the development confines and for a distance of up to 250m beyond. This "halo" around the Site boundary is considered in order to take into account the potential for off-site contamination sources and receptors. The baseline data will be sourced from a desk based study and site walkover survey together with available data on the geological and geo-environmental conditions from any existing site investigation reports, together with published information and existing borehole logs published by the British Geological Survey.

5.39 Consideration of the future baseline will take into account the activity required to facilitate the Proposed Development including earthworks, foundations, construction and any associated remediation works which may affect the contamination status of land and/ or may affect the Proposed Development itself.

Effect prediction and assessment of effect significance

5.40 The methodology for impact prediction is based on assessing both the magnitude of the changes expected and the sensitivity of the receptors. Criteria for assessing the significance of potential human and environmental impacts will be based on a qualitative assessment of the magnitude of the impact, or how far the impact deviates from the baseline condition, and the receptor sensitivity.

5.41 The following resources/receptors will be considered in the assessment: construction workers, future site users, surrounding land users, controlled waters (groundwater and surface water bodies), ecology, and the built environment. It is not anticipated that these resources/receptors will all be significantly affected, but it is necessary to demonstrate that these important receptors have been considered. Incorporation of mitigation such as personal protective equipment (PPE) and the health & safety regime for construction workers will address the majority of any potential health risks associated with the development itself.

5.42 Receptors are considered to have varying degrees of sensitivity to contamination potentially present beneath the Site, based on the potential scale of exposure and the integrity of any site specific exposure pathways. The scale of receptor sensitivity will be defined on a scale from low to high.

5.43 The criteria used to assess the magnitude of effects will be based on a qualitative assessment of the potential seriousness of the effect or how far the effect deviates from the baseline condition and the period of time that the effect could last. The combination of the sensitivity of the receptor and the magnitude of the impact will provide an indication of the level of contamination on the Site, and the nature and severity of possible effects. It should be noted that both rankings may vary in accordance with the different scenarios being considered (i.e. baseline, construction and operation). Positive or negative effects during construction and when the Site is operational will be identified. The positive effects are associated with the mitigation of risks associated with contamination. The negative effects are temporary during the construction phase and relate to the increased potential for contaminant exposure (e.g. from the generation of contaminated dusts) and long term from the use of the Site during the operational phase (and any residual contamination if remediation was inadequate or not carried out).

Socio-Economic Impacts

Assessment context

Topic Purpose

5.44 A socio-economic assessment is designed to examine the impact of a proposed development on the current economic and social performance of the area. It then identifies and quantifies, where possible, the impacts and effects of the proposed development relating to employment, housing supply, economic output, spending within the local area, social infrastructure and local amenities and services.

5.45 The socio-economic assessment will consider the impacts and effects during the construction and operational phases of the Proposed Development. The likely sensitive receptors are considered to be:

- Existing and future local businesses and employees; and,
- Existing and future local residents.

5.46 The assessment also examines the policy context and relevant planning guidance provided at the national, sub-regional and local level and identifies whether the Proposed Development is likely to contribute to, or conflict with, the objectives and requirements of these documents.

Spatial Scope

5.47 The principal economic effect of the Proposed Development will be considered relative to the local and regional areas, as these represent the principal labour market catchment areas.

5.48 Effects on social and community infrastructure are assessed by various geographical effect areas, according to the most up-to-date socio-economic data or policy available. This depends in part on the availability of relevant data, but in all probability the impacts will be more local.

Legislative Context

5.49 A review of relevant planning, economic development and regeneration policies at the local, sub-regional and national level will be undertaken to identify whether the Proposed Development is likely to contribute to, or conflict with, the objectives and requirements of these documents. The review will also outline the key strategic regeneration outcomes sought for the local area.

Potential construction effects

5.50 The Proposed Development will generate temporary employment opportunities, both direct and indirect, during the construction phase. Due consideration will be given to the potential beneficial effects on the local economy and labour market, including the implementation of a Local Labour Agreement.

Potential operational effects

5.51 The socio-economic assessment will consider the following potential effects during the operational phase:

- The creation of long-term, direct, indirect and induced employment opportunities from the Proposed Development as well as any impacts on existing employment uses;
- Additional local spending associated with the visitors and employees brought to the site by the Proposed Development; and,
- Impacts and effects arising from the scheme on social infrastructure in the area, which could be used by future visitors and operational phase employees including open space.

5.52 The measures designed to secure and maximise the positive benefits will be outlined as part of this process. Any significant adverse effects will be identified, with mitigation measures recommended where necessary.

5.53 Wherever possible, the effects of the socio-economic assessment will be appraised against relevant national standards such as those provided by the Homes and Communities Agency (HCA). Where no standards exist, professional experience and judgement will be applied and justified.

5.54 Assessment of the impacts of the proposed scheme, could potentially be both positive and negative. It is envisaged at this stage that the positive impacts will include employment and income impact.

5.55 The measures designed to secure and maximise the positive benefits will be outlined as part of this process.

5.56 Any significant negative effects such as displacement impacts and crime impacts will be identified with mitigation measures recommended where necessary.

Assessment methodology

Technical scope

5.57 This ES chapter will outline potential socio-economic impacts and effects (both direct and indirect) of the Proposed Development. It will also clearly set out the significance of the residual socio-economic effects (those that remain after mitigation) of the Proposed Development.

5.58 A cumulative effects assessment will assess potential combined socio-economic effects of the Proposed Development and the other key reasonably foreseeable developments (under application or with extant planning permission) as set out in Appendix 2 of this Report.

Baseline assessment

5.59 A baseline assessment will be undertaken to establish the socio-economic conditions which currently surround the site, both at the local and regional level. The ES chapter will utilise data from a variety of sources including:

- 2001 and 2011 Census data;
- Data from the Office for National Statistics (ONS) including: Business Register and Employment Survey (2017), Annual Population Survey (2017) and Claimant data (2017/18);
- Indices of Multiple Deprivation (IMD) (2015); and,
- Relevant local and regional studies and assessments.

Effect prediction and assessment of effect significance

5.60 The assessment of potential socio-economic effects will be undertaken utilising a number of methodologies, data sources and assumptions. These are set out below:

- Construction related employment effects will be assessed using standard ratios of construction output to employment;
- The employment expected to be accommodated by the completed / occupied Proposed Development will be assessed by applying standard job density ratios using the Homes and Communities Agency (HCA) (2015), Employment Densities Guide 3rd Edition and information provided by the Applicant;
- The assessment will also consider additionality effects such as deadweight (effects that would occur regardless of the Proposed Development), leakage (the proportion of an effect that will occur outside the target area or group), displacement (the proportion of an impact accounted for by the reduction of existing outputs) and substitution effects (those which replace existing outputs) using HCA Additionality Guidance (2015); and,
- An estimate of the spending generated as a result of the completed / operational Proposed Development will be calculated using ONS data sources as well as information provided by the Applicant.

5.61 The assessment of the socio-economic effects will be made with reference to the standard EIA significance criteria terminology, in terms of the likely nature, scale, permanence and significance of effects.

Light Spill

Topic Purpose

5.62 The Proposed Development includes a new exterior amenity lighting system for the public realm as well as façade illumination of the building and installation of a media façade.

5.63 A key requisite of any exterior lighting installation is to minimise consequent obtrusive spill light, which might adversely sensitive receptors, which may include nearby residential communities, traffic and transport routes or environmental habitats, including those that might be used by protected species such as bats.

5.64 The EIA will therefore describe and assess the baseline conditions in and around the Site. It will assess the impact of the Proposed Development, identifying any likely significant environmental effects arising and recommend mitigation measures to minimise the impact of light spill to the identified sensitive receptors.

Baseline assessment

5.65 A baseline Lighting Condition Survey is provided at Appendix 6. At various points within the immediate surrounding of the Site, a horizontal illuminance reading is presented, which was taken at floor level with the light meter orientated so as aiming straight up. Additional vertical illuminance readings are taken with light meter orientated directly towards the Site at 2m above ground level.

5.66 Locations of the measurements and a photographic record are shown in Appendix 6, and include various locations at a distance of up to 500m from the Site, at circa 40m to 50m intervals.

5.67 The Etihad Campus to the south of the Site obstructs direct view from the existing residential properties located south of Ashton New Road and potential light spill to them.

5.68 Areas within 500m west of New Viaduct Street are not subject to glare or ambient light spill from the Site as they are obstructed by the foliage of trees next to the trainline and are at lower level than the Site. The road is lit by street lighting and it slopes down towards the north where views to the Site are obstructed by a rail bridge.

5.69 To the west, the main contribution of ambient illumination is by the street light illuminating Alan Turing Way. The light levels are quite high as this is a traffic route for motorised vehicles of medium to high driving speeds with conflict areas e.g. intersections and pedestrian passages.

5.70 The residential area south of Philips Park is at lower level than the Site. There is a direct line-of-sight from the buildings adjacent to Alan Turing Way but not from other locations in this area. The horizontal light levels next to the Park are quite high. These streets are well lit by post top luminaires.

5.71 In a radius within 150m of the Site the main sensitive area in terms of habitat is the canal, which is currently lit by LED lighting columns. The vertical light levels are high due to the contribution of light from the street columns. During the survey bats were recorded flying above the canal; this aligns with the findings of the Ecological Appraisal (Appendix 4).

5.72 Areas further than 500m from the Site are very unlikely to suffer from light spill (due to distance) or direct glare from a façade installation.

5.73 On that basis, it is proposed that the assessment will scope in the following receptors:

- Residential properties: located to the south east of the Site opposite Alan Turing Way (with a direct line of sight to the Proposed Development).
- Local vehicular routes: Alan Turing Way and New Viaduct Street.
- Ashton Canal: areas with direct line of sight to the Site.

5.74 Other receptors will be scoped out of the assessment.

Legislative and Policy Context

5.75 The legislation governing light pollution is the Planning (Clean Neighbourhoods and Environment) Act 2005. It applies to "artificial light emitted from premises so as to be prejudicial to health or a nuisance"; in accordance with Section 102 of the act, consideration has to be given to impact on residential properties and as such, residential receptors that could potentially be affected by the Proposed Development are scoped in to the assessment.

5.76 The NPPF sets out at Paragraph 180 that new developments should "limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation".

5.77 The assessment will also be undertaken by reference to industry standard guidelines, including:

- CIE 150:2003 – Guide on the limitation of the effects of obtrusive light from outdoor lighting installations.
- ILP: Guidance Notes for the Reduction of Obtrusive Light GN01:2011.

Assessment methodology

5.78 The main criteria for assessment of light will be:

- Light trespass on the vertical plane of any adjacent residential building scoped in to the assessment; the appropriate lux levels will be set by reference to the curfew criteria established by MCC Environmental Health and this should be less than 10 lux (daytime hours) and 2 lux (night-time hours) to avoid significant adverse effects.
- Source intensity of the luminaire should be less than 10,000 cd (daytime hours) and 1,000 cd (night-time hours) to avoid significant adverse effects.
- The maximum upward light ratio of all light fittings should be less than 15%.
- With regard to maximum spill light levels to the highway, criteria to be confirmed by MCC Highways.

5.79 The proposed lighting scheme will be assessed using Dialux, a standard industry Software for professional light planning.

5.80 Dialux utilises 3D modelling to model the Proposed Development and allows the use of the photometric files of any proposed light fittings. The results from the computer simulation provide information about the light distribution of the proposed installation. The calculation model cannot include proposed planting within a landscaping scheme; however, this will be accounted for when assessing and making conclusions about the light spill based on information provided by the landscape architects and the survey of existing site conditions.

5.81 The lighting levels of the lighting installation will be calculated with all the luminaries switched on, representing the 'worst case scenario'. A second calculation will be carried out to represent the part-lighting strategy operation. From these calculations, illuminance levels of areas of interest throughout the Site and at points outside the boundary will be produced so that the impact on identified receptors can be assessed.

5.82 The sky glow impact from the Site will be calculated for the 'worst case scenario', with all the luminaries switched on.

Potential Effects

5.83 Effects during the construction phase are not anticipated to be significant and would be short term and temporary in nature.

5.84 The lighting design for the operational phase of the Proposed Development may add to existing light levels; therefore, the design will be developed to avoid direct lines of sight and to reduce light spill.

5.85 The lighting scheme will adhere to industry standard guidelines.

Noise and Vibration

Assessment context

5.86 The Proposed Development has the potential to introduce changes in noise and vibration levels in the area. These changes need to be assessed to understand the potential impact and effect on the nearby sensitive receptors, which could be either adverse, neutral, or beneficial.

5.87 The Proposed Development works which need to be assessed in terms of noise and vibration, in the context of their impact on the surrounding environment, are:

- Construction works; and
- Operation of the Proposed Development.

5.88 Coordination with the work on the prediction of future traffic flows will be undertaken.

5.89 The Site is positioned to the north of the Sportcity, Etihad Campus, Manchester. It is bounded by Sportcity Way to the north, Alan Turing Way to the east, the Manchester canal to the south, and Joe Mercer Way to the west. Additionally, the 60,000 capacity Etihad Stadium is to the south of the Proposed Development, Regional Tennis Centre to the west, and the Metrolink stop for Sportcity, Etihad Campus to the south.

5.90 The residential properties which could potentially be affected by the Proposed Development are to the east of the Site, and are listed below (OS coordinates in brackets):

- Stuart Street (53.486018, -2.197371); and
- Gibbon Street (53.485470, -2.196978).

5.91 The assessment baseline is considered to be the current noise and vibration climate in the area before the construction commences, which includes measured data from event days at the Etihad Stadium.

Potential construction effects

5.92 Construction has the potential to generate high levels of noise and vibration through activities such as material movements, earthworks, ground improvement and piling, crushing and breaking. These will be assessed. No demolition is expected to take place. The potential for propagation of ground-borne noise and vibration due to piling works will be assessed, although the nearest noise sensitive receivers are most likely too far away to be impacted to any significant degree. Construction vehicle movements also have the potential to generate noise, although typically the increase in road traffic associated with construction is minor, particularly in comparison to heavily trafficked roads such as those in the vicinity of the Site.

Potential operational effects

5.93 The Proposed Development is expected to generate additional road traffic, increase to pedestrian movements, and potential for noise break-out during events and associated plant. On non-event days it is expected that operational effects will be minimal and limited to preparation for upcoming events and use of food and beverage and retail units. It is also expected that events at the nearby Etihad Stadium are likely to be more onerous with respect to the noise output compared to the activities at the Proposed Development, primarily due to the arena being completely sealed.

5.94 The operational noise effects of the Proposed Development will be assessed in coordination with the work to predict future traffic and pedestrian flows as well as the potential for noise break-out through the building envelope.

Assessment methodology

Technical scope

5.95 Construction noise and vibration will be predicted at chosen receptor locations to be agreed with the Local Authority, using accepted 3D computer noise modelling techniques and industry standard source sound-level data. Guidance on construction noise and vibration is contained within British Standard BS 5228:2009.

5.96 Procedures described in Department of Transport / Welsh Office Memorandum '*Calculation of Road Traffic Noise*' (1998) will be used for calculating and measuring road traffic noise. Procedures for the calculation and measurement of railway noise in '*Calculation of Railway Noise*' (DfT, 1995) will also be followed.

5.97 Guidance on the impact assessment of traffic noise is provided within the IEMA Guidance Note No. 1 *Guidance for the Environmental Assessment of Road Traffic*. The document recommends assessment, where traffic flows, will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%) and where specifically sensitive areas experience traffic flow increases of 10% or more. The guidance indicates that projected changes in traffic of less than 10% create no discernible environmental noise impact.

5.98 BS4142:2014 '*Methods for Rating and Assessing Industrial and Commercial Sound*' is widely used for assessing the impact of noise from mechanical services plant. The assessment parameter is the 'rating level' L_R of the plant noise assessed at the position of residential properties compared with the 'background' level L_{A90}.

Baseline assessment

5.99 The pre-development baseline conditions for noise will be established by means of careful consideration through an environmental noise survey. The survey will be conducted over a period sufficient to indicate the local ambient noise climate over the intended time of operation of the Proposed Development. The survey will include unattended logging and attended short period samples on event and non-event days at the Etihad Stadium. Noise monitoring will get underway as soon as practicable according to the following site plan.

Figure 5.1: Proposed noise monitoring positions (Imagery: Google Maps)



5.100 The survey methodology will comply with the requirements of BS 744501:2003 'Description and measurement of environmental noise. Guide to quantities and procedures'.

5.101 Procedures for measurement of road traffic noise will comply with the guidance in 'Calculation of Road Traffic Noise', using the 'short term' procedure where appropriate.

5.102 As the proposed development is located more than 25 m from the nearest Metrolink line it is expected that vibration impact will not be significant on the buildings. This follows BS 5228-2 advice that indicates that vibration activities are generally only considered when located 20 m or less from sensitive locations. As such, a pre-development baseline vibration survey has not been undertaken.

Effect prediction and assessment of effect significance

5.103 Effect prediction will use a range of recognised calculation and modelling methodologies, which will be coordinated through the use of three-dimensional acoustic modelling using CADNA/A software.

5.104 Reference will be made to Manchester City Council's, Planning and Noise, Technical Guidance (MCCTG) dated December 2015.

5.105 Guidance on construction noise and vibration assessment within BS 5228:2009 Part 1 will be referred to, although it does not provide any objective noise limits associated with construction activities. These will be established considering site context and the baseline condition. BS5228:2009 Part 2 provides guidance on the perception of vibration within

occupied buildings; this provides a simple method of determining annoyance alongside evaluation of cosmetic damage associated with vibration.

5.106 As previously described, the impact of noise from mechanical services and plant will be informed by BS4142:2014 '*Methods for Rating and Assessing Industrial and Commercial Sound*' in-line with the following MCCTG criterion:

"Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5 dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location."

5.107 Railway noise and vibration are important considerations at the development itself. Railway noise will be assessed using the methodologies set out in the DfT's '*Calculation of Railway Noise*'. The potential effects of railway vibration on human comfort will be assessed using BS 6472-1:2008 and potential effects on building fabric will be assessed using BS 7385-2:1993 and BS ISO 4866:2010.

5.108 There is no specific guidance for noise from entertainment venues; however, an adoption of the Noise Impact Working Party Guidelines have been chosen as an appropriate assessment criteria. The Institute of Acoustics (IOA) and Institute of Environmental Management and Assessment (IEMA) has considered what category of impact can be ascribed to various changes in noise level from the existing noise climate compared with predicted noise levels.

Townscape & Visual Impact

5.109 The townscape and visual impact chapter will assess the likely significant effects of the Proposed Development with respect to townscape and visual amenity. It will also describe the methods used to assess the effects; the baseline conditions currently existing at the site and surrounding area; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted.

Baseline Conditions

5.110 The Site is located to the north east of Manchester City Centre, approximately 2.1km north east of Manchester Piccadilly Rail Station. It is located within the Etihad Campus, which includes the Etihad Stadium, the Academy Stadium, City Football Academy (CFA) training facility and the Club's headquarters.

5.111 The site is currently used as surface car parking, and is located immediately west of the A6010 Alan Turing Way, and approximately 100m north east of the Etihad Campus Metrolink stop.

5.112 The Site is located to the immediate north of the Ashton Canal, which forms the route of a number of key recreational walking and cycling routes, including:

- The Medlock Valley Way;
- The Cheshire Ring Canal Walk;
- Regional Cycle Network Route 86, and;
- National Cycle Network Route 60, which also run north along the site's eastern edge.

5.113 The Grade II registered Philips Park is located to the east of the Site, and will potentially have a visual connection to the Proposed Development. Users of Philips Park are likely to be focussed on the landscape and sensitive to change.

5.114 At the wider level, the Site is located within the Eastlands Regeneration Framework (ERF) area. An update to the ERF was endorsed by Manchester City Council's Executive Committee in July 2019. The ERF supports the on-going regeneration of the Eastlands area. The broad vision for Eastlands is for it to become a place which is attractive for people to live, work and to visit; an area which builds upon its assets to provide a distinctive contribution to the overall success of the city region; and to be a place where all residents are able to share in the long term success of the area.

5.115 Central to the long term vision for the Etihad Campus and the wider area has been the ambition to establish it as a place with a globally competitive sport, leisure and recreation offer.

Assessment Methodology

5.116 The Townscape and Visual Impact Assessment will be carried out with reference to the Guidelines for Landscape & Visual Impact Assessment, 3rd Edition, 2013 (referred to hereafter as "the Guidelines") by Planit-IE Ltd, a registered practice of the Landscape Institute with considerable experience in landscape and visual assessment.

5.117 A three-stage assessment process has been adopted. Firstly, the nature of receptors (sensitivity) have been assessed, and secondly, the nature of effects (magnitude) likely to result from the proposed development have been assessment. From this, the overall significance of the identified effects on receptors have been assessed.

5.118 Heritage matters are intrinsically linked to townscape and visual considerations and, are considered here as key components of the city fabric.

5.119 The assessment of the Proposed Development will also be supplemented by a cumulative assessment of approved adjacent developments where relevant (see Appendix 2), and the ERF, in order to understand if any further potential significant environmental effects are likely to arise in relation to townscape and views.

5.120 Desk-based studies will be carried out to collate and map baseline townscape information, and a review of relevant policy and guidance will be used to inform the assessment.

5.121 A Principal Viewpoints plan has been produced (see Appendix 6). The viewpoints were selected through a process of desktop survey and site knowledge. A basic 3D block model reflecting the maximum potential height of the Proposed Development was put into Google Earth and a basic Zone of Visual Influence was created using Google Viewshed. The Viewshed highlights areas in green that have the potential for a visual relationship with the Site, taking into consideration factors such as surrounding building heights and topography. The Viewshed has been used to inform viewpoint selection, in addition to detailed study of urban form, topography, site knowledge and professional experience. A total of 9 viewpoints have been selected, and are considered representative viewpoints from key visual receptors. Viewpoints were excluded where there is likely to be no significant impact beyond that which was already identified within the selected views. Refer to Appendix 6 for an illustration of the Google Viewshed and the proposed key views.

5.122 For the purposes of the assessment, photographs of each of the principal viewpoints will be taken by a professional photographer in accordance with Landscape Institute's Advice Note 01/11, *"Photography and Photomontage in Landscape and Visual Impact Assessment"* (Ref. 1.7), which is in the process of being updated. The Guidance recommends a fixed 50 mm Focal Length (FL). This is considered the benchmark for landscape photography and should normally be used. The Guidance Note was produced

in March 2011 and is currently in the process of being updated by the Landscape Institute.

5.123 Visually verified photomontages will be produced by Virtual Planit, a professional visualization studio with extensive experience in the production of photomontages, in accordance with the Landscape Institute's Technical Guidance Note 02/17 "*Visual Representation of Development Proposals".*

5.124 The maximum parameters proposed for the building height and massing will be assessed, in order to assess 'worst case scenario', in accordance with the Guidelines.

5.125 In order to provide the most comprehensive, rounded and objective view of the Townscape and Visual Impacts of the proposed development, assessed effects will be agreed following round-table review by a team of individual assessors.

5.126 Table 5.2 will be used to guide the assessment of the significance of both townscape and visual effects, from a combination of the assessment of receptor sensitivity and the magnitude of effects:

Table 5.2: Townscape and Visual Impact Assessment Matrix

		Magnitude of Effect				
		Major Effect	**Moderate Effect**	**Minor Effect**	**Negligible Effect**	**Neutral / No Change**
Sensitivity of Receptor	**High**	Significant	Moderately Significant	Moderately Significant	Minor Significance	Not Significant
	Medium	Moderately Significant	Moderately Significant	Minor Significance	Not Significant	Not Significant
	Low	Moderately Significant	Minor Significance	Not Significant	Not Significant	Not Significant

5.127 The nature of effects may be positive or negative (beneficial or adverse) or neutral. Neutral effects recognise that there will be a change to the receptors, however this change is in keeping with the existing characteristics of the receptor.

5.128 Table 5.2 has regard to guidance in the Guidelines for Landscape and Visual Impact Assessment, Third Edition, 2013, at paragraph 5.56, page 92 (significance of landscape effects) and paragraph 6.44, page 116 (significance of visual effects). This matrix is used as a guide to determine significance, along with professional judgement.

5.129 For the purposes of this Townscape and Visual Impact Assessment, only effects deemed Moderately Significant and Significant are considered to be Significant in the meaning of EIA Regulations (2017).

Summary of Assessment Scope

5.130 Table 5.3 summarises the townscape and visual receptors that will be considered for assessment, with an indication of whether they have been scoped in or scoped out.

Table 5.2: Townscape and Visual Impact Receptors

Receptor	Impact	Potential Effect	Scoped in / out
Townscape Character	Minor effect within the context of the wider townscape character.	Consolidation of existing Campus character.	Scoped in
Heritage Designations	No direct impact on heritage assets	Potential visual connections from listed Phillips Park context around other listed buildings/structures.	Scoped in
Urban Grain	Creation of new grain within the site.	Consolidation of wider urban form created as part of Campus complex	Scoped in
Land Use	Creation of new land use.	Creation of land use which fits within the wider masterplan setting.	Scoped in
Building Heights	Creation of new height parameter for the site.	Proposed height in keeping with wider large-scale development within the Campus context.	Scoped in
Topography/Site Levels	Minor alterations to accommodate Proposed Development within the site.	-	Scoped out
Movement and Linkages	Existing vehicular access from the northern edge.	The Proposed Development fits with the existing Campus pedestrian and vehicular route network.	Scoped in
Environmental Designations and Public Open Space	No environmental designations covering the site.	-	Scoped out
Site Character	Currently used as surface car parking	New character defined for the site, as part of the wider masterplan vision.	Scoped in
View 1: south from pedestrian crossing, Alan Turing Way.	Key pedestrian and vehicular route from the north. Within the context of Grade II listed Entrance Lodge to Phillips Park	Direct views with some screening by highways infrastructure and trees.	Scoped in
View 2: south from Grade II listed Phillips Park.	Viewers are likely to be focussed on the landscape and have some sensitivity to a change in the view.	Some screening provided by trees, particularly when in leaf.	Scoped in
View 3: pedestrian footbridge leading to Commonwealth Way.	Framed views experienced by pedestrian on approach the Stadium.	The view is dominated by the Stadium.	Scoped in

Receptor	Impact	Potential Effect	Scoped in / out
View 4: north east from A662 Ashton New Road.	Travelling view allowing oblique views to the proposed development.	High numbers of viewers.	Scoped in
View 5: east from CityLink pedestrian/cycle link	Direct views. Open character along the canal.	High numbers of viewers on match days. The Proposed development will be viewed within the context of the stadium and wider Campus	Scoped in
View 6: west along towpath Ashton Canal.	Framed views.	Viewers are likely to have some sensitivity to change. However, the Proposed development will be viewed within the context of the stadium and wider Campus	Scoped in
View 7: Joe Mercer Way	View from elevated walkway.	High numbers of viewers on match days. Direct, open and elevated views.	Scoped in
View 8: North along Grey Mare Lane.	Framed views from residential areas to the south.	Character of the view already defined by views of the Etihad Stadium.	Scoped in
View 9: Saxon Saint Park.	Medium-range, open views of large structures currently characterise the view	Viewers are likely to have some sensitivity to change. However, the Proposed development will be viewed within the context of the stadium and wider Campus.	Scoped in

Traffic and Transport

Assessment context

5.131 A Transport Assessment (TA) will be prepared by Buro Happold in relation to the Proposed Development. This will include a full multi-modal impact assessment on all transport infrastructure in the vicinity of the Site. The TA will form a technical appendix to the ES.

5.132 The Traffic and Transport ES chapter will also be prepared by Buro Happold; it will provide sufficient information to enable the reader to understand the likely significant effects in environmental terms of the Proposed Development in relation to traffic and transport. The methodology to be applied in the TA is subject to separate but parallel scoping discussions.

5.133 MCC and TfGM are the local highway and transport highway authorities responsible for the highway and transport network in Manchester.

5.134 The assessment will consider the existing 2019 baseline conditions and the extent of the proposed study area will be agreed with MCC/TfGM as part of the pre-application discussions, together with any future assessment years and committed developments (Appendix 2).

5.135 The proposed scope draws upon the guidance set out in the following documents:

- Design Manual for Roads and Bridges, DfT, 2011;

- 'Guidelines for Environmental Impact Assessment, IEMA, 2004'; and
- 'Guidelines for the Environmental Assessment of Road Traffic, IEMA,1993'.

5.136 Comments arising from the EIA scoping process with MCC/TfGM will be addressed in the assessment.

Potential construction effects

5.137 The effects of construction traffic resulting from the construction of the Proposed Development including workforce traffic will be assessed in consideration of the predicted net change in traffic flows. Cumulative effects of construction will also be considered where appropriate in terms of other construction sites that are active at the same time as the Proposed Development. The potential effects of construction traffic will be assessed by comparing the likely trip generation of construction traffic against future baseline traffic conditions (assessment year to be determined).

5.138 The key areas which will be assessed are as follows:

- Severance;
- Pedestrian delay which is also considered with pedestrian amenity;
- Driver delay; and
- Accidents and safety – professional judgement will be used to evaluate accidents and safety as IEMA guidance does not define these. A full collision assessment will be provided as part of the TA.

5.139 The guidelines acknowledge that for many developments some of the effects listed may not be widely relevant but suggests that reasons should be provided for any exclusions. In accordance with the IEMA guidelines, the study area will be defined by identifying any road link where it is felt that potentially significant environmental effects may occur as a result of the Proposed Development. A desktop exercise augmented by a number of site visits will be undertaken to identify any sensitive receptors in the study area. This will be agreed with MCC Highways and TfGM.

5.140 To assist with identifying the magnitude of change as a result of the Proposed Development reference will be made to the DMRB/IEMA guidelines, which identify considerations and thresholds in respect to changes in the volume and composition of traffic. Where there is no set criteria, professional judgement will be used.

5.141 In terms of public transport, the IEMA guidelines do not identify a specific need to assess the impact of public transport changes. Where improvements involve material changes to public transport services and/or if they form part of a mitigation measure to reduce traffic generation (such as a Travel Plan) it may be necessary to consider this.

Potential Operational Effects

5.142 The same potential environmental effects identified and defined for the construction stage above also apply to the operational stage, again based on the predicted net change in flows against the future baseline traffic conditions (assessment year to be determined through scoping discussions with MCC Highways and TfGM) but this time resulting from the operational development.

5.143 The potential effects of operational traffic will be assessed by comparing the likely trip generation for the Proposed Development against future baseline traffic conditions and any other horizon years agreed with MCC Highways and TfGM during scoping.

Assessment methodology

Technical Scope

5.144 As detailed above, the assessment will deal with those transport effects likely to be relevant to the Proposed Development i.e. severance; pedestrian amenity (which for the purposes of this assessment includes fear and intimidation); driver delay; pedestrian delay; and accidents and safety. All other transport related considerations will be examined within the TA.

Baseline Assessment

5.145 The relevant baseline conditions within the study area will be described in detail in the TA and will be summarised in the ES Traffic and Transportation chapter.

5.146 In accordance with the IEMA guidelines, the study area will be defined by identifying any road link where it is felt that potentially significant environmental effects may occur as a result of the Proposed Development.

5.147 The existing baseline year is 2019, which represents the submission date of the planning application. The source of any baseline data is still subject to discussion with MCC/TfGM but could include one or more of the following sources:

- Survey data made available through liaison with the Stadium Working Group at the Etihad;
- Traffic and transport surveys including manual classified vehicle counts undertaken specifically for this project;
- Published/web-based AADT/AAWT information;
- TfGM road traffic accident statistics for the latest available five-year period;
- Local, regional and national planning policy documents; and
- Discussions with MCC/TfGM.

Effect Prediction and Assessment of Effect Significance

5.148 The assessment scenarios used to consider the effects of the Proposed Development will be agreed with MCC/TfGM during the scoping process. At this stage, it is envisaged this may include the following:

- Baseline Year – the year during which the assessment is made;
- Future baseline year (s) without the development –referred to as ‘Do Nothing’ scenario; and
- Future baseline year (s) with the development - referred to as the ‘Do Something’ scenario.

5.149 The potential effects of the Proposed Development on the transport networks in these scenarios will be considered against the IEMA assessment guidelines. During the course of the TA, it will be determined whether the significance of an effect warrants detailed assessment in environmental terms using the thresholds and guidance set out by IEMA. If certain impacts are found to be negligible, then they will be scoped out for further assessment and the reasoning given in the ES Traffic and Transportation chapter. The TA scope of works will be agreed in parallel with the consideration of the EIA Scoping Report by the Local Planning Authority and confirmed in the EIA Scoping Opinion.

Water Quality, Drainage and Flood Risk

Assessment context

5.150 The following section has been prepared by Buro Happold. A site specific Flood Risk Assessment (FRA) and Drainage Strategy will be prepared, and will form appendices to the ES chapter.

5.151 The current drainage arrangements for the Site will be reviewed as part of the Drainage Strategy to be developed for the Proposed Development. Appropriate dialogue will be held with United Utilities (foul water and surface water) and the Environment Agency (EA) (surface water) to agree connections and flow rates.

5.152 The nearest surface watercourse to the site is the Ashton Canal, which runs immediately adjacent to the southern boundary of the Site. The River Medlock is the next closest surface watercourse, which meanders through Philips Park to approximately 140m north east of the Site, before flowing south through a culvert for 600m under the Etihad Stadium car park to the north of the Site, resurfacing approximately 330m west of the Site. It confluences with the River Irwell in the centre of Manchester.

5.153 The primary source of flood risk to the Site is from surface water. From a review of the EA's flood risk mapping, the Site is currently located within Flood Zone 1, defined as land with less than 1 in 1,000 annual probability of river or sea flooding. With the effects of climate breakdown, causing more erratic weather patterns including drier summers and wetter winters, this may be subject to change.

5.154 The Site falls within the River Irwell catchment and North West River Basin District. The associated River Basin Management Plan sets a numbers of actions to meet the requirements (i.e. to reach 'good' status) of the Water Framework Directive (WFD). With regard to the WFD clarification system, the River Medlock in this location is heavily modified and currently designated as overall 'moderate' classification owing to its ecological potential of moderate and chemical quality is designated as good. The current classifications are projected to stay the same through the current planning cycle ending in 2021.

Potential construction effects

5.155 An initial review of the Proposed Development and existing surrounding water environment suggests that potential significant effects during the construction phase may include:

- Localised changes in surface water flow regime during rainfall events;
- Deterioration of the quality of surface water run-off from the Site, which may worsen the quality of adjacent and downstream water bodies;
- Accidental leaks and spillages of hazardous material which could adversely affect the quality of downstream water bodies;
- Potential for direct pollution and or disturbance of sediment in the Ashton Canal as a result of construction works; and,
- Flood risk to construction workers and plant.

Potential operational effects

5.156 An initial review of the Proposed Development and the existing surrounding water environment suggests that potential significant effects during the operational phase may include:

- Increased water demand and foul water demands from the site placing pressure on infrastructure;
- Potential change of surface water flow regime across the Site changing capacity requirements for surface water sewer network;
- A change to the quality of surface water run-off, which may affect the quality of nearby water bodies, via the surface water sewerage network;
- A change to surface water discharge rates, which will impact on the capacity of drainage infrastructure and therefore may have an effect on flood risk off-site;
- The Proposed Development's vulnerability to flood risk; and
- The flood risk to future site users.

Assessment methodology

Technical scope

5.157 The assessment will consider the potential effects of the Proposed Development on the surrounding water environment and the potential effects of the water environment on the Proposed Development. This will include an assessment of the potential change in water supply, foul drainage, surface water drainage, pollution prevention and flood risk.

Baseline assessment

5.158 The baseline assessment will consider the existing scenario both on and around the Site. Data will be gathered from the following sources:

- Envirocheck report;
- Site visits;
- Consultation with the relevant authorities (i.e. through pre-development enquiries);
- EA data on current quality of existing surface water features in line with the requirements of WFD;
- Review of existing permitted discharges and surface and ground water abstractions;
- Review of existing surface water runoff regime and flood risk issues. Note a detailed FRA and drainage strategy will inform the baseline study and will form an Appendix to the ES; and,
- A review and summary of relevant international, national and local legislation relating to the water environment.

Effect prediction and assessment of effect significance

5.159 Potential effects on the water environment, and water environment features stated above, arising from the Proposed Development will be assessed against the baseline condition. Effects will be assessed for both the construction and operational phases of development.

5.160 Potential changes to pollution to the surface water environment will be assessed through a qualitative based approach.

5.161 An FRA and Drainage Strategy will be prepared, including consultation with UU and the EA where necessary, and will assess the risk of flooding from all sources (fluvial, groundwater, surface water and sewer) and the change in risk due to climate change.

5.162 The FRA and Drainage Strategy will be developed in accordance with the guidance set out in the NPPF and other guidance, including the Strategic Flood Risk Assessment (SFRA) for the locality – Manchester, Salford and Trafford SFRA.

5.163 The FRA and Drainage Strategy will provide a level of quantification, or appraisal, with regard to drainage impacts and effects for both foul water and surface water flows. This will be summarised in EIA terms within the ES chapter.

5.164 The effect significance will be based on assessing the effect magnitude (i.e. the deviation from the baseline condition) and the sensitivity of the likely receptor. Professional judgement and the use of a matrix approach will determine if potential effects are considered to be significant.

Wind Microclimate

Assessment context

5.165 The following section has been prepared by Buro Happold. New buildings could generate wind acceleration at ground level, which could cause discomfort to pedestrians. The purpose of assessing the wind microclimate around the Proposed Development is to determine the effects it will have on the comfort and safety of pedestrians in and around the Site, in terms of local wind speeds.

5.166 The assessment of the Proposed Development will include the effects created by the existing terrain, buildings and structures within a 450m radius of the Site.

5.167 There is no specific national or regional legislation or policy guidance for the assessment of the local wind microclimate impact that a new development has on the comfort and safety of users. However, a number of local authorities provide planning guidance for tall buildings, recommending that a microclimate assessment be performed. Manchester's Core Strategy Development Plan Document has a number of policies that reference a requirement for consideration of the wind microclimate, including EN2 Tall Buildings and DM1 Development Management. Objective 6 (Environment) states in paragraph 12.6 that development in Manchester will be expected to follow seven design principles, including "Quality of the public realm: a place with attractive, and successful outdoor areas".

Potential construction effects

5.168 During construction, localised wind acceleration is likely to result in a gradual transition to the new conditions. It is possible there will be temporary localised wind acceleration across the Site. Since the effects would be short-term and local, these will be reviewed on a qualitative basis.

Potential operational effects

5.169 The size and height of the Proposed Development in the context of smaller surrounding buildings will have the potential to generate wind acceleration, which can have adverse impacts on sensitive receptors.

5.170 A safe and comfortable wind climate is integral to the success of any development. New buildings can generate wind acceleration at ground level, which could result in discomfort or unsafe conditions for pedestrians. An assessment of the wind microclimate created by a proposed development is necessary to identify any potential impacts that the development may have on sensitive receptors adjacent to the Site, as well as within the Proposed Development.

Assessment methodology

Technical scope

5.171 The Proposed Development will introduce a new building to a vacant brownfield site, with the potential to create accelerated pedestrian level winds, through downdraughts and corner wind acceleration. It will also introduce a number of amenity spaces, where

recreational activities will be more sensitive to wind conditions and will potentially require purposeful design of the landscaping scheme.

5.172 A detailed wind microclimate assessment will therefore be carried out via CFD (Computational Fluid Dynamics) to assess the suitability of conditions for planned pedestrian activities within the Site and confirm that the Proposed Development does not unduly impact on the suitability of wind conditions for existing and future pedestrian activities in the surrounding area.

Baseline assessment

5.173 Based on wind climate statistics from Manchester Airport, winds from the southerly quadrant are prevalent. Light to moderate winds from the south and south-south-east are most common, whilst stronger winds more frequently blow from the south-south-west. Winds from the west-south-west also occur frequently, and extreme wind speeds (relevant to pedestrian safety) are most likely to blow from this direction. Northerly winds are generally light and rare, though cold north-easterly winds are common during spring. Wind speeds are generally higher during winter and lower during summer.

5.174 The Site is sheltered at low-level from the prevailing southerly winds by the Etihad Stadium, but is more exposed to the stronger west-south-westerly winds. The existing Site is empty and this is likely to result in accelerated wind speeds. Residential developments are located to the East, these are likely to offer some shelter to the Site. The resulting suitability of pedestrian level wind conditions, in and around the Site, for existing activities will be assessed in detail based on the methodology outlined.

Effect prediction and assessment of effect significance

5.175 Due to the sensitive nature of the recreational activities to be introduced, and the potential for the Proposed Development to create accelerated pedestrian level winds, a detailed wind microclimate assessment will be carried out based on CFD (Computational Fluid Dynamics) virtual wind tunnel, in accordance with best industry practice. Where required, mitigation measures will be developed to ensure an acceptable residual effect in terms of suitability of conditions for planned pedestrian activities in and around the Site.

5.176 The closest and most suitable wind data provided by the MET Office will be obtained on which Wind Frequency Analysis will be completed. This will be applied as boundary conditions for a CFD virtual Wind Tunnel that will be used to quantify the wind microclimate of the site and its surroundings and include:

- Wind translation from the wind data location to the Proposed Development; and,
- Topographical data available for the surroundings and geometrical data of the Proposed Development.

5.177 The evaluation criteria that will be used will be based on the Lawson Criteria to assess the level of comfort for both existing sensitive receptors and new residential uses and public routes and spaces proposed as part of the Proposed Development from which the following will be identified:

- Potential impacts and effects from the Proposed Development;
- Cumulative impacts and effect before and after construction of the Proposed Development and any residual effects; and
- Assessment of the significance of effect through comparison of the Proposed Development and the comfort Lawson criterion (including yearly, seasonal and worst season effects), and safety where necessary.

5.178 Assessment of the following scenarios will be completed:

- The existing Site and existing surrounding buildings;
- The Proposed Development and existing surrounding buildings; and
- The Proposed Development and proposed future surrounding buildings (cumulative scenario).

5.179 If mitigation is found to be required to mitigate adverse wind effects, a quantitative assessment of proposed mitigation will be carried out. The quantitative assessment will be compared with previous results for the existing receptors and proposed development without mitigation.

Summary of Assessment Scope

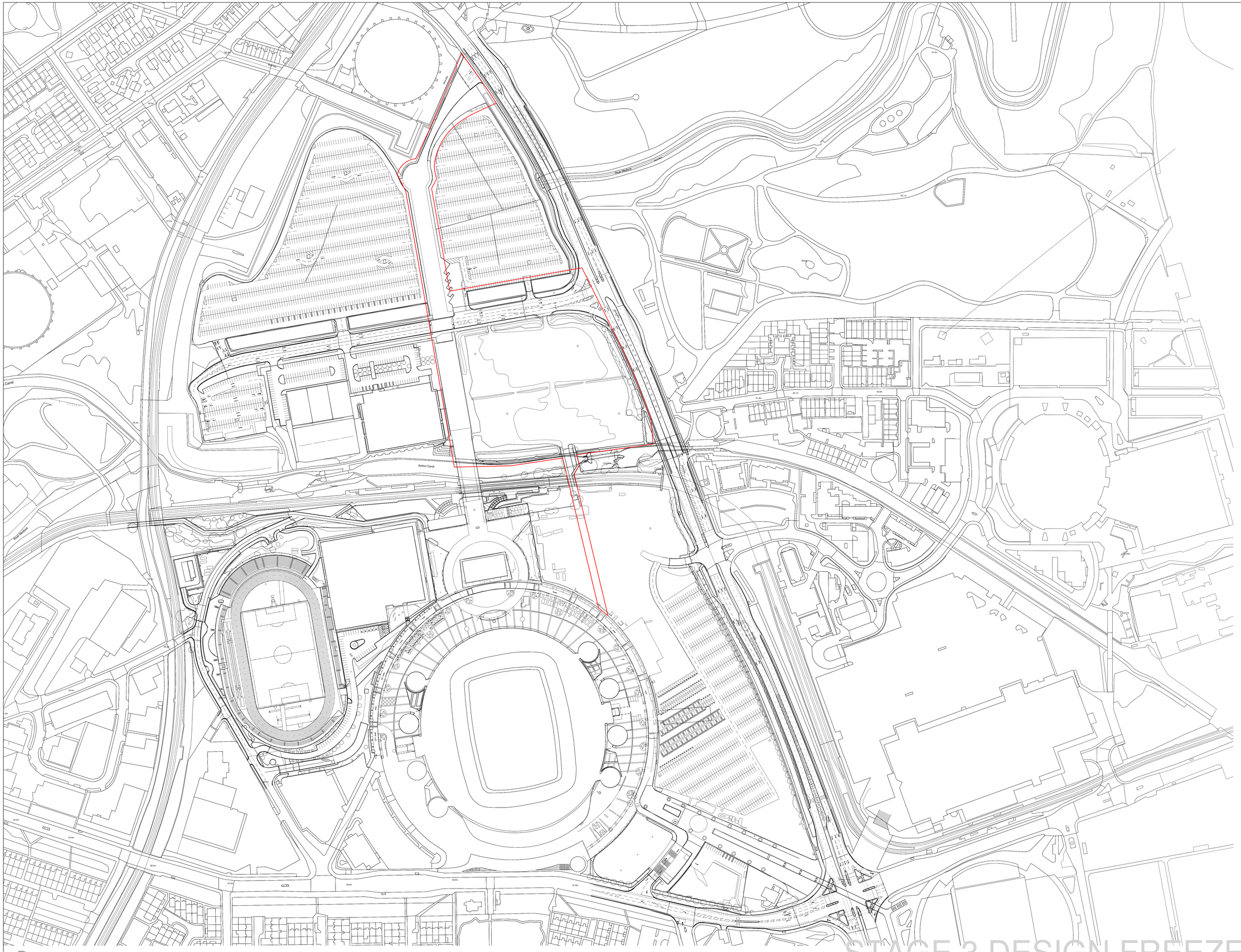
5.180 Potential impacts and effects during the construction and operational phases to be addressed in the EIA are as follows:

- Short term temporary effects on local wind conditions and sensitive receptors (pedestrian activities) during construction activities.
- Residual long term wind effects on local conditions and surrounding areas caused by the Proposed Development. The long term wind effects will be addressed for both existing sensitive receptors and new public realm uses proposed as part of the Proposed Development.

Table 5.4 Identified receptors and potential effects arising with regard to the wind environment

Receptor	Impact	Potential Effect
Pedestrian activities in and around the site	Wind acceleration	Effect on comfort and safety
Entrance doors	Wind acceleration	Effect on comfort and safety

Appendix 1 Site Location Plan

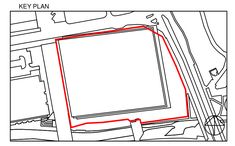


1 SITE PLAN_ EXISTING 1:1250
1 : 1250

REVISIONS

REV	DATE	DESCRIPTION
P01	21.10.2019	STAGE 3 DESIGN FREEZE

KEY PLAN



CLIENT

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PROJECT NAME

PROJECT BRADFORD

DRAWING TITLE

EXISTING SITE LOCATION PLAN

STATUS	PROJECT No.
Stage 3- Design Freeze	4933

DATE	SCALE	SIZE
21/10/2019	1 : 1250	A0

DRAWN	CHECKED	APPROVED
FS	PG	DS

PROJECT	ORIGIN	ZONE	LEVEL	TYPE	ROLE	DRAWING	REV
BRA-POP-	00-	ZZ-		DR-	A-	0001	P01

Appendix 2 Committed Developments

A number of Sites within a 1km radius of the Site benefit from extant Planning Permission, or are currently under consideration by the Local Planning Authority. These are set out in Table A. The distance from the Site is specified within the table; it is anticipated that committed developments at a distance greater than 500m radius would be unlikely to give rise to cumulative effects but are included for completeness and would be considered qualitatively as relevant within the assessments.

In addition, the Site is located within the Eastlands Regeneration Framework (ERF) area; an update to the ERF was endorsed by Manchester City Council's Executive Committee in July 2019.

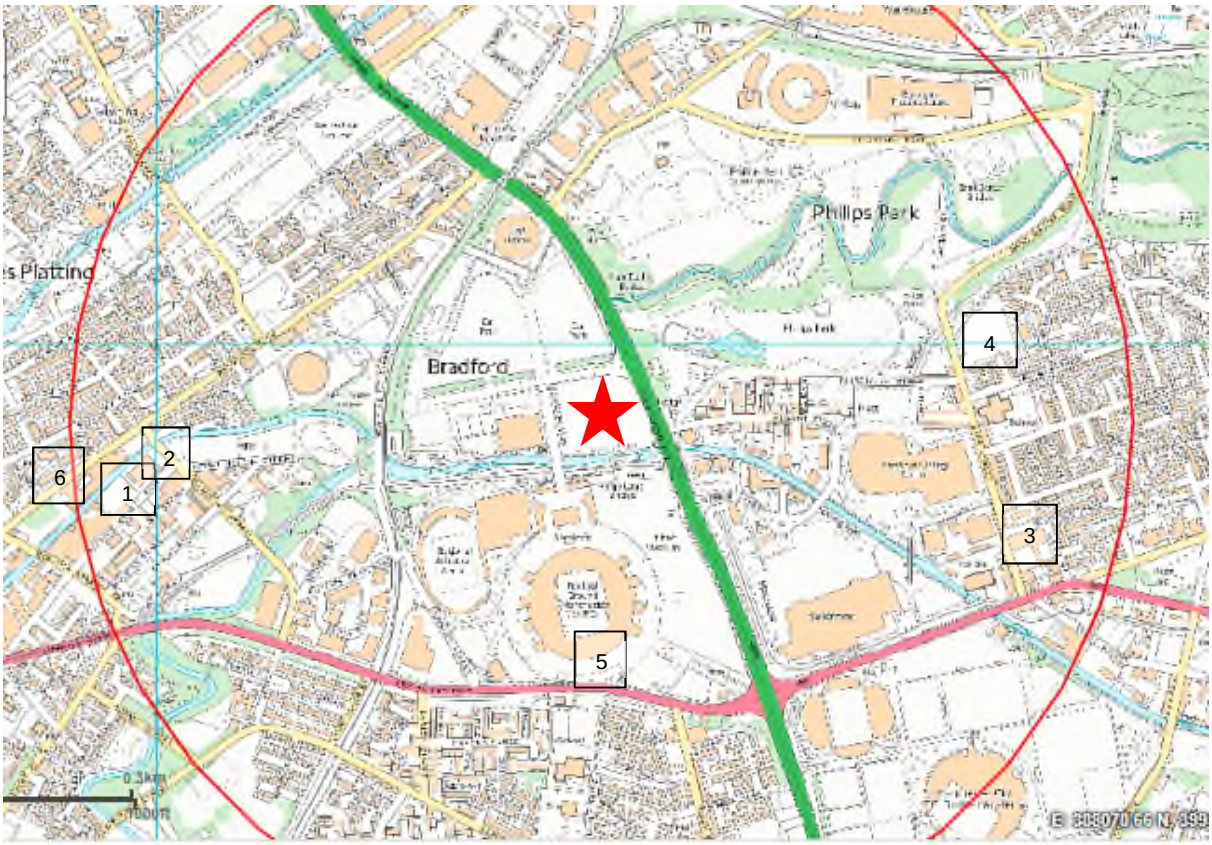
The ERF supports the on-going regeneration of the Eastlands area, which could encompass new development opportunities as follows:

- Etihad Campus – Sports and Innovation Zone: new higher education and support facilities, student accommodation and commercial workspace.
- Etihad Campus – Comercial Zone: commercial workspace, indoor arena, leisure and hotel development.
- Holt Town Central: mixed-use neighbourhood with residential, employment and community uses.
- Holt Town East: residential-led mixed-use development.
- Lower Medlock Valley: higher density residential use.
- Beswick: residential development (enhancement of existing and new) and potential sports hub.
- Croft Street Triangle and Eccleshall Street: residential neighbourhood and local retail.
- Manchester Abattoir / Riverpark Road Trading Estate: residential neighbourhood.
- Pollard Street: employment or employment-led, mixed use development.
- Central Retail Park: flexible office space, retail and leisure facilities.

Table A: Committed Developments within a 1km radius of the Site as at 15 October 2019

No.	Name	LPA Planning Ref.	Distance	Description of Development	Status
1	Co-working	122546/FO/2019	1km	Application for temporary siting and use of site for 50 recycled shipping containers to provide co-working space (sui generis) for a temporary period of up to 5 years, with associated car parking, portable toilets and servicing from Pollard Street East	Temporarily approved 24 Apr 2019
2	Co-working	124267/FO/2019	980m	Application for temporary siting and use of site for 64 additional recycled shipping containers (114 no. in total) to provide co-working space (sui generis) for a temporary period of up to 5 years, with associated car parking, portable toilets and servicing from Pollard Street East	Awaiting approval
3	Residential	112641/OO/2016	795m	Outline application relating to matters of access in relation to a residential development comprising of 14 x two storey dwellinghouses (Class C3) with all other matters reserved	Approved 09 Nov 2016 Will expire in Nov '19
4	Residential	122897/FO/2019	720m	Proposed redevelopment of vacant land to create 66 no. 2, 3 and 4 bedroom dwellings incorporating new access roads off Bank Street and Tartan Street, pavements and associated landscaping and boundary treatments	Approved 28 Jun 2019
5	Etihad Stadium Extension	104315/FO/2013/N2	440m	Alterations to the Etihad Stadium, including increasing the overall height of the South and North stands and associated elevational alterations, to allow an increase each stand capacity by up to 6,250 seats respectively and up to 2,000 additional pitch side seats creating a total match day capacity of up to 62,170 seats (from 47,670), expansions of concourse facilities, alteration to public realm including changes to car parking layout, landscaping and boundary treatments and associated infrastructure works.	Partially implemented (South Stand complete and operational). North Stand planning permission remains extant by virtue of the planning permission being implemented.
6	Residential	123735/FO/2019	995m	Erection of 13 residential properties with a mix of two and three storey semi-detached / terraced properties with associated road access, parking, landscaping and boundary treatment.	Validated in May 2019 and awaiting determination.

Map of Committed Developments*:



Source: ProMap access by Deloitte in August 2019.

*Site is demarcated by a red star.

Appendix 3 Archaeological Reports

Sports City, Eastlands, Manchester

An Archaeological Desk-Based Assessment

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April 2000 (28)

THE UNIVERSITY of MANCHESTER

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1. Introduction

1.1 This report presents the results of a desk-based archaeological assessment of Sports City, Manchester, carried out by the University of Manchester Archaeological Unit and commissioned by AMEC Developments. The aim was to identify as far as possible the nature of the archaeological resource, to assess the impact of the development on that resource and, where appropriate, to propose a strategy of mitigation.[1]

1.2 Provision for the treatment of archaeological remains which will be affected by development is set out in *Planning Policy Guidance 16: Archaeology and Planning* (DoE 1990).

Under current legislation, authorities considering applications must take into account the effect on Listed Buildings and their setting. The present report also assesses the impact of the Sports City development on Listed Buildings in the immediate proximity.

1.3 The assessment consisted of a desk-based study and a site inspection. The desk-based study made use of the following sources:

- The Greater Manchester Sites and Monuments Record (GMSMR) held by the Greater Manchester Archaeological Unit at the University of Manchester
- Printed and unpublished maps
- Published documentary sources

1.4 The aim of the site inspection was to relate the findings of the desk-top study to the existing topography and land-use and to recover evidence not available from the desk-top sources.

Access to the proposed development area west of Alan Turing Way was provided by Laing Construction. Most of the proposed development area east of Alan Turing Way is fenced off and was not directly accessible, but adequate visibility was provided from public rights of way.

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1) The assessment was carried out by Dr Peter Arrowsmith, UMAU, with the assistance of David Lloyd BA. Thanks also to Norman Redhead, Assistant County Archaeologist for Greater Manchester.

2. Base Line Assessment

2.1 Setting

2.1.1 *Location*

The proposed Sports City development area lies c 2km east of Manchester city centre and comprises four areas aligned either side of Alan Turing Way and north and south of the Ashton Canal (**Fig 1**).

2.1.2 *Geology*

As shown by the OS Geological Survey, the solid geology of the proposed development area comprises Westphalian C Coal Measures of the Carboniferous. Four seams outcrop within the proposed development area, on alignments running north-west to south-east. From west to east these are the Charlotte Mine (whose line of outcrop crosses the site of Bradford Colliery), Bradford Three Quarters Mine, Bradford Four Foot Mine and, in the north-east corner of the proposed development area, Yard Mine.

The OS Geological Survey shows the solid geology of the proposed development area as covered by a drift geology of glacially deposited boulder clay; the extreme north-western corner of the area includes part of a narrow band of alluvium along the former course of the River Medlock. Maps of 1845 and earlier show that this corner of the proposed development area was crossed by a meander of the river (**Figs 2 & 3**). The cartographic evidence also indicates that by the late 19th century the course of the river had been diverted and straightened so that it now followed a line to the north and west of the proposed development area (**Fig 4**).

2.1.3 *Land-use*

The proposed development area is a brownfield site. Formerly extensively developed for industry and terraced housing, it now contains no standing buildings other than electricity substations.

On the west side of Alan Turing Way, the proposed development area forms part of the extensive fenced site which includes the construction site of the Commonwealth Games stadium. This side of the proposed development area includes areas of concrete footings east of Forge Lane and on the site of the former Bradford Colliery. Elsewhere on this side, recent earth movement and disturbance has obscured evidence for earlier land-use. In the area of the former Bradford Iron Works, those groundworks have produced a downslope falling c 1.5m from east to west, running roughly north to south, and perhaps modifying earlier landscaping.

East of Alan Turing Way, much of the proposed development area comprises concrete, and grassed over, footings between the remains of the street pattern. Between the canal and Stuart Street by Alan Turing Way is an area of landscaping, grassed over, with trees.

2.1.4 *Topography*

The proposed development area lies at a height of c 60m AOD. East of Alan Turing Way the present ground level is fairly level, with localized variations resulting from landscaping. West of Alan Turing Way, ground level is more irregular. In part this irregularity is attributable to modern landscaping, and current earth moving and disturbance. However, in the north-west a slope from east to west may reflect a natural fall in ground level to the former course of the River Medlock. West of Alan Turing Way and immediately south of the Ashton Canal, ground level is slightly elevated, so that from here there are extensive views to the north and, particularly, to the west. This site, which in the medieval period was occupied by Bradford Old Hall, may be a natural rise.

2.1.5 *Designated Sites*

There are no sites with statutory protection within the proposed development area.

The following Listed Buildings lie in immediate proximity to the proposed development area:

- Ashton Canal Lock No 6, west of Alan Turing Way, Grade II (**A, on Fig 1**)
- Ashton Canal Lock No 7 and Roving Bridge, east of Alan Turing Way, Grade II (**B on Fig 1**)
- Ashton Canal Lock-keeper's Cottage, east of Alan Turing Way, Grade II © **on Fig 1**)

2.2 Archaeological and Historical Background

2.2.1 *Prehistoric/Romano-British*

No prehistoric finds are known from within the proposed development area, and the possibility of there being archaeological remains from this period is considered to be low. Within the North-West the evidence for prehistoric activity is often sporadic and based on chance finds. However, this evidence does point to settlement and other activity being concentrated on sands and gravels, particularly close to watercourses or wetlands, rather than on the heavier more impermeable boulder clays which form the drift geology of much of the region, and almost all of the proposed development area.

No Roman finds are known from within the proposed development area. Within the general locality the Roman road between Manchester and York is believed to have run on a line c 0.3km to the north-west of the proposed development area (GMSMR 24), while a Roman coin is reported to have been found in Philips Park (GMSMR 3672). This last find may be explicable in terms of its proximity to the Roman road, rather than be indicative of a site.

2.2.2 *Medieval*

Historically the proposed development area lay within the township of Bradford. Its place-name is documented from the 1160s and has an Old English derivation meaning `the wide ford' (Mills 1976, 66). This is believed to be a reference to a crossing point on the River Medlock at the end of Mill Lane (Crofton 1905, 385). In the mid- to late 19th century Mill Lane was renamed Mill Street, and in recent years has been widened as a dual carriageway and renamed Alan Turing Way.

A map of 1761 shows a moated site located just to the west of Mill Lane (**Fig 2**) (**site 1**; see section 2.3 below). The southern arm of the moat is crossed by a bridge, leading onto the central platform which is shown covered by trees, possibly an orchard. This is presumed to be the site of Bradford Old Hall, a moated house which was referred to in a rate book of 1717-18 but was subsequently demolished (Crofton 1905, 398). Local dating evidence for moated sites is scarce, but suggests that the heyday for their construction was between the late 13th and mid-14th century. The origin of Bradford Old Hall is obscure. In the late 13th and early 14th century Bradford formed part of the demesne land of the lords of Manchester, but the hall is not mentioned in surveys of their lands carried out in 1282 and 1322. It was possibly constructed between the 1330s and 1350s when the Bradford estate was held by John de Salford of Wakerley (Worsley) and his wife Alice. In 1357 the manor was granted by the lord of Manchester to Thomas de Booth of Barton. In the early 1360s he also bought out the Wakerley family, and documents of that time refer to the Bradford estate as including a `messuage' or dwelling, which may have been the moated site (Crofton 1905, 399-401). The site may also be alluded to in 1514 when John Booth, killed in the previous year at the Battle of Flodden, was recorded as having held property which included the manor of Bradford Hall (Crofton 1905, 404). The south-west corner of the moated site seems, from the map evidence, to have been sited within the proposed development area.

The 1761 map shows other buildings within the proposed development area, grouped around the moated site, two to its south (**sites 3 & 4**) and others to the east on Mill Lane (**sites 5 & 6**). It is possible that one or more of these sites, like the moated site, was of medieval origin.

2.2.3 *Industrial*

The earliest documented industrial activity within the proposed development area may be coal mining. There is mention of a coal pit in the township as early as 1593, situated close enough to the River Medlock for the workings to be affected by flooding (Crofton 1905, 394-5). Coal mines are again mentioned in Bradford in 1607-8, while in 1611, 1622 and on two occasions in the 1660s individuals were buried in Manchester parish church (now the Cathedral) who had died as a result of accidents at `Bradford coal pit' (Farrer & Brownbill 1911, 275 n 14; Crofton 1904, 121, 123-4). The local evidence corresponds with the sources across the Manchester Coalfield, for which references to mining are few in the medieval period but become more commonplace from the mid-16th to the mid-17th century. In part this is probably a result of an increase in the number and range of surviving sources from the post-medieval period, but probably also reflects an actual increase in mining during this period, as coal was increasingly used as an alternative fuel to timber and peat.

The earliest evidence for mining in Bradford is imprecise as to its location. However,

a 1761 map of the township names two adjacent fields within the south-east of the proposed development area as New Coal Pit Field and Further Coal Pit Field, implying mining in that locality, and a coal pit is shown in this same area on maps of the early 19th century, roughly on the line of the outcrop of the Bradford Three Quarters Mine (**site 9**). The 1761 map also shows, drawn in a later hand, coal workings along the Four Foot seam, crossing the proposed development area from north-west to south-east, which include a shaft at the site of the Bradford Colliery (**site 10**).

Other industrial activity within the proposed development area by 1761 is implied by the names of two adjoining fields, Bowk House Field and Yarn Croft (**sites 7 & 8**). They suggest an area used for bleaching textiles, the common method during this period being the use of natural alkalis as a bleaching agent and exposure of the material in the open air.

The Ashton Canal, which transects the proposed development area, was authorized by Act of Parliament in 1792, one of the principal aims of the canal being the transportation of coal from the Ashton area to Manchester. The canal was navigable from Ancoats Bridge to Ashton by June 1797, and from Piccadilly by May 1799 (Keaveney & Brown 1974). In the early 19th century a canal arm was constructed leading from the canal to Bradford Colliery (**site 11**).

In the mid-1840s most of the proposed development area was still to be built upon (**Fig 3**). By the 1890s new streets had been laid within the area, much of which was now built over with housing or industrial works, the latter being concentrated along the Ashton Canal and its branch (**Fig 4**). On the main canal by this date were textile mills (**sites 14, 16 & 18**) and an India rubber works (**site 17**), to be joined in the early 20th-century by a metal works (**site 15**). Alongside the branch canal by the 1890s were Bradford Iron Works (**site 12**), the Park cotton mills, the site of which was also later part of the iron works (**site 13**), as well as Bradford Colliery. Its pithead buildings had been considerably enlarged by this date. In the mid-20th century, after acquisition by Manchester Collieries Ltd, its surface plant was completely replaced, but the colliery closed in 1966 with large reserves virtually untouched (**site 10**). Elsewhere within the proposed development area, other iron works were built in the late 19th and early 20th century (**sites 19, 24 & 25**), and schools and places of worship were constructed for the local community (**sites 20, 21, 22 & 23**).

2.3 Gazetteer of Sites

The following gazetteer gives details of the sites within the proposed development area identified by the UMAU desk-based assessment. See also **Figs 1-8**.

1) SJ 8694 9878
Bradford Old Hall (moated site)

Moated site shown on 1761 map, comprising a square platform surrounded by a moat which is crossed by a bridge on its south side; the platform is shown as containing trees, possibly an orchard. This is presumably the site of Bradford Old Hall, a moated house which was referred to in a rate book of 1717-18 but was subsequently demolished (Crofton 1905, 398). Not shown on the 1818-19 map. By 1845 the site of the north and west arms of the moat was occupied by the curving north end of the Ashton Canal arm (**site 11**), which by 1889 had taken on a wider, more irregular form. Much of the moat platform by 1845 was occupied by Bradford Mill, producing smallwares, and named in the tithe award as owned and occupied by the firm of William Pritchard and Brothers. Photographs of 1960 show

the mill from the north, canal side, and indicate that what was probably the original factory was a 5 or 6 storey building (MCL m53905, 53906, 53909). By 1889 the mill complex had expanded to occupy more of the area of the moated site; also by this date, Philips Park Road had been built on the south, and may itself have encroached on the site of the moat. Further development meant that by 1951 almost all the former moated site was either built over or occupied by the colliery arm. Only the south-west corner of the moated site seems to lie within the proposed development area. The industrial buildings on the site have all been demolished, and concrete footings are visible. No evidence was seen to suggest that these buildings were cellared. The site is slightly elevated, commanding extensive views to the north, and particularly the west.

2) SJ 8690 9872
Building

Building shown on 1818-19 and 1845 maps, and named in the 1845 Bradford tithe award as a house. By 1889 site was part of Bradford Iron Works (**site 12**).

3) SJ 8695 9868
Building

Rectangular, gabled building shown aligned roughly east-west, to south of moated site (**site 1**), on 1761 map. A building on this approximate site is also shown on Yates's map of the 1770s. Site vacant on 1818-19 and 1845 maps, by which latter date it lay immediately west of the Ashton Canal arm (**site 11**). By 1889 the site formed part of Bradford Iron Works (**site 12**).

4) SJ 8693 9865
Building

Rectangular, gabled building shown to south of and on roughly the same alignment as building **site 3**, on 1761 map. A building on this approximate site is also shown on Yates's map of the 1770s. Site vacant on 1818-19 and 1845 maps, by which latter date it lay immediately west of the Ashton Canal arm (**site 11**). By 1889 the site formed part of Park Mills, later part of Bradford Iron Works (**site 13**).

5) SJ 8698 9882
Building(s)

One or more buildings appears to be shown on this site on the 1761 map. The field to the rear is named on the map as Barn Meadow, suggesting a possible function (although see also **site 6**). The site may also be indicated on Yates's map of the 1770s, but is shown as vacant on the 1818-19, 1845 and 1889 maps, and terraced housing had been built here by 1906.

6) SJ 8700 9877
Buildings

Two neighbouring buildings shown alongside Mill Lane on 1761 map. The field to the rear is named on the map as Barn Meadow, suggesting a possible function of at least one of these structures (although see also **site 5**). The site may also be indicated on Yates's map of the 1770s. Two buildings are still shown here on the 1818-19 and 1845 OS maps, both of which also show a third building to their rear (east). This third building is not shown on the 1845 Bradford tithe award, which identifies the other two buildings as `House, outbuilding, yard & garden'. By 1889 the site of the more northerly of these two buildings was occupied by a range of buildings, which formed one side to a yard adjacent to, and probably belonging to, African Mills (**site 16**); the site of the more southerly of the two buildings was occupied by the north-west corner of the main mill block.

7) SJ 8720 9860
Bleaching Croft?

Field-name `Bowk House Field' is shown on 1761 map, suggesting that this site was used as a bleaching croft. Site lay immediately south of Yarn Croft (**site 8**).

8) SJ 8718 9870
Bleaching Croft?

Field-name `Yarn Croft' is shown on 1761 map, and in 1845 Bradford tithe award. Site lay immediately north of Bowk House Field (**site 7**) and may have been used as a bleaching croft.

9) SJ 8714 9853
Coal Pit

`Coal Pit' shown on this site on the 1845 map. A coal shaft with a building on its south is indicated on approximately this same site on the 1818-19 map. On the 1761 map and 1845 Bradford tithe award the site lay within a field named as `Further Coal Pit Field', the field adjoining to the north-west being named on the 1761 map as `New Coal Pit Field'. By 1845 the

15) SJ 8713 9880
Union Works

Site vacant on 1906 map. Square block shown on 1915 map. Named on 1932 map as `Union Works (Metal)'. Still shown and named on 1951 map.

16) SJ 8704 9875
African Mills

Site vacant on 1845 maps. L-shaped block, named as `African Mills (Cotton)', shown here on the 1889 map. Still indicated as such on the 1915 map, but by 1932 is named as `Philips Park Printing Works', and is similarly named on the 1951 map. Part of the northern boundary wall between the mill site and the canal tow path still stands to a height of c 2m, immediately to east of the Listed lock-keepers cottage. This wall is stone built, with some modern repair, and includes a window blocked with brick.

17) SJ 8718 9870
Vulcanized India Rubber Works

Site vacant on 1845 maps. Group of building between Gibson Street and the Ashton Canal shown on 1889 map and named as `Vulcanized India Rubber Works'. Still indicated as such on the 1915 map, but on the 1932 map the buildings are shown but not named. Some of the buildings had been demolished by 1951 when the site is named as part of `Bradford Iron Works (Wire)'.

18) SJ 8723 9866
Bradford Mill GMSMR 2067

Site vacant on 1845 maps. L-shaped block named as `Bradford Mill (Cotton)' shown on 1889 map. Site is still named as such on the 1951 map. Mill buildings were still standing here in the 1980s when they were recorded by the Greater Manchester Textile Mill Survey. According to the GMSMR description, following that survey, `The spinning mill is late C19 and brick built. Now only the ground floor remains. Timber internal structure augmented by cast-iron beams. Flat roof. Rectangular windows with stone sills & brick arches. Corner pilasters. Single corner tower. The engine house is attached to the rear of the mill, facing the canal. Octagonal brick chimney with a stone crown and a brick built boiler house. The modernized entrance to the former mill building has 2 old-style windows, and it also includes office space. The weaving shed is also late C19 and brick built with a single offset gable slate roof. Stone coping. Single storey. 10 x 1 bays. The warehouse is brick built and has 1 storey and 10x1 bays. Site completed by various sheds.' All of these buildings have since been demolished.

19) SJ 8706 9879
Townley Iron Works

Site vacant on 1845 maps. A small group of buildings is shown here on the 1889 map and named as `Townley Iron Works'. On the 1915 and 1932 maps the site is named as `Townley Works', and on the 1951 map as a warehouse.

20) SJ 8716 9860
School

Site vacant on 1889 map. School shown here on 1906 map and still shown in 1951.

21) SJ 8708 9854
Methodist Chapel

Site vacant on 1845 maps. Independent Methodist Chapel shown here on 1889 map. This is still indicated, as `Meth. Church' on the 1951 map.

22) SJ 8715 9851
School

Site vacant on 1845 maps. School shown here on 1889 map, at this date indicated as segregated into Boys, Girls and Infants. Between 1906 and 1915 an Infant School was built on the plot of land immediately to the north. Both are still shown on the 1951 map.

23) SJ 8721 9839
Methodist Chapel

Site vacant on 1845 maps. A Wesleyan Methodist Chapel had been built here by 1889. Still indicated on the 1932 map, but on the 1951 map the chapel appears to form part of the Iron Works complex (**site 24**).

24) SJ 8724 9844
Iron Works

Site vacant on 1845 maps. Small group of buildings shown here on 1889 map and named as Iron Works, and on 1906 map as Engineering Works. Similarly named on the 1915 map, but by this date the site had greatly expanded. Named as Iron Works on the 1932 map and again on the 1951 map; by the latter date, the building complex effectively filled the block

between Ashton New Road, Queen Street, Upper Dover Street and Corbett Street.

25) SJ 8731 9846
Works

Site vacant on 1845 maps. Unnamed industrial buildings shown here on 1889 map. Early 20th century maps show a succession of additions. By 1951 the site comprised two main adjoining blocks. That on the west is named as Iron Works and on the map evidence was built, or expanded to this form, between 1932 and 1951. That on the east is named simply as Works; parts of this building may have been built before 1889, with its full plan being seemingly reached by 1906.

2.4. Significance of the Remains

2.4.1 Although there are a wide number of methodologies for assessing archaeological significance, that with the greatest legal standing is the Secretary of State's criteria for the scheduling of ancient monuments, outlined in Annex 4 of PPG16. In the following the known or possible remains in the study area are assessed using these criteria.

2.4.2 *Period*

The earliest known site within the proposed development area is the site of the medieval moated site of Bradford Old Hall (**site 1**), the south-west corner of which is believed to have been sited within the proposed development area. A 1761 map shows other buildings within the proposed development area (**sites 3, 4, 5 & 6**). These were grouped around the moated site, and one or more of these may also have been of medieval origin. Mining was probably taking place in the proposed development area by the 17th century, and almost certainly by the mid-18th. The Ashton Canal arm dated from the early 19th century. The majority of known sites within the proposed development area dated from the mid- to late 19th century onwards.

2.4.3 *Rarity*

Any medieval remains might be considered of possible regional rarity, as would any remains of 17th-century or earlier coal mining.

The sites within the proposed development area which were of a later date are not particularly rare types.

2.4.4 *Documentation*

The general historic development of the proposed development area can be traced reasonably well through the cartographic sources. More could be learned by further documentary research. This would undoubtedly provide further information on the industrial development of the area, and may also furnish details on Bradford Old Hall.

2.4.5 *Group Value*

The group value of any archaeological remains within the proposed development area is considered to be low.

2.4.6 *Survival/condition*

Intensive development for building and industry in the 19th and early 20th century, and late 20th century demolition and groundworks can reasonably be assumed to have caused damage and destruction to earlier archaeological features. It is likely, for example, that any significant remains have survived of the buildings shown on the 1761 map (**sites 3, 4, 5 & 6**).

On the other hand, the moated site of Bradford Old Hall (**site 1**) may contain archaeological deposits. This site is known to have suffered some destruction through the construction of the Ashton Canal arm in the 19th century and further damage may have been caused by the construction of factory buildings on the site. However, given the lack of evidence for those buildings being cellared, it is possible that at least some remains of deep features, principally of the moat itself, have escaped destruction and survive below the current ground level.

2.4.7 *Fragility*

See 3.2 below.

2.4.8 *Diversity*

The diversity of any archaeological remains within the proposed development area is likely to be low.

2.4.9 *Potential*

The potential for archaeological remains other than those identified is believed to be low.

2.4.10 On the above criteria, none of the known or potential sites within the proposed development area is considered to be of national importance.

2.4.11 However, there may be archaeological remains within the proposed development area which are of regional importance, based largely upon their rarity. These are remains of the moated site of Bradford Old Hall and remains of 17th century or earlier coal mining.

3. Identification of Impacts

3.1 The archaeological impact of redevelopment on a site can be identified as follows.

Direct

This would involve an alteration to the physical condition of the site. The alteration might be either positive or negative. A positive effect might, for example, remove possible threats to its survival eg causes of erosion. A negative effect would involve damage or destruction to a site. These impacts can be refined by assessing the likely extent of the alteration to the site.

Indirect

This would involve an alteration to the setting of a site. Indirect impacts can be positive or negative, ie they can improve or detract from the appearance, understanding or appreciation of a site. Indirect impacts may be either temporary (ie lasting during the groundworks or other works for a development) or permanent.

3.2 Below-ground Remains

In the case of the proposed Sports City development, direct negative damage may be caused to below-ground archaeological remains by reduction or other disturbance of ground levels, including deep piling, and the digging of foundation or service trenches.

No indirect impacts have been identified for below-ground remains.

3.3 Listed Buildings

Listed Buildings in close proximity to the proposed development area (along the Ashton Canal) will be indirectly affected by the proposed development. This may involve both a temporary and a permanent indirect impact.

4. Evaluation of Impacts

4.1 Below-ground Remains

4.1.1 The present assessment has identified two possible types of remains of regional significance on which development may have a direct negative impact. These are possible remains associated with the medieval moated site of Bradford Old Hall (**site 1**), and possible remains relating to early coal mining.

4.1.2 The likelihood of these remains being directly affected is dependent both on the depth at which remains survive and the depth and extent of proposed groundworks.

4.1.3 In the case of Bradford Old Hall, any surviving remains will represent only a portion of the original site and may occupy a relatively small area. Any damage or destruction of remains may therefore have a major impact on this site. Such damage or destruction might be caused by relative shallow works, such as the excavation of foundation or service trenches.

4.1.4 It is presumed that any possible early mine workings would lie at a greater depth, and as such are unlikely to be affected by any relatively shallow groundworks. Such workings might, however, be exposed and damaged by deeper excavations, including work undertaken to seal these by grouting.

4.2 Listed Buildings

4.2.1 Development may have a temporary indirect negative impact on Listed Buildings in close proximity to the proposed development area (ie along the Ashton Canal). This effect may involve some visual intrusion on these sites.

4.2.2 Development would also have a permanent indirect positive impact on the Listed Buildings, by enhancing the setting of these buildings which currently lie adjacent to derelict brownfield sites.

5. Mitigation

5.1 PPG 16 draws a distinction between remains of national importance and other remains. In the case of the former, the presumption should be in favour of preservation in situ; in the case of the latter, where this is warranted by their significance, remains may undergo preservation by record, that is the making of an appropriate record by the use of survey, photography, excavation or other methods.

5.2 None of the remains identified within the study area are considered to be of national importance.

5.3 As outlined in section 2.4 of this report, there are potential remains within the study area of regional significance. These may require preservation by record should they be directly affected by redevelopment.

5.4 The precise archaeological response would be dependent upon the nature, location and extent of groundworks required for redevelopment.

5.5 In the case of the moated site of Bradford Old Hall (**site 1**), should there be any disturbance to the existing ground level, trial trenching will first be carried out, to record any significant archaeological deposits.

Moated sites often preserve organic material, including both artefactual evidence such as leatherwork and evidence for the local historic environment, such as pollens. A contingency will be made for the preservation of artefactual material, and for the sampling and analysis of palaeoenvironmental evidence.

5.6 Should excavations be proposed which would be of sufficient depth to uncover and damage evidence of early mining, that evidence will be recorded, where feasible, by an archaeological watching brief.

5.7 The strategy for archaeological mitigation will be finalized by consultation with the Greater Manchester Archaeological Unit.

6. Conclusion

6.1 The key issues are as follows.

6.2 **Below-ground Remains**

6.2.1 There are no known sites within the proposed development area which are of national importance and therefore might merit preservation in situ.

6.2.2 The medieval moated site of Bradford Old Hall may preserve archaeological remains of regional importance which may be damaged or destroyed by development. To mitigate this effect, these remains will be first recorded by trial trenching. A contingency will be made for treatment of any organic finds and analysis of palaeoenvironmental material.

6.2.3 Any remains of 17th century or early coal mining may also be of regional importance. Where these will be directly affected, they will be recorded, where feasible, by an archaeological watching brief.

6.2.4 Any other below-ground archaeological remains within the proposed development area are likely to be of only local significance and will not require further archaeological work.

6.3 **Listed Buildings**

6.3.1 There are three Listed Buildings, all Grade II, along the Ashton Canal immediately adjacent to the proposed development area. These are:

- Lock No 6
- Lock No 7 and Roving Bridge
- Lock-keeper's Cottage, by Lock No 7

6.3.2 Development may have a temporary negative impact of these Listed Buildings, involving some visual intrusion on their setting during construction work.

6.3.3 Development will have a permanent positive impact on the Listed Buildings, by enhancing the setting of these buildings which currently lie adjacent to derelict brownfield sites.

MCL - Manchester Central Library

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Ashton under Lyne Canal: 144, Manchester. Mill Street Bridge (MCL m53909).

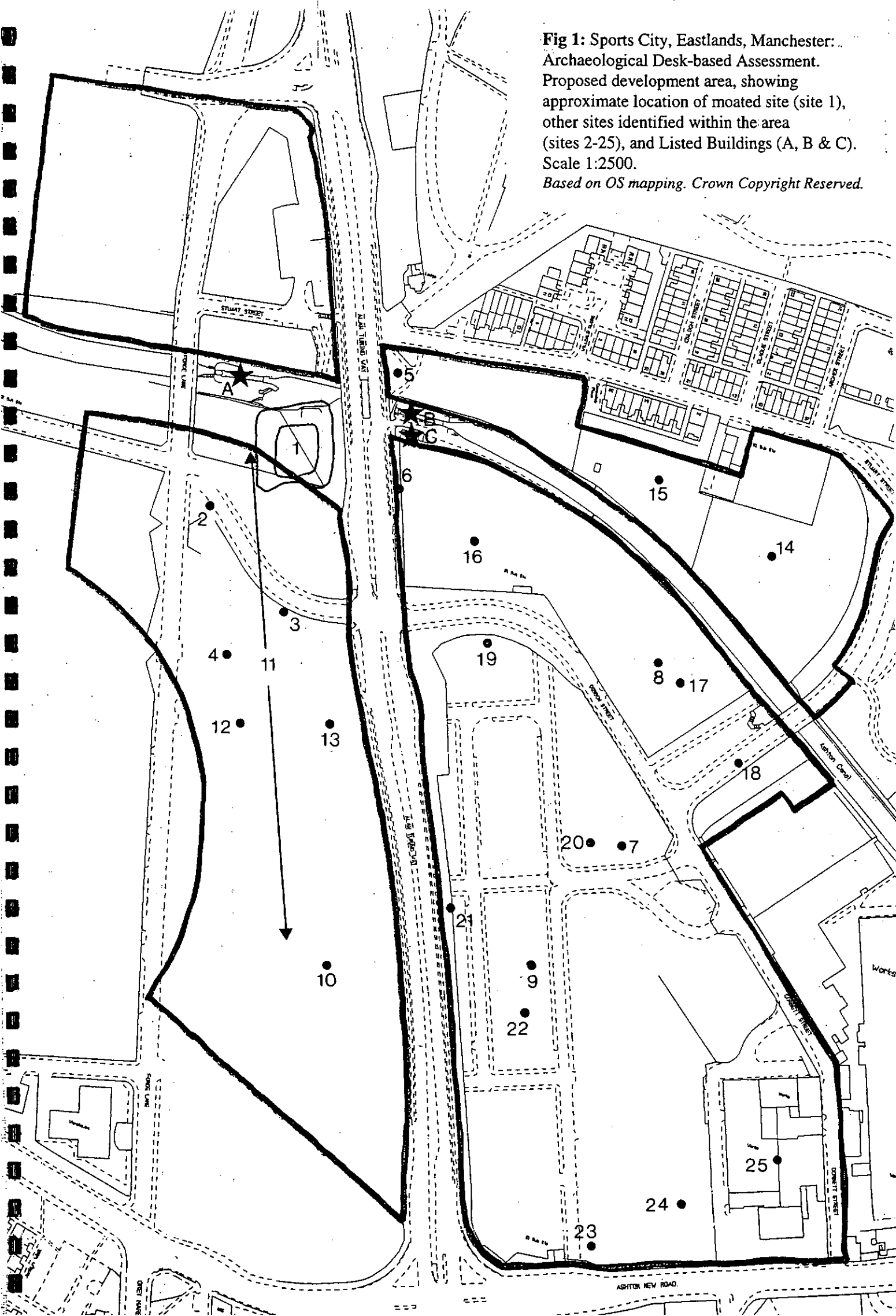


Fig 1: Sports City, Eastlands, Manchester: Archaeological Desk-based Assessment. Proposed development area, showing approximate location of moated site (site 1), other sites identified within the area (sites 2-25), and Listed Buildings (A, B & C). Scale 1:2500.

Based on OS mapping. Crown Copyright Reserved.

Fig 2: Sports City, Eastlands, Manchester: Archaeological Desk-based Assessment. Detail of 1761 map, reproduced at c 1:2500, with proposed development area superimposed, and moated site (Bradford Old Hall) arrowed.

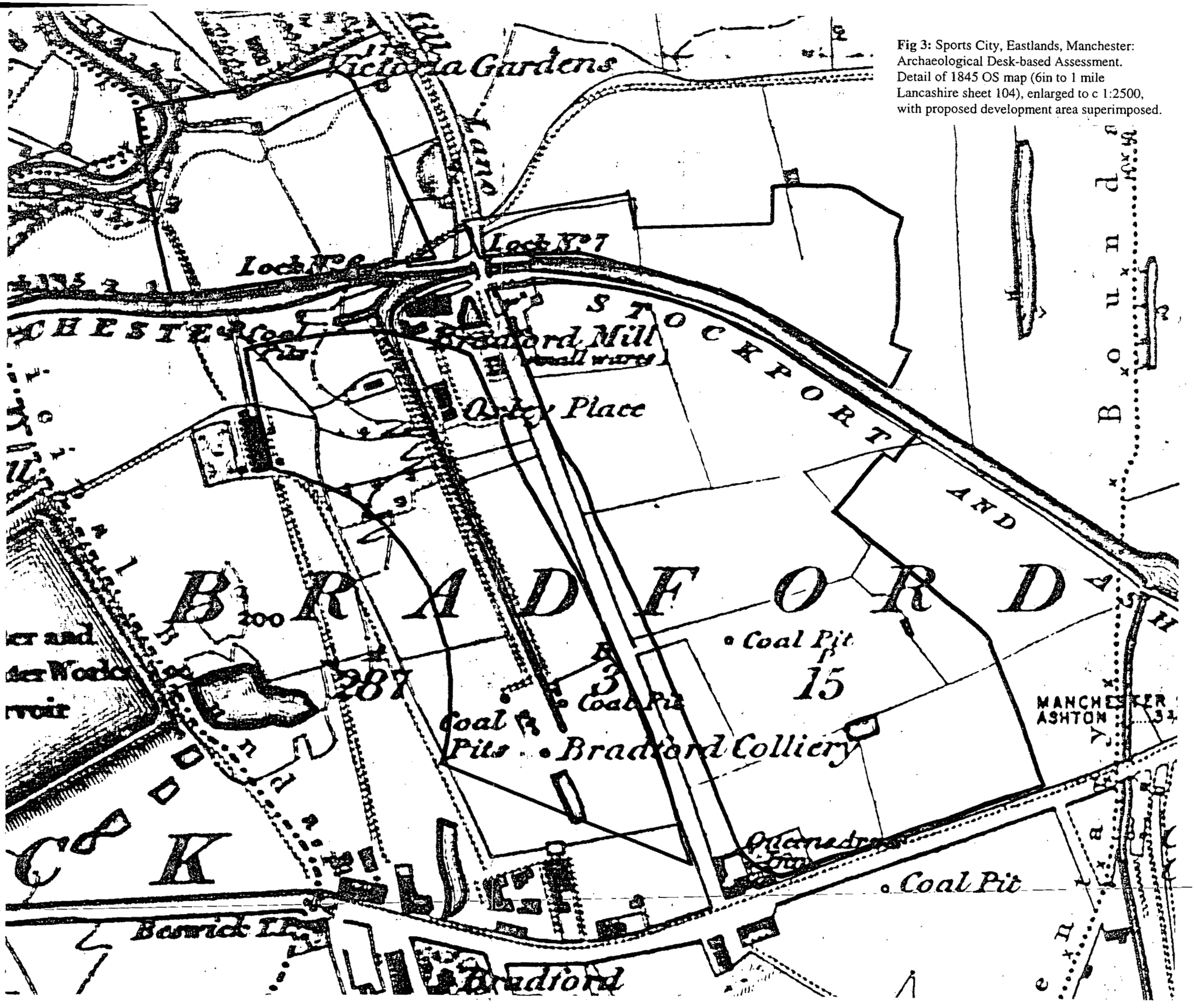


Fig 3: Sports City, Eastlands, Manchester: Archaeological Desk-based Assessment. Detail of 1845 OS map (6in to 1 mile Lancashire sheet 104), enlarged to c 1:2500, with proposed development area superimposed.

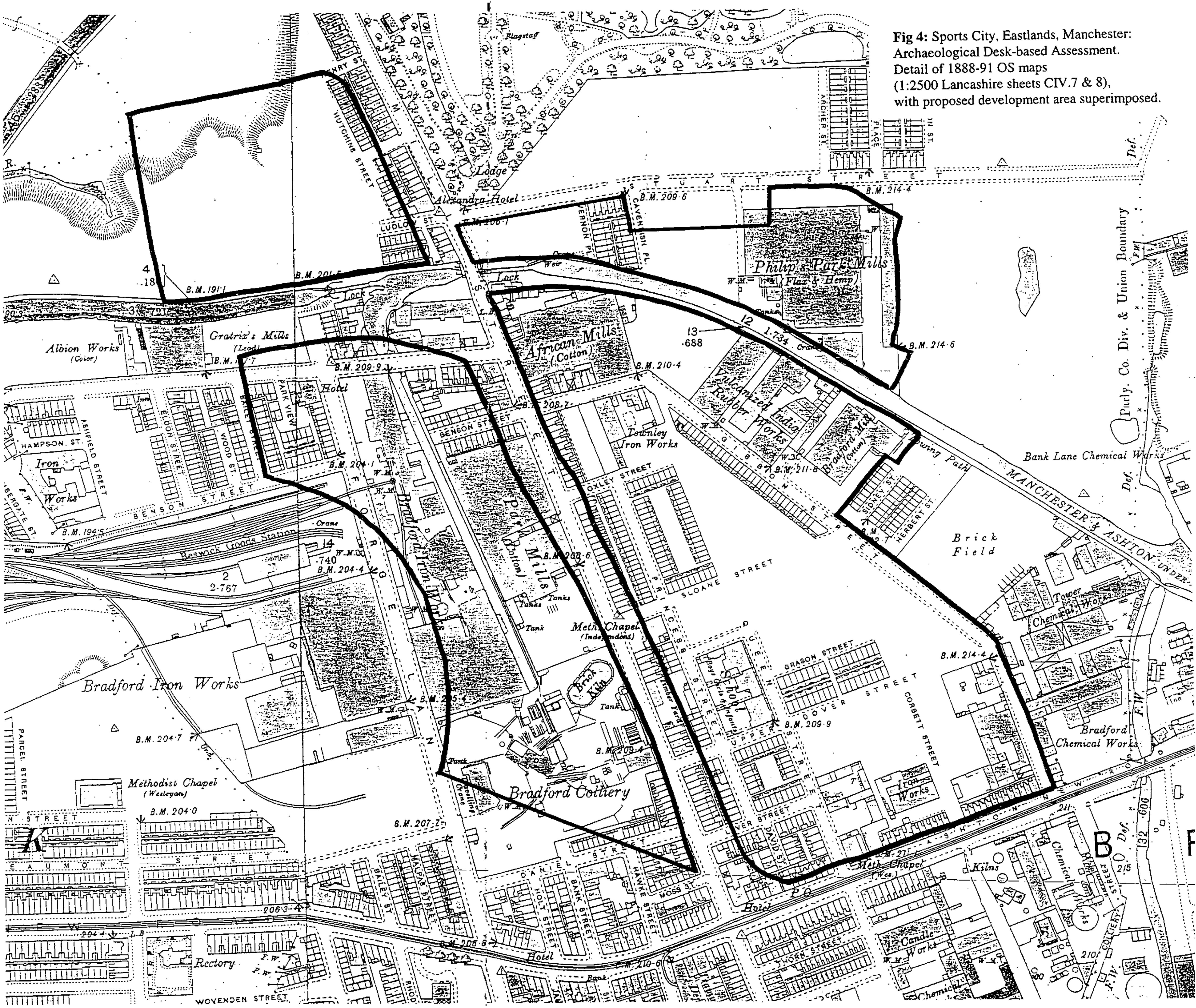


Fig 4: Sports City, Eastlands, Manchester: Archaeological Desk-based Assessment.
Detail of 1888-91 OS maps
(1:2500 Lancashire sheets CIV.7 & 8),
with proposed development area superimposed.

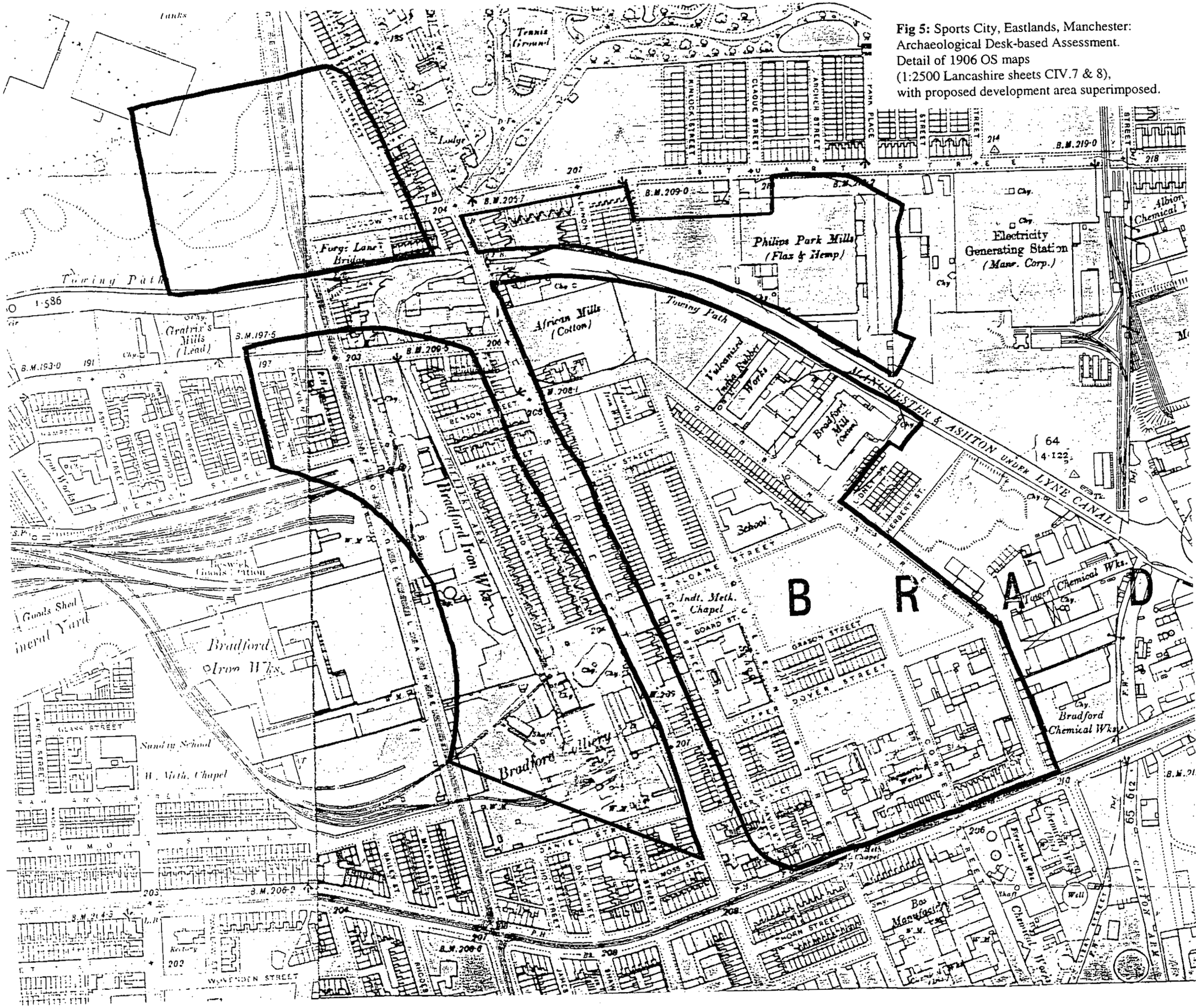


Fig 5: Sports City, Eastlands, Manchester: Archaeological Desk-based Assessment. Detail of 1906 OS maps (1:2500 Lancashire sheets CIV.7 & 8), with proposed development area superimposed.

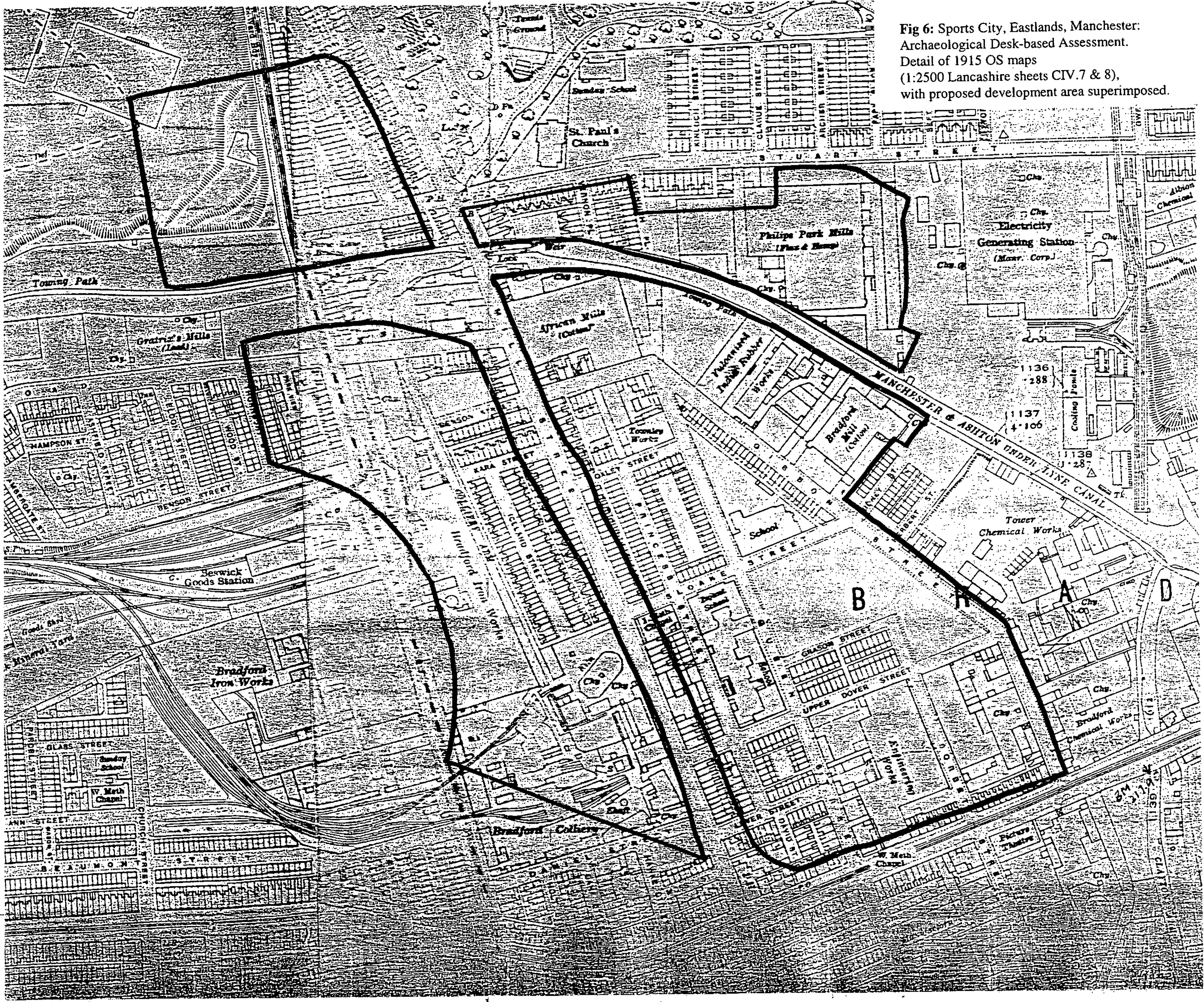


Fig 6: Sports City, Eastlands, Manchester: Archaeological Desk-based Assessment. Detail of 1915 OS maps (1:2500 Lancashire sheets CIV.7 & 8), with proposed development area superimposed.

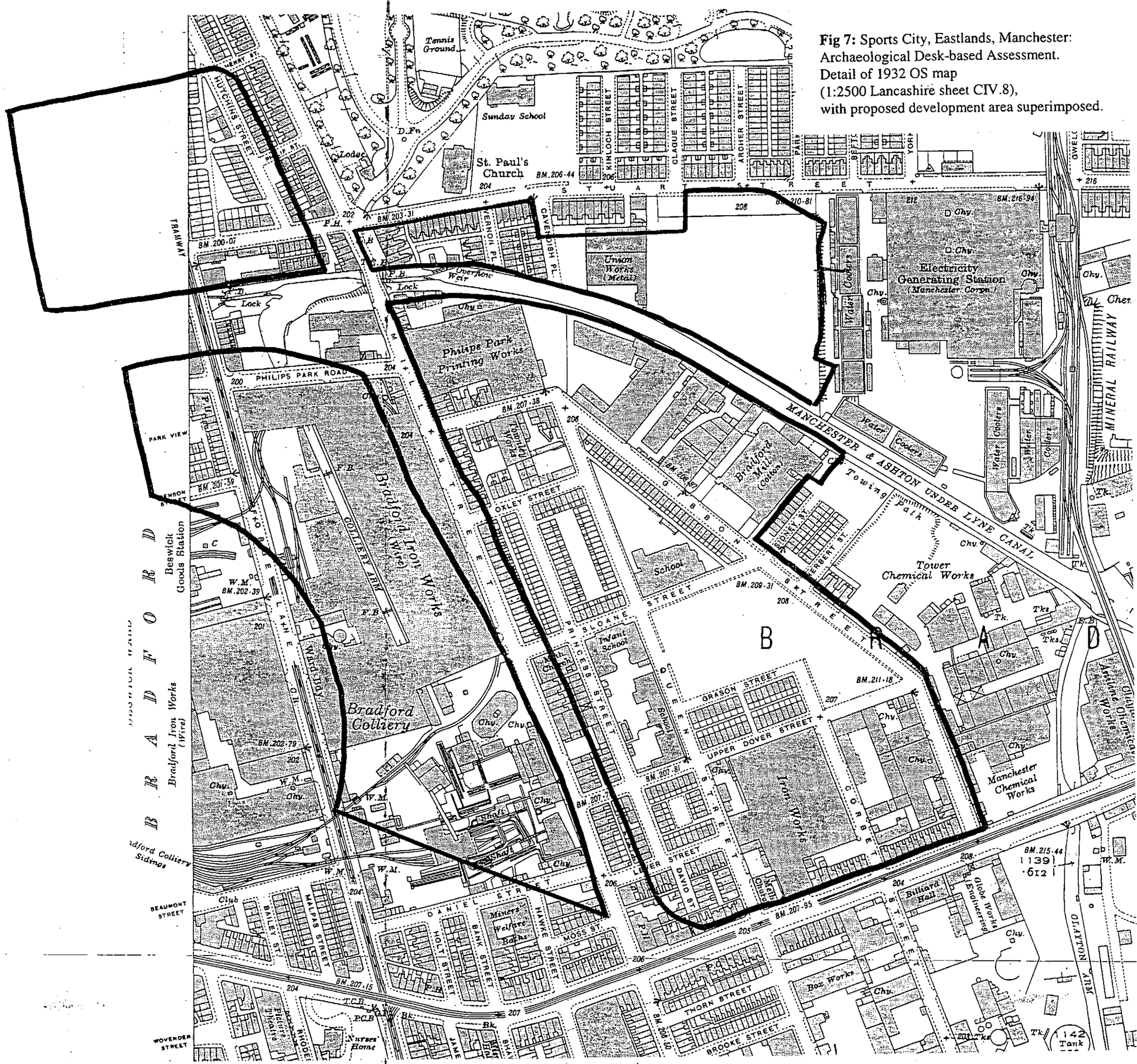


Fig 7: Sports City, Eastlands, Manchester: Archaeological Desk-based Assessment. Detail of 1932 OS map (1:2500 Lancashire sheet CIV.8), with proposed development area superimposed.

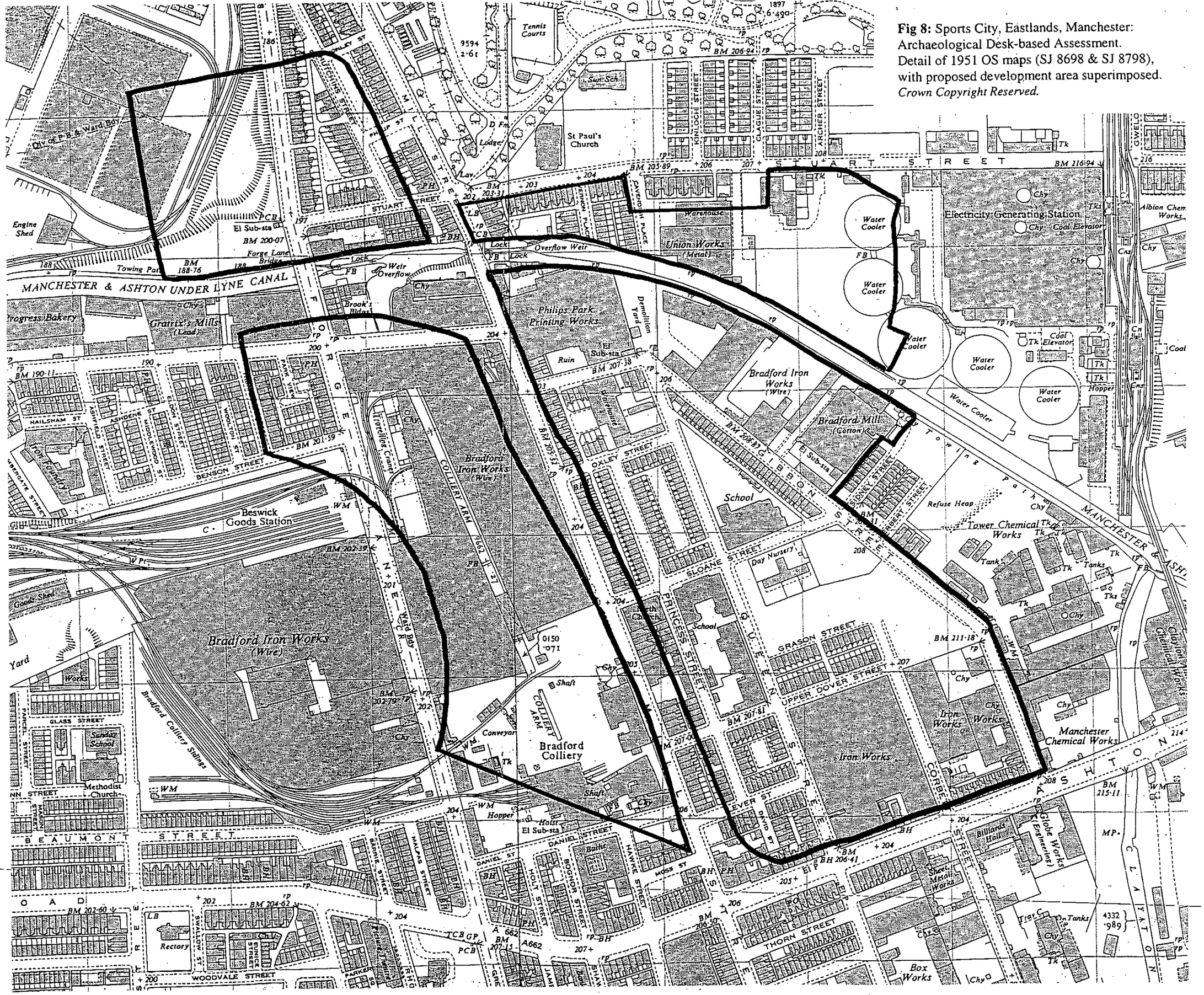


Fig 8: Sports City, Eastlands, Manchester: Archaeological Desk-based Assessment. Detail of 1951 OS maps (SJ 8698 & SJ 8798), with proposed development area superimposed. *Crown Copyright Reserved.*



SPORTCITY, BRADFORD, MANCHESTER

Greater Manchester

Final Excavation Report

Oxford Archaeology North

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SUMMARY

Today, the historic township of Bradford in East Manchester is dominated by the City of Manchester Stadium. Often referred to as Eastlands, this state-of-the-art arena forms the centrepiece for a suite of sporting venues developed to host the Commonwealth Games that were held in Manchester in 2002. These include the Regional Athletics Arena, Manchester Velodrome, the National Squash Centre, and the Manchester Tennis Centre, creating the largest concentration of world-class sporting facilities in Europe, and known appropriately as Sportcity.

In order to ensure the economic value of the City of Manchester Stadium after the Commonwealth Games had finished, it was leased by the City Council to Manchester City Football Club (MCFC) for use as their home ground. In 2010, MCFC signed an agreement with the City Council to allow a £1 billion redevelopment of approximately seven hectares of brownfield land immediately to the east of the stadium (centred on NGR SJ 869 986). As an initial stage, it was proposed that remediation and site-servicing works was carried out to treat soils contaminated by the site's former industrial use, and to decommission and remove associated buried structures.

The area is of considerable archaeological interest, as it incorporated a moated hall site during the medieval period and, from the mid-nineteenth century onwards, emerged as an important centre of industrial activity. In particular, the site was occupied by Bradford Colliery, which became the largest coal mine in the Manchester Coalfield. In the early 1850s, the famous Bradford Ironworks of Richard Johnson & Nephew was established adjacent to Bradford Colliery, and promptly developed an international reputation for revolutionising the wire-manufacturing industry. By the end of the nineteenth century, the colliery and the ironworks were surrounded by a range of textile mills, rubber works, chemical factories, and brick works, interspersed with streets of terraced housing.

In order to secure archaeological interests, the County Archaeologist for Greater Manchester, recommended that a programme of archaeological investigation was carried out to support the application for the proposed remediation of the site. The archaeological works required in the first instance were specified in a brief devised by the County Archaeologist, and allowed for detailed historical research of the site and the excavation of 12 targeted evaluation trenches. In December 2009, Oxford Archaeology North (OA North) was commissioned by Manchester City Council to undertake the specified programme of work, which was carried out in January 2010. The evaluation trenching demonstrated that buried remains of archaeological interest survived *in-situ* across the site. In particular, buried structural remains of buildings pertaining to the former colliery, the Bradford Ironworks, and elements of two textile factories, Park Mills and Bradford Mill, were exposed. Following consultation with the County Archaeologist for Greater Manchester, it was recommended that these buried remains merited a programme of further archaeological investigation, as the proposals for remediation did not allow for the retention *in-situ*. Five areas of the site were identified for further excavation, which was carried out between March and May 2010. In addition, a sixth trench was also excavated across the site of the early nineteenth-century pit head and the canal arm.

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The most substantial remains encountered during the excavation programme pertained to the colliery and Bradford Ironworks. Whilst there were no structural remains that could be attributed firmly to the early nineteenth-century phase of the colliery, the later nineteenth-century development of the site was represented by the well-preserved remains of a boiler house for a bank of five Lancashire boilers, and the foundations of the engine house for the steam-powered winding engine. The majority of the excavated remains of the colliery, however, represented the restructuring of the surface plant after 1945. In particular, the concrete foundations for structures associated with the coal-preparation plant were exposed. The excavation of Bradford Ironworks provided evidence for the remodelling of the original forge area with the installation of a range of boilers. The remains of a Siemens-type regenerative furnace was also revealed.

The results obtained from the archaeological investigation have been prepared for publication as a 'popular' booklet. This will form Volume 4 in the new *Greater Manchester's Past Revealed* series.

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The desk-based research was carried out by Ian Miller, and incorporates material provided by Gary Crate and Carl Lowe. The programme of initial evaluation trenching was directed by Chris Wild, who was assisted by Liz Murray. The excavation carried out subsequently was directed by Graham Mottershead, assisted by Phil Cook, Christina Robinson, Lewis Stitt, and Charlotte Vallance. The report was compiled by Graham Mottershead and Chris Wild, with specialist contributions from Alison Plummer and Ian Miller. The illustrations were produced by Graham Mottershead and Marie Rowland. The report was edited by Ian Miller, who was also responsible for project management. The project was funded entirely by Manchester City Council.

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1. INTRODUCTION

1.1 CIRCUMSTANCES OF PROJECT

1.1.1 Manchester City Council has proposed to carry out a major programme of remediation to land at Sportcity, adjacent to Alan Turing Way in the Bradford area of Manchester. The scheme of remediation will necessitate considerable earth-moving works, and will inevitably have a major negative impact on any buried archaeological remains across the site. The area is of considerable archaeological interest, as it incorporated a moated hall site during the medieval period and, from the mid-nineteenth century onwards, emerged as an important centre of industrial activity. In particular, the site of the former Bradford Colliery and the Bradford Ironworks lie within the area that is to be subject to remediation.

1.1.2 In order to secure archaeological interests, the County Archaeologist for Greater Manchester, who provides archaeological planning advice to Manchester City Council, recommended that an initial programme of archaeological research and intrusive evaluation was required to support the planning application for the proposed remediation of the site. The scope of these initial archaeological works was specified in a brief devised by the County Archaeologist, and allowed for detailed historical research of the site to enhance the results obtain from a previous desk-based study (UMAU 2000), and the excavation of 12 targeted evaluation trenches.

1.1.3 In December 2009, Oxford Archaeology North (OA North) was commissioned by Manchester City Council, to carry out the programme of targeted evaluation, coupled with detailed historical research, in accordance with a Project Brief (*Appendix 1*). The work was undertaken in January 2010. The evaluation trenching demonstrated that buried remains of archaeological interest survived *in-situ* across the site. In particular, buried structural remains of buildings pertaining to the former colliery, the Bradford Ironworks, and elements of two textile factories, Park Mills and Bradford Mill, were exposed. Following consultation with the County Archaeologist for Greater Manchester, it was recommended that these buried remains merited a programme of further archaeological investigation, as the proposals for remediation did not allow for the retention *in-situ*. Five areas of the site were identified for further excavation and detailed archaeological recording, which was carried out by OA North between March and May 2010. In addition, a sixth trench was placed across the line of a former canal branch.

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1.2 SITE LOCATION, TOPOGRAPHY AND GEOLOGY

1.2.1 The study area (centred on NGR SJ 869 986) is situated within the Bradford area of Manchester, which lies some 2km to the east of the city centre (Fig 1). The site is bounded by the Manchester City football stadium to the east, Alan Turing Way to the west, and the Ashton Canal and Ashton New Road to the north and south respectively (Plate 1).



Plate 1: Aerial view of the study area prior to the archaeological investigation

1.2.2 ***Topography:*** 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 as a whole comprises the Mersey river valley, whilst the rivers Irwell, Medlock, and Irk represent the principal watercourses in Manchester (Countryside Commission 1998, 125). The study area, however, is situated close to the southern bank of the river Medlock. It lies at a height of approximately 60m above Ordnance Datum (aOD) and, in broad terms, is fairly level, with localised variations that are the direct result of recent landscaping schemes.

1.2.3 ***Geology:*** Bradford lies on the Manchester Coalfield, which extends for some 6.5km through East Manchester, and is up to 2.5km wide. It is enclosed almost entirely by strata of red sandstone, which separates the Manchester Coalfield from the South-West Lancashire and Oldham coalfields. The Upper Coal Measures form the highest commercially viable beds of the coalfield, and comprises two thin seams of coal between bands of shales, limestone and sandstones. Below this are the Middle Coal Measures, with seven beds of coal including Bradford Four Feet, Three Quarters, Charlotte Mine and Openshaw Mine. These lie approximately 300m below the surface, and are known collectively as the Bradford Group. Situated at a depth of about 465m, the

Bradford Four Feet is the lowest and thickest of these seams. Beneath the Bradford Group is the Parker Mine, lying at a depth in excess of 480m below the surface. The deepest seam is the Crombouke, which lies at approximately 845m below the surface.

1.2.4 The overlying drift incorporates Pleistocene boulder clays of glacial origin, and sands, gravels, and clays of fluviatile/lacustrine origin (Hall *et al* 1995, 8).

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2. METHODOLOGY

2.1 INTRODUCTION

2.1.1 The fieldwork undertaken followed the method statement detailed in the approved project design (*Appendix 1*), and was consistent with the relevant standards and procedures provided by the Institute for Archaeologists.

2.2 EXCAVATION

2.2.1 The modern surface was removed using a tracked excavator fitted with a mechanical breaker and a toothed bucket operating under archaeological supervision. The same machine, fitted with a toothless ditching bucket, was then used to carefully define the extent of any surviving walls, foundations and other remains, after which all excavation was undertaken manually.

2.2.2 All information was recorded stratigraphically on OA North *pro-forma* recording sheets with accompanying plans and sections drawn at an appropriate scale. A photographic record, both of individual contexts and overall site shots from standard view points, was undertaken with digital and 35mm cameras on archivable black-and-white print film as well as colour transparency; all frames included a visible, graduated metric scale.

2.2.3 The precise location of the trenches, and the position of all archaeological structures encountered, was surveyed by EDM tacheometry using a total station linked to a pen computer data logger. This process generated scaled plans and sections within AutoCAD, which were then subject to manual survey enhancement. The drawings were generated at an accuracy appropriate for 1:20 scale, and all information was tied in to Ordnance Datum.

2.3 FINDS

2.3.1 A programme of artefact recovery was carried out in accordance with best practice (following current Institute for Archaeologists guidelines), and subject to expert advice in order to minimise deterioration.

2.4 ARCHIVE

2.4.1 A full professional archive has been compiled in accordance with the project design (*Appendix 1*), and with the current UKIC (1990) and English Heritage (1991) guidelines. The paper, material, and digital archive will be deposited with the Museum of Science and Industry in Manchester within six months of completion of the project, while a copy of this final excavation report will be submitted to the Greater Manchester Historic Environment Record (HER). Copies of the report will also be forwarded to Museum of Science and Industry in Manchester, and Manchester City Council Planning Department.

3. BACKGROUND

3.1 INTRODUCTION

3.1.1 An understanding of the archaeological and historical background of a site provides the local context within which the extant structures and buried remains can be assessed archaeologically. The following section provides an outline of the natural setting of the study area, and summarises the historical development of the Bradford area of Manchester. The historical background has been compiled largely from secondary sources and the sequence of available historic maps, and includes a chronological account of the development of the site in terms of its occupants and uses.

3.2 HISTORICAL BACKGROUND: DEVELOPMENT OF BRADFORD

3.2.1 The current understanding of any activity in the Manchester area during the prehistoric period is poor, although it is reasonable to suggest that the Castlefield area in the centre of the city may have been conducive for late prehistoric settlement on account of the natural topography and its riverside location. However, physical indications for any such settlement are, at best, fragmentary, and there is no known evidence for prehistoric activity in proximity to the study area (UMAU 2000).

3.2.2 Evidence for Roman activity in the vicinity of the study area is similarly lacking. The first military occupation of Manchester was established during the governorship of Agricola (AD 77-84), and commenced with a five-acre wooden fort, known as *Mamucium* (Brunton 1909). During the second century, the fort was developed in association with a substantial extramural settlement, or *vicus*, which expanded in both a northerly direction, and along the line of Chester Road to the south (Grealey 1974, 11). Roads from the fort linked Manchester with Ribchester to the north, Castleshaw, Slack and York to the north-east, Wigan to the north-west, Northwich and Chester to the south (Gregory 2007), and Buxton to the south-east. The route of the road to Castleshaw, Slack and York (GMSMR 24) has been projected as running on a line some 0.3km to the north-west of the Scheme Area, while a third-century coin is reported to have been found in Philips Park (GMSMR 3672). However, this Roman coin was an isolated find, and there is no additional evidence for any Roman settlement in Bradford (UMAU 2000).

3.2.3 There is very little archaeological evidence in the region as a whole that represents the period between the end of the Roman occupation and the Norman Conquest. The area around Manchester came under the control of several kingdoms during this period. In AD 620, Edwin conquered and occupied Manchester, and it may have been at this time that settlement in the town was established around the cathedral (Farrer and Brownbill 1911).

3.2.4 The study area is located within the historic township of Bradford, which is documented from the 1160s. The name is believed to be derived from Old English, and means 'wide ford'. This may refer to a crossing point over the river Medlock at the end of Mill Street, which lies a short distance to the north-east of the study area (Mills 1976, 66; Crofton 1905, 385). During this period, the study area is likely to have comprised a mixture of wood land and good pasture, with water meadows alongside the river Medlock (Cooper 2002, 30). Local tradition maintains that wolves and eagles once inhabited the woodlands, and that honey production was part of the local economy, although there is little firm evidence to corroborate such claims.

3.2.5 The earliest plan of the area, dating to 1761, shows that a square-shaped moat in the northern part of the study area, marking the site of the medieval Bradford Old Hall (*Section 3.3*). The development of Bradford Colliery and Bradford Ironworks in the nineteenth century (*Sections 3.4 and 3.5*) no doubt led to the development of housing in Bradford and, by the end of the nineteenth century, the study area and its environs were densely populated. In consequence of the expanding local population, and the associated problems of dealing with issues such as sanitation and drainage on a local scale, Bradford applied to be incorporated within the city of Manchester during the 1880s (Frangopulo 1962, 62). The area continued to expand its industrial base during the twentieth century, although industrial activity was dominated by the Bradford Colliery and the adjacent Bradford Ironworks (Plate 2).



Plate 2: Aerial view of 1946, showing Bradford Colliery (shown within the green boundary) and Bradford Ironworks (shown within the red boundary)

3.3 BRADFORD OLD HALL

3.3.1 By the late thirteenth century, Bradford formed part of the demesne land of the lords of Manchester. Settlement during this period is likely to have been focused in the area of Bradford Old Hall, although the origin of this manor house is not entirely clear. The hall is not mentioned in surveys of the demesne land carried out in 1282 and 1322, suggesting that it may not have been built by that date (UMAU 2000). However, it seems possible that the hall was built between the 1330s and 1350s, when the manor of Bradford was held by John de Salford of Wakerley (Worsley). The manor was granted to Thomas de Booth of Barton by the lord of Manchester in 1357 and, in the early 1360s, de Booth also bought out the Wakerley family. Documents of that time refer to the Bradford estate as including a 'messuage' or dwelling, indicating that the hall may have been extant by that date. The manor house is also alluded to in 1514, when John Booth, killed in 1513 at the Battle of Flodden, was recorded as having held property including the manor of Bradford Hall (Crofton 1905, 399-404).

3.3.2 The final reference to the hall is provided by an entry in a rate book of 1717-8 (*ibid*), and it seems to have been demolished shortly afterwards. It was replaced by a new manor house, which was built to the north, on the southern bank of the River Medlock. The site of the original hall is depicted on a plan of Bradford dating to 1761, which shows a moat located just to the west of Mill Lane, although the actual hall is not shown, suggesting that it had been demolished by that date (Plate 3). Access across the moat was via a bridge across its south side, leading to the central area that is depicted as covered by trees on the plan of 1761.



Plate 3: Copy of a plan of Bradford of 1761, showing the moat of Bradford Old Hall

3.3.3 The plan of 1761 shows that the land immediately to the south of Bradford Old Hall to have been divided into several small plots, within which are two possible buildings. The land to the south was divided into several larger fields, bounded to the south and east by roads (later named Ashton New Road and Mill Street). On the east side of Mill Street two adjacent fields are named as 'New Coal Pit Field' and 'Further Coal Pit Field'. The underground mine workings in the 'Four Feet Seam' are also marked on the plan, although this is almost certainly later annotation.

3.3.4 In 2002, immediately prior to the construction of a Metro-link tunnel under Alan Turing Way, the Greater Manchester Archaeological Unit carried out an excavation in the area of the moat. A thick deposit of silty clay containing organic material was exposed beneath the brick foundations of a nineteenth-century building, which lay on top of the eastern arm of the moat. This deposit was excavated to a depth of 3m with no discernible change in material, leading to a conclusion that this may have been the fill of the moat (UMAU 2002, 13-4).

3.3.5 Excavation to the north exposed similar organic material, together with the remains of a wall that was composed of large, roughly hewn, red sandstone blocks. The largest of these measured 450 x 450 x 170mm, and had tool marks creating a decorative herringbone pattern. The wall was aligned north-north-west to south-south-east, and was interpreted as the inner face of the revetment wall for the eastern arm of the moat. The moat revetment was also exposed further to the north, although its method of construction was slightly different. There, it comprised smaller fragments of limestone and yellow sandstone, compacted into a matrix of clay. Set between the stones were the stumps of two oak posts, together with several wooden stakes (Plate 4).



Plate 4: Section of moat revealed during excavation in 2002 (reproduced courtesy of GMAU)

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3.3.6 ***The Bradford Canal Arm:*** Bradford Old Hall had certainly been demolished prior to the construction of the Ashton Canal in 1796, which seemingly took a course across the site. Indeed, a plan of the area that probably dates to the early nineteenth century indicates the west side of the moat to survive as a visible earthwork, and seemingly utilised as a reservoir for the short section of the canal between two locks (Plate 5). This map also depicts several mining shafts is the area; two shafts are depicted to the east of the moat, a third shaft is shown a short distance to the west of the moat, and another shaft is marked in the area of Bradford Colliery.

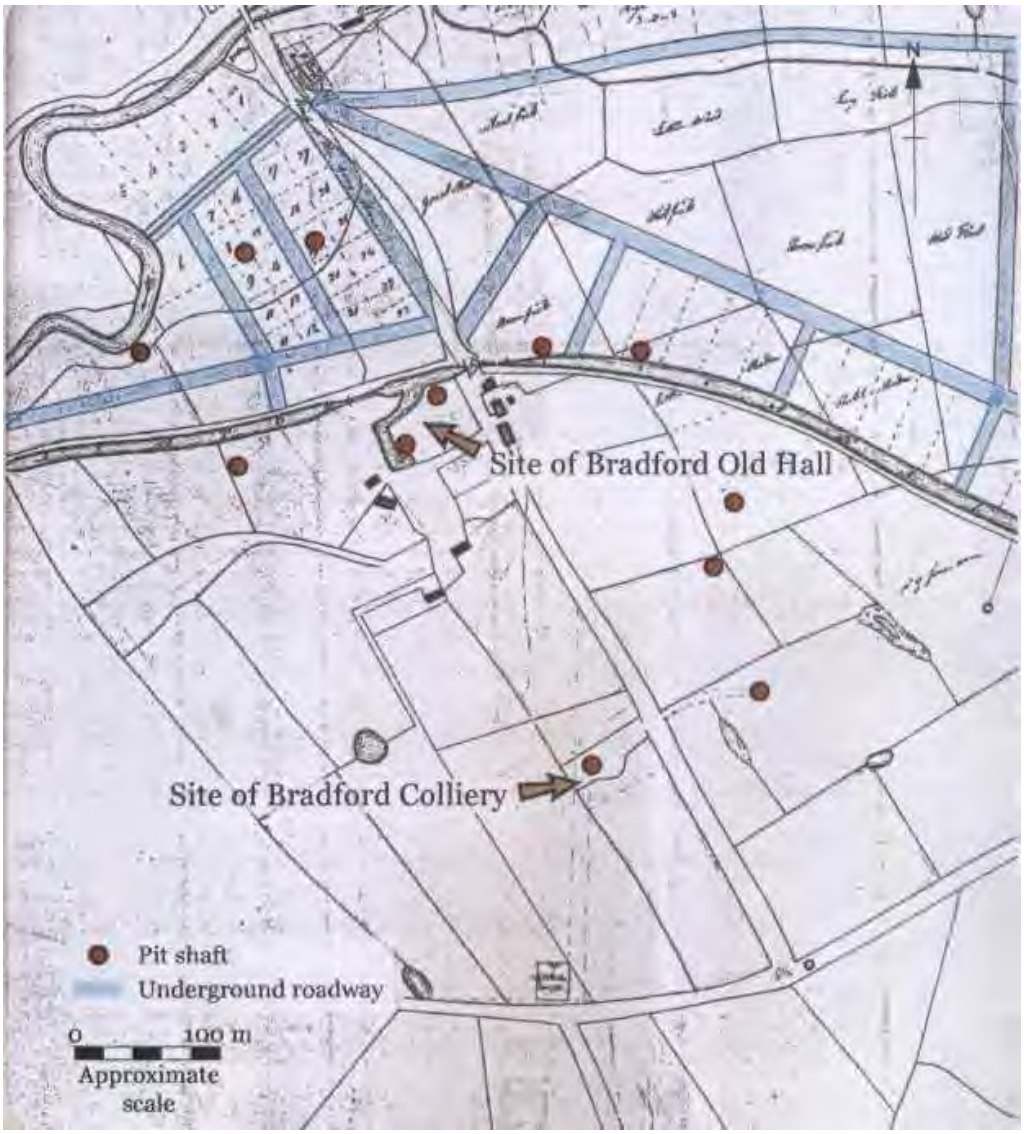


Plate 5: An undated plan that was probably drawn in the early nineteenth century, showing the initial development of the canal arm, together with numerous coal pits

3.3.7 The canal is shown to have a similar layout on Johnson's *Plan of the Parish of Manchester* of 1820 (Fig 3), and George Hennet's *Map of the County Palatine of Lancaster* of 1830. However, the Bradford tithe map of 1845 shows this putative pound reservoir to have been expanded into a private canal arm, which extended down to Bradford Colliery from the main line of the Ashton Canal.

3.3.8 The Ashton Canal had numerous branches that served factories and industry along its length. Below Lock 4, for instance, was a basin for the gas works on Bradford Road, where coal was brought in and tar and coke was taken away. The Bradford Branch was a private branch canal, and was intended specifically to connect Bradford Colliery and Bradford Ironworks to the main line, providing these works with a direct route of communication to central Manchester and numerous factories along the way. The junction of the Bradford Branch was immediately above Lock 6, and was 137m long (Keaveney and Brown 1974, 27).

3.3.9 The latest arm off the canal was intended to serve a basin built specially for Armstrong Whitworth Ltd, which became Lancashire Steel Corporation subsequently. This basin appears to have been built in *c* 1914, measured some 75m by 10m, and was designed for the reception of coal and coke from Bradford Colliery and Bradford Gas Works (*ibid*).

3.3.10 It is uncertain precisely when the Bradford Branch was closed to navigation, although this may have been linked to the closure of Bradford Colliery in 1968. There are certainly records of coal being transported by canal boat from Bradford Colliery during the Second World War, and the canal is visible on an aerial photograph taken in 1946, passing through the centre of Johnson & Nephew's ironworks complex (Plate 2). It is also named on the Ordnance Survey map of 1951, although subsequent mapping is not clear (Plate 6).

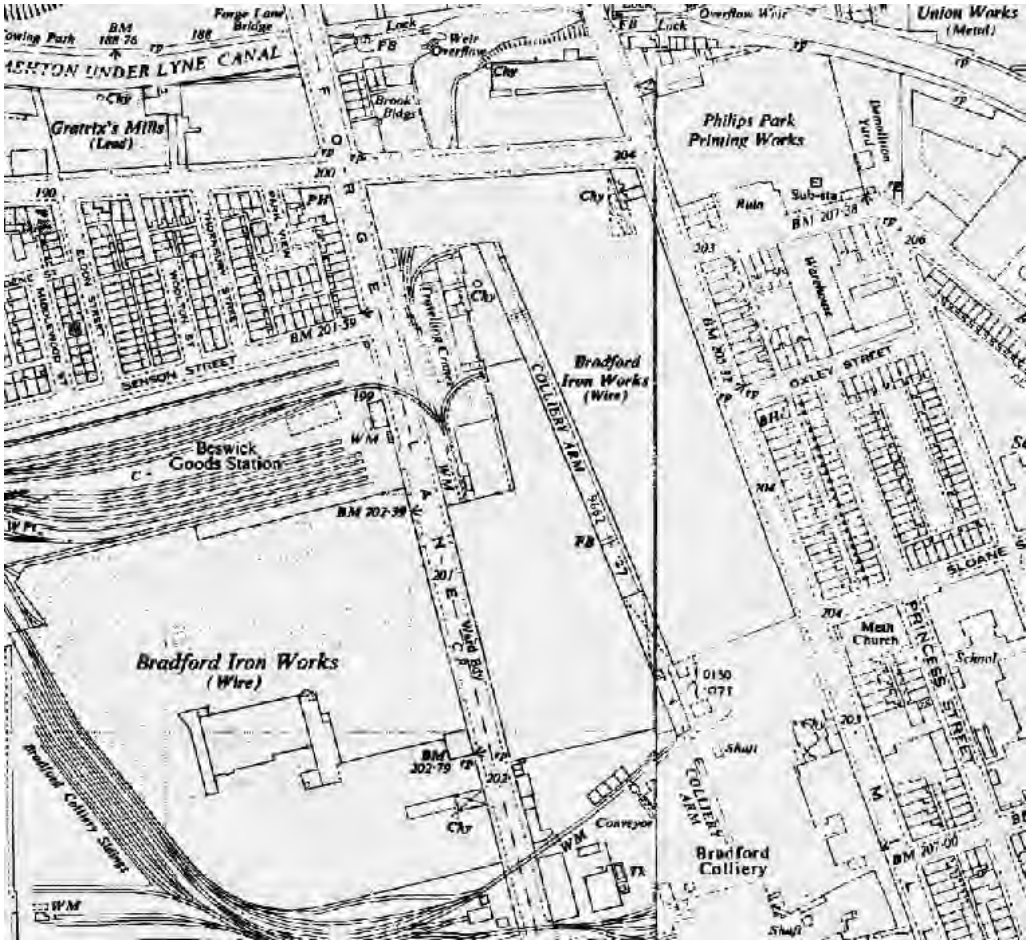


Plate 6: Extract from the Ordnance Survey map of 1951

3.4 BRADFORD COLLIERY

3.4.1 Coal was being mined at Bradford by the late medieval period, although the modern colliery was not established until the mid-nineteenth century. It became the largest of five collieries that were sunk on the eastern side of the Great Pendleton fault in the Manchester coal basin. The coal available at Bradford Colliery was of high quality and also present in large quantities, with an estimated 310 million tons available in the workable seams. There were also quite favourable conditions for working at the colliery, including low gas emissions, a lack of water and a low geothermic gradient, meaning that the deep workings remained relatively cool (*The Colliery Guardian* 1953, 127).

3.4.2 ***Early development:*** a coal pit in the Bradford township is mentioned as early as 1593, when it was affected by flooding (Crofton 1905, 394-5). Coal mines are again mentioned in Bradford in 1607-8; and in 1611, 1622, and twice in the 1660s, individuals were buried in Manchester parish church (now the Cathedral) who had died as a result of accidents at 'Bradford coal pit' (Farrer and Brownbill 1911, 275; Crofton 1904, 121-4; Hatcher 1993, 122).

3.4.3 In 1740, ten miners were employed at the coal workings in Bradford (Warrender 2007, 112), and the map of Bradford township from 1761 marks 'shafts' in the approximate area of the later Bradford Colliery. Annotation on the map shows this to have been located on the line of a 'Four Foot Coal' seam, which is shown on the plan to cross the study area on a north-west/south-east alignment (Plate 3). However, it is probable that this annotation was added to the plan at a date somewhat later than 1761.

3.4.4 ***Nineteenth-century expansion:*** Johnson's map of 1820 appears to show two coal pits with associated, buildings within the study area (Fig 3). These lay in the area shown on subsequent mapping to have been occupied by Bradford Colliery, and at least one of the buildings was probably for the winding gear. The pits are likely to have been owned by the Bradford Colliery Company, which is listed in a trade directory as the owner of a coal yard on Newton Street in the Ancoats area of Manchester. D Holroyd is named as the coal yard agent (Pigot 1822, 157).

3.4.5 It is possible, although unconfirmed, that one of the shafts shown on Johnson's map was Forge Pit, widely believed to have been one of the earliest deep shafts for what became the colliery. This shaft was situated to the east of the canal arm that was constructed subsequently. It was oval in cross-section, and measured 9' 6" at its widest part, with winding carried out using a capstan (Hayes 2004, 112). This shaft was used after the mid-nineteenth century for pumping, with the water being discharged into the canal arm. The second shaft depicted on the map may have been Furnace Pit, which was situated some 45m from Forge Pit, but this was filled in during the 1920s and a new washing plant built over it. Johnson's map also shows a track heading eastwards, across Mill Street, connecting the pits to another in the approximate area of Further Coal Pit Field.

3.4.6 The Bradford Colliery Company is referred to in a newspaper article of 1835 (*Manchester Times and Gazette*, 10 January 1835). By that date, it seems likely that the colliery was owned by the firm of Thomas Porter & Co, which is listed in a trade directory as the owners of the coal yard on Newton Street in Ancoats (Pigot 1834, 408). A newspaper article printed some eight years later recounts an act of highway robbery, where a man returning home from his coal yards 'was stunned by a violent blow in the forehead'. The victim, Thomas Porter, is described as 'a proprietor of coal pits at the Bradford Colliery' (*Preston Chronicle*, 5 February 1842). The name 'T Porter' is annotated on a rectangular-shaped building depicted on the early nineteenth-century plan of Bradford (Plate 5). This building, situated on the east side of Mill Street close to the bridge across the river Medlock may have been Porter's house, although it is interesting to note that it lies above the junction of several underground roadways in the colliery, suggesting that it may have been a colliery building.

3.4.7 Census Returns for Bradford for 1841 provide interesting information on the socio-occupational make-up of Bradford. It is clear that a considerable proportion of the local male population were employed as coal miners at Bradford Colliery, highlighting the importance of the colliery to the local economy (Table 1). Indeed, there is some evidence to suggest that most of the miners employed at the colliery until the 1870s lived in Bradford.

NAME	AGE	ADDRESS
Thomas Arandale	25	Ashton New Road, Bradford
Richard Johnson	40	Ashton New Road, Bradford
Francis Johnson	38	Ashton New Road, Bradford
John Kenyon	18	Ashton New Road, Bradford
William Philpot	40	Ashton New Road, Bradford
Richard Philpot	19	Ashton New Road, Bradford
Aaron Philpot	14	Ashton New Road, Bradford
Thomas Siddall	35	Ashton New Road, Bradford
John Thornton	20	Ashton New Road, Bradford
James Thornton	15	Ashton New Road, Bradford
Samuel Thornton	11	Ashton New Road, Bradford
Benjamin Beswick	45	Ashton Old Road, Bradford
James Beswick	15	Ashton Old Road, Bradford
Thomas Broadhurst	20	Ashton Old Road, Bradford
John Eckersley	20	Ashton Old Road, Bradford
Thomas Handley	30	Ashton Old Road, Bradford
John Handley	23	Ashton Old Road, Bradford
Joel Ogden	25	Ashton Old Road, Bradford
Philip Scholes	23	Ashton Old Road, Bradford
John Tipton	40	Ashton Old Road, Bradford
Charles Welch	20	Ashton Old Road, Bradford
James Duncuff	50	Bailey Street, Bradford
John Duncuff	26	Bailey Street, Bradford

William Duncuff	14	Bailey Street, Bradford
James Duncuff	10	Bailey Street, Bradford
Joseph Handley	19	Bailey Street, Bradford
William Livesay	53	Bailey Street, Bradford
William Livesay	17	Bailey Street, Bradford
John Livesay	14	Bailey Street, Bradford
John Vickers	19	Bailey Street, Bradford
William Vickers	14	Bailey Street, Bradford
John Blease	14	Bradford Grange
William Murgatroyd	50	Colliers Square, Bradford Lane
John Morgan	22	Colliers Square, Bradford Lane
Peter Singleton	21	Colliers Square, Bradford Lane
Thomas Porter	53	Gleden House, Bradford Lane
William Whittle	35	Bradford Road
William Walker Whittle	11	Bradford Road
James Ogden	12	Gleden Brow
Joseph Bredbury	60	Bradford Vale
Charles Bredbury	20	Bradford Vale

Table 1: Coal miners at Bradford colliery in 1841 (taken from the 1841 census)

3.4.8 The next available plan of the area is provided by the Bradford tithe map of 1845 (LRO DRM 1/21). This shows the branch of the canal had been constructed as far as the colliery, which does not appear to have expanded relative to Johnson's map of 1820. The previous year (1844) had seen industrial action at the colliery, as the miners went on strike in protest of 'the most barefaced injustice ever practised by one man towards another'. T Porter Esq is cited as the owner of the colliery at that date, and also the reason for the industrial unrest (*Northern Star*, 27 January 1844).

3.4.9 The tithe map also shows the initial urbanisation of Bradford as an industrial settlement. A group of buildings (Plot 51) situated at the junction of the branch canal, owned and occupied by William Pritchard and Brothers, is listed in the tithe schedule as 'factory, yard and land unbuilt upon'; this became Bradford Mill (*Section 3.6 below*). A row of three cottages fronting Mill Street to the south-east (Plots 54-6) were owned by Robert Walker, with another group of cottages owned by Thomas Oxley (Plots 58-66), and a detached house with a yard in its own plot of land (Plot 57), were situated to the south of the factory. The central part of the study area (Plot 68), extending as far as the colliery, is shown as undeveloped. This is listed as 'Little Seven Acre', and was owned by Lady Hoghton and occupied by the Bradford Colliery Company. A small plot to the south is shown to have contained a single pit (labelled Forge Pit on subsequent mapping) and an L-shaped building range, which may have housed the pit winding gear. The Bradford Colliery Company also occupied 'Great Seven Acre' (Plot 70), situated to the south of the pit, and land on the western side of the branch canal, which included a house and garden owned by Lady Hoghton.

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3.4.10 In the south-east extent of the study area are two plots, the northern of which (Plot 158) contains a house and garden owned by Robert Hadfield. To the south-east of this is a group of houses and yards (Plots 150-54), with a stable to the east (Plot 155), all of which are owned by James Butterworth. To the north-east of this is a detached smithy (Plot 149), owned by Jonathan Holland. Further west is an area containing five groups of dwellings. On the east side is a rectangular row of cottages owned by the 'Grey Mare Building Club' (Plots 133-146). West of this is a group of cottages (Plots 126-29), and to the south a group of houses and yards (Plots 130-32), all owned by Catherine Mills. West again is a larger group of cottages (Plots 115-21), again owned by Catherine Mills. Fronting Ashton New Road are a group of cottages and yards including a stable (Plots 109-113, 113a, 114 and 114a), owned by John Holt. Ponds are shown both to the west and north-east of these five groups of dwellings. In the south-west corner of the study area is a group of houses and yards (Plots 93-101) owned by Charles Malpas.

3.4.11 The industrial unrest at the colliery in 1844 (*Section 3.4.8 above*) may have resulted in Thomas Porter selling the Bradford Colliery Company, as Messrs Clegg and Livesey had become the owners by 1845. The layout of the colliery during this period is shown on the Ordnance Survey first edition 6": 1 mile map, surveyed in 1845 and published in 1848 (Fig 4). This names the site as Bradford Colliery, and depicts three pits with associated buildings, which may have housed a winding engine and a pump; the latter was probably steam powered, and whilst the winding gear may also have been steam powered, it is conceivable that it was originally driven by a horse gin. The north-western shaft of the three shown on the map is likely to have been Forge Pit. This was one of the earliest deep shafts at the colliery, and was sunk to a depth in excess of 460m to reach the Bradford Four Feet Seam. Forge Pit had an oval cross-section, and measured less than 3m across at its widest part.

3.4.12 The first modern shaft at the colliery was sunk in 1854. This had a diameter of 5.5m, and was sunk to a depth of nearly 500m to reach the Parker Seam. It was reputed to be the second deepest in British coalfields. A second shaft, which became known as Little Pit, was sunk a short distance to the north-west and provided the ventilation required in the underground workings. Forge Pit was used thereafter for pumping water out of the underground workings. Four types of coal were mined, namely gas coal, household coal, manufacturing coal and steam coal, which was supplied to Manchester and to the nearby mills (Cooper 2002, 30).

3.4.13 It seems likely that the new shaft was equipped with a steam engine that was used for winding miners to the bottom of the pit, and also for hauling coal to the surface. This may have been installed in an engine house to the east of the shaft, whilst the steam required by the engine was supplied by a row of boilers that was situated to the north. However, cruder technology also remained in place in parts of the workings, as described in a printed account of an accident at the colliery in 1855. The accident 'was well nigh being productive of instantaneous death', involving John Cook, who was responsible for tending the pumping apparatus at Bradford Colliery. As part of his duties, Cook descended a shaft that was 150 yards (137m) deep and then passed some 300

yards (274m) through a tunnel to reach another pit, which was approximately 70 yards (64m) deep. Cook intended to descent this shaft by means of 'a horse', described as 'a piece of wood with a rope fastened to each end, and then fastened to a hook belonging to the main rope which had to let him down'. Cook seated himself on the horse holding several lighted candles for illumination. However, the rope snapped, and Cook 'precipitated with great velocity down the pit shaft'. Miraculously, he survived (*Manchester Times,* 4 August 1855).

3.4.14 Another accident at the colliery during the following year, however, did result in a fatality. A collier, Daniel Siddall, was strangled 'in consequence of the chain to the cage in which he descended the pit shaft getting twisted round his neck at the bottom, and the cage being drawn up while he was in that position'. The firm of Messrs Jackson, Livesey & Co is given as the owners of the colliery (*Blackburn Standard*, 14 May 1856).

3.4.15 Another accident at the colliery was the subject of an inquest in June 1874, which concerned Edward Bryan of Ashton New Road, who had been killed by an underground explosion at 'the top end of the colliery'. A witness to the incident had seen Bryan 'shift his candle from one block to another', which was followed by a flash. The deceased was found subsequently on the wagon road, suffering from severe burns. Although he had been using a candle for illumination, it was reported that there had been safety lamps available, and that miners had 'no right to work with a naked light on the spot where the accident happened' (*Manchester Times,* 13 June 1874). Further deaths at the colliery were reported in 1878, when two miners drowned on account of 'an inundation of water' in the underground workings. Messrs Johnson & Livesey were reported to be the owners of the colliery at this date, and their colliery manager, Thomas Arrandale, was summoned to the Manchester County Police Court for having neglected to comply with a certain regulation of the Coalmines Regulation Act of 1872 (*Manchester Times,* 16 February 1878).

3.4.16 The principal cause of the occasional deaths reported at Bradford Colliery in the late nineteenth century was roof falls. Recorded incidents included the death of Samuel Smith in 1880, a 34 year-old miner of Daniel Street (*Manchester Times*, 19 June 1880), Henry Gough in 1886 (*Manchester Times*, 6 February 1886), and James Pugh, who was killed by a roof fall in Parker Pit (*Manchester Times*, 3 May 1890). In 1892, 15 year-old Fred Tomkins was leading a line of wagons drawn by a pony, when one of the wagons came off the rails and knocked over a prop supporting the roof, causing a localised collapse that killed Tomkins (*Manchester Times*, 21 October 1892). Another fatal incident involving coal wagons occurred in 1882, when 14 year-old Joseph Clarke fell over a sleeper and had his head crushed under a coal tub (*Manchester Times*, 23 September 1882). A further incident at the colliery was reported in May 1895. A cage in the main shaft became completely jammed among the guiding timbers, leaving several hundred miners trapped below ground. They were winched to the surface eventually via the upcast shaft, using a bucket arrangement (*Manchester Times*, 31 May 1895).

3.4.17 ***Bradford Colliery Brickworks:*** the manager of Bradford Colliery, Edward Williams, decided in the early 1870s to capitalise on the seams of fireclay that were found in the mine (Plate 7), and built a kiln for making tiles and bricks, including refractory types that were required, amongst other uses, for lining the furnaces of an increasing number of ironworks in the area. Williams decided to build a continuous-type kiln, of an improved type designed and patented by Friedrich Hoffmann in 1870. Cartographic evidence shows that the kiln was over 30m long and 17m wide, and probably contained either 12 or 14 firing chambers. The kiln had been completed by 1874, as the brickworks were described as 'newly comprised' in the Inspector of Mines report of that year (Warrender 2007, 112; Dickinson 1874).

3.4.18 This type of kiln could be kept working continuously, and was ideally suited for producing large quantities of bricks and tiles. It comprised a central barrel-arch, creating a circuit around the interior of the kiln, forming a passage for the fire. A series of chambers connected with the fire passage, and were separated from each other by a temporary 'wall' of combustible material. Pallets of bricks ready for firing were stacked in each chamber, ready for firing. Each chamber was fired for a specific time, and the fire was then guided to the adjacent chamber through careful control of the air flow in the chambers. Fuel, frequently in the form of coal slack, was fed into the individual chambers from above as required. It became one of the largest brick-making sites in the area, all their bricks bearing the trademark 'BC' stamp.

3.4.19 The brickworks was still operational in 1896, and was still owned by Edward Williams. However, the only employees were three underground workers still extracting clay and two surface workers, reflecting a decline in the local firebrick-manufacturing industry. The fire-clay workings were finally abandoned in 1903, as annotated on a contemporary plan (Plate 7), and the kiln fell into disuse.

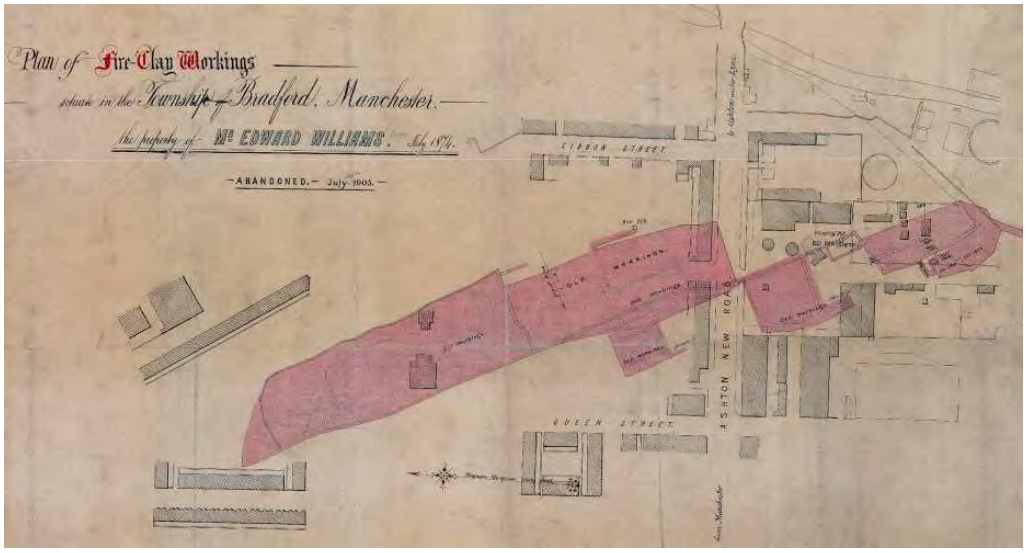


Plate 7: Plan of the fire-clay workings, produced in 1874

3.4.20 ***Twentieth-century expansion of Bradford Colliery:*** in 1899 the Bradford Colliery Company was formed as a limited company, and was purchased by the Fine Cotton Spinners' and Doublers' Association (*The Times* 25 May 1901), although continued to trade as the Bradford Coal Company. Developments at the colliery then included the deepening of the downcast shaft (which then became known as the Deep Pit) to 927 yards (847.65m), with the bottom seam of Crombouke coal being intersected at 2769' 9" (844.22m) from the surface (Hayes 2004, 112). At that date, the colliery employed 404 men underground, and 125 surface workers (Warrender 2007, 112).

3.4.21 In 1900, an extensive electrical plant was installed by Messrs JH Holmes of Newcastle-upon-Tyne, which was one of the earliest of this type of scheme at a colliery. There were three engines in total, each built by Browett and Lindley of Sandon Works, Patricroft. The power was supplied underground by lead-covered armoured cables, which served four haulage engines, two pumps and a tub creeper. At the surface, power was supplied to two 80hp motors which drove the screening plant and a 15hp motor, which powered the carpenter's shop (*op cit*, 112-3).

3.4.22 In 1906, Robert Daglish of St Helens installed a new winding engine at the Deep Pit. As the colliery was located within a built-up area the winding engine was a twin-cylinder vertical, which took up less space than other winding engines. The engine had a 25' diameter drum, and 42" and 72" cylinders, the headgear was of timber (Plate 8), and the winding depth was 902 yards. The cages carried six 10cwt capacity tubs, with three tubs per deck. Each cage had four wire rope conductors, and there were two rubbing ropes between the cages (*ibid*).

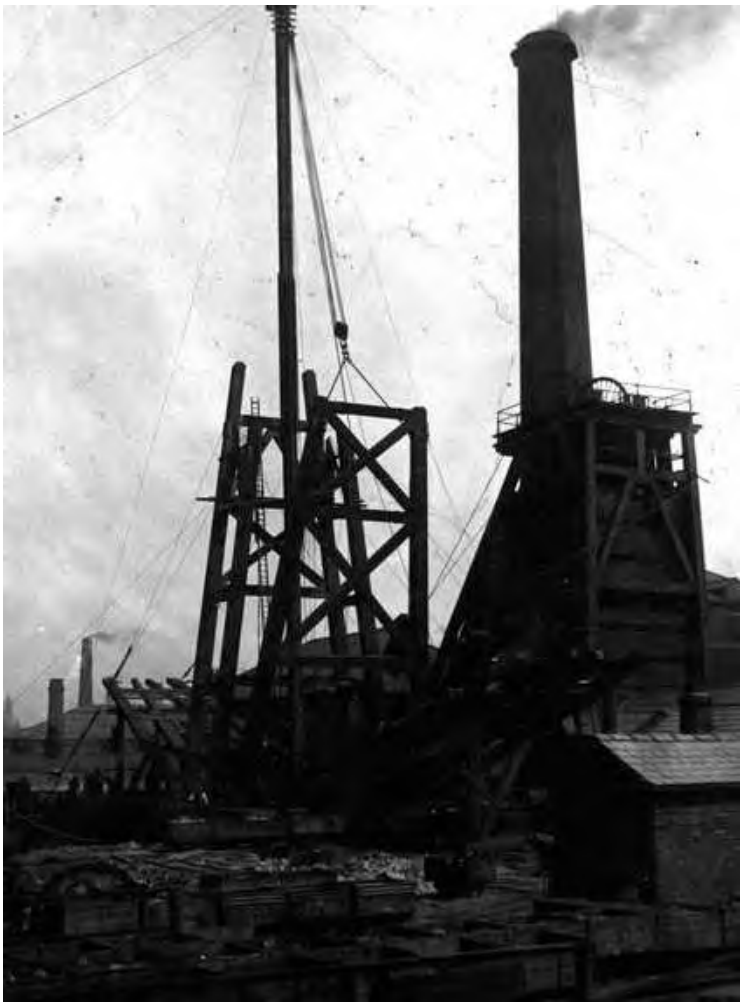


Plate 8: Installing new timber headstock and winding gear in 1905

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3.4.23 A second shaft, known as Parker Shaft (No 2), was sunk in 1906. This was the upcast ventilation shaft, and was also used for winding. It had a twin cylinder horizontal winding engine, which fitted with Daglish's automatic cut-off on the inlet valves. The cylinders measured 36" by 78", and there were two winding drums, each measuring 18' 8" diameter by 4' 7" wide. They were located one on each side of a 15" wide brake path. There were two cages, each with four rope conductors with two rubbing ropes between.

3.4.24 In the *List of Mines in Great Britain and the Isle of Man* for 1908, the Bradford Colliery Co Ltd is listed as the owner of the colliery, with George Bentley as the manager. At that date, 644 men were employed underground, and 146 on the surface.

3.4.25 In 1913 the generating plant was enlarged by the installation of a 700kW mixed-pressure turbine, which ran at 1800rpm. This was enlarged subsequently by the installation of a 1000kW mixed pressure turbine set, which also ran at 1800rpm (*op cit*, 113-4). Steam was supplied to the colliery by eight Lancashire boilers, which worked at 100psi, as well as three sets of Green's economisers and three chimneys (*op cit*, 114).

3.4.26 In the *List of Mines in Great Britain and the Isle of Man* for 1918, the Bradford Colliery Co Ltd is listed as the owner of Bradford (Parker) Colliery, with TH Dixon as the manager. At that date, 498 men were employed underground, and 122 on the surface. A new headgear of timber was erected in 1925.

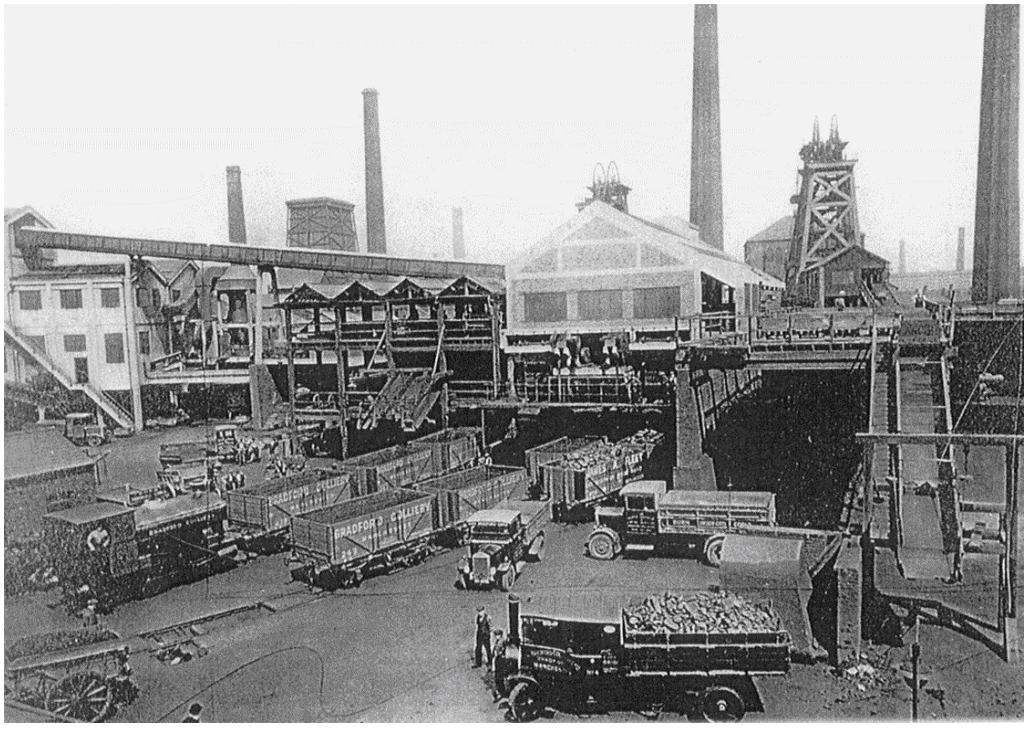


Plate 9: A view across Bradford Collier in 1928

3.4.27 In 1926, the pithead baths were erected by the Miner's Welfare Committee, and opened in 1931. These were housed in a square building located in the northern half of the plot bounded by Bank Street and Hawke Street. Internally,

the building comprised a clean clothes and a dirty clothes locker room (each containing 480 lockers). The shower-bath cubicles were located in the centre of the building, between the two locker rooms. The pit-clothes entrance was in Bank Street and the clean clothes entrance off Hawke Street (Bradford Colliery Pithead Baths 1931, 4-6). The baths were heated by a boiler, which was retained after all the other colliery boilers were dispensed with in the late 1940s/early 1950s (*The Colliery Guardian* 1953, 127).

3.4.28 Bradford Colliery was purchased in 1935 by Manchester Collieries Ltd, a considerable concern which, by 1940, owned 14 mines in the Lancashire Coalfield: Astley Green (Astley); Bedford (Leigh); Brackley (Little Hulton); Bradford (Manchester); Chanters 1 & 2 (Hindsford, Atherton); Gibfield (Atherton); Gin (Astley); Howe Bridge (Atherton); Mosley Common (Boothstown); Newtown (Clifton); Nook (Astley); Sandhole (Walkden); St Georges (Walkden); and Wheatsheaf (Pendlebury). In view of the favourable working conditions and the potential yield of high-quality coal, Manchester Collieries Ltd implemented several improvements in order to increase productivity. This included the replacement of the surface plant, which necessitated the demolition of the brickworks. As a result, output increased from 171,557 tons in 1937 to 243,363 tons in 1940 (Hayes 2004, 114).

3.4.29 By this date, the Crombouke seam was becoming exhausted, although it was known that the Roger seam, a rich seam of high-grade coal, lay some 27m below the Crombouke. Work began on deepening the Parker Pit in 1944, which was completed to 955 yards (873m) in 1948. During this period, Manchester Collieries Ltd commissioned an independent report to assess the potentialities of the colliery (Browne 1945). This conclusion drawn from this comprehensive report strongly recommended an expansion of the colliery, although it was noted that a significant issue was the means of the disposal of fuel on the surface. In this respect, the report considered the implementation of a proposed direct delivery to Stuart Street Power Station as crucial, as this would obviate the need for an extension of the colliery site. In addition, it was proposed that coal should be bagged on site for sale to the householder, providing reduced distribution costs. The report also recommended that the colliery should be developed with a transport system on continental lines to which a series of seams in close proximity in steep measures were suitable for the extensive use of roadway conveyors. The proposed reconstruction of the colliery anticipated an output of 350 tons an hour, or 2000 tons per working day on one shift.

3.4.30 Skip winding was installed at 897 yards (820m), with two sets of rigid guides installed in the shaft to take the 12-ton capacity skips. There was an electric winder of the Koepe friction wheel-type built by Metropolitan-Vickers, and the headgear was installed in a new 200’ (60.96m) high tower of reinforced concrete, which was completed in 1953 (Plate 12). The upper part of the shaft was also reinforced in concrete to support the headgear (*ibid*). Deep Pit also had a new electric winder and headgear. The winder had clutched drums so that two-cage winding could be carried out at different levels. Ventilation was then provided by two axial flow fans, which were installed in a chamber below ground, due to the lack of space on the surface (*op cit*, 114-5).

3.4.31 The improved workings also had a policy of stowing material in the goaf, or waste areas. This was due, in part, to the mine workings being located beneath a densely populated area. There was not enough waste material from the mine to stow in these areas, however, and so waste from other mines had to be brought in and wound down into the pit. Three electronically driven turbo-compressors were installed at this time to power the stowing machines (*ibid*).

3.4.32 The old brickworks in the north-east corner of the site was redeveloped as a coal-preparation plant (Plate 10). At this plant, the coal was separated into different sizes by passing through primary screens, washed to extract the fines, and then screened again. A Tromp washer was installed for coal of 2-6", and a Baum jig washer for smaller coal. The larger lumps of coal, usually ranging in size between 2" and 6", was either bagged automatically or loaded directly into lorries. Smaller coals were transferred to the land-sale yard, where it could be bought by local residents.

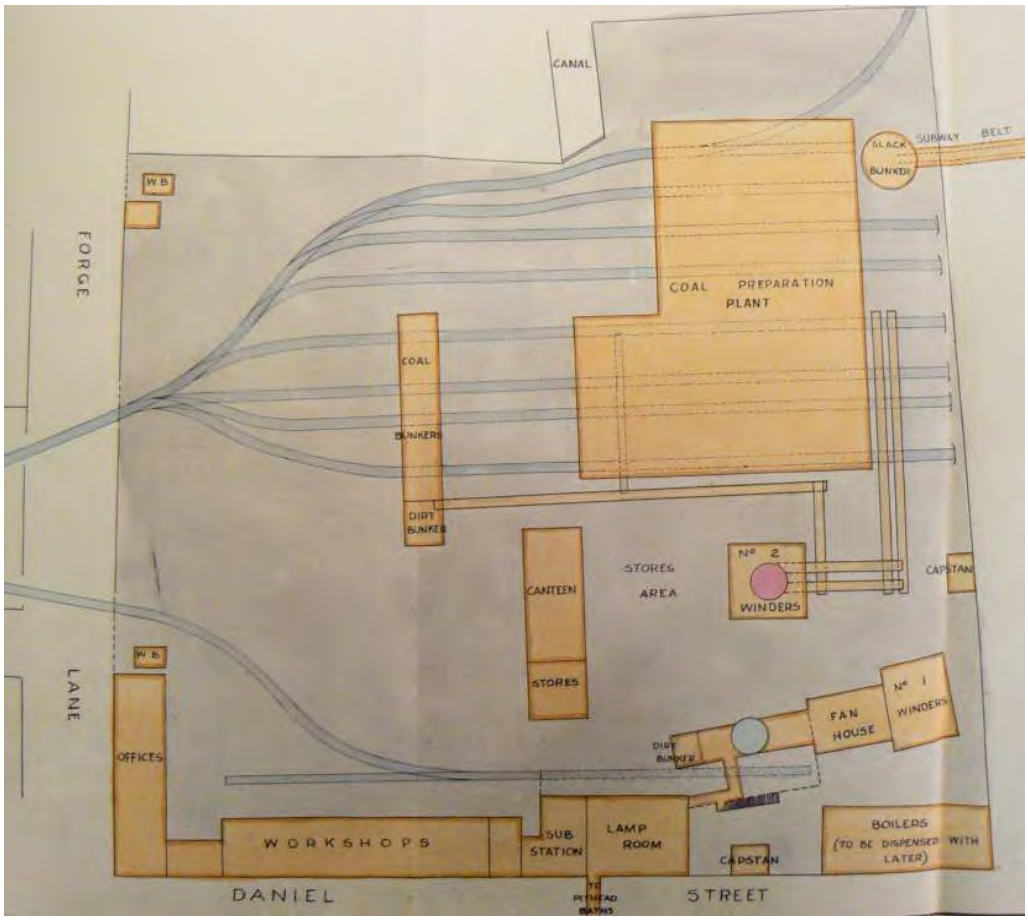


Plate 10: Plan of the proposed new coal-preparation plant, dated 1945

3.4.33 The smallest fragments of coal were mixed with the fines recovered from the washing process and sold to Manchester Corporation as fuel for their power station on Stuart Street (Plate 11). Coal was delivered directly to the power station via a conveyor belt, which was ingeniously laid in a 0.46km long tunnel that passed beneath Mill Street and the Ashton-under-Lyne Canal (Hayes 2004, 115; *The Colliery Guardian* 1953, 130).

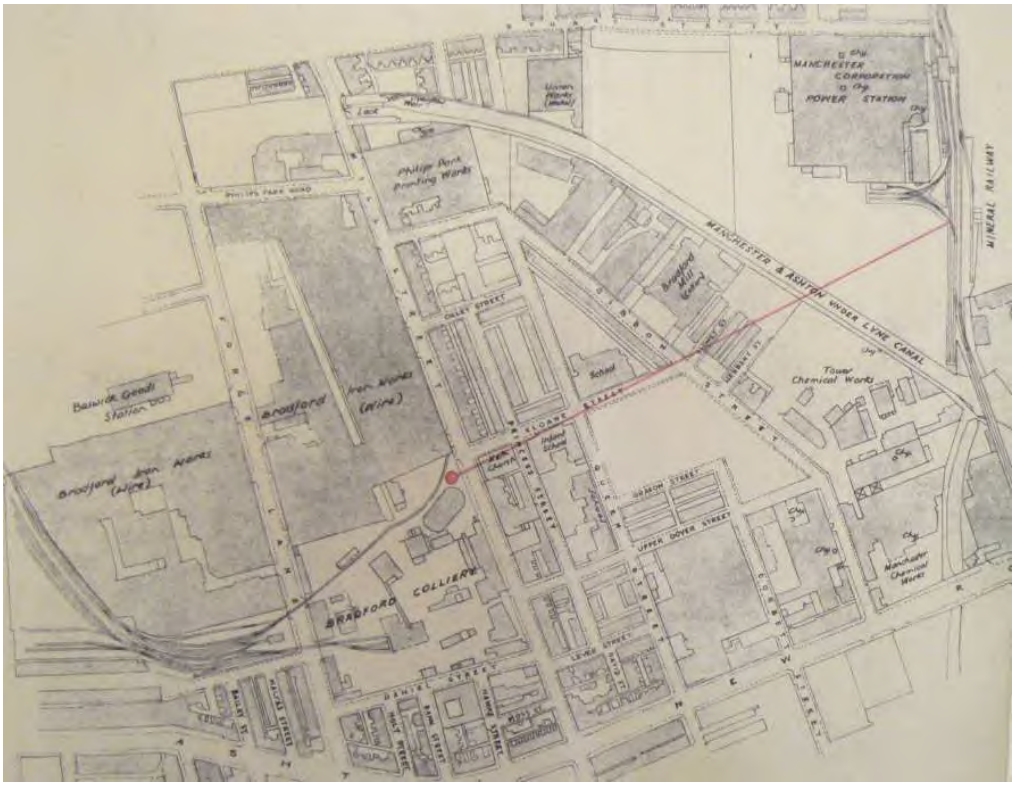


Plate 11: Plan of 1945 showing the proposed route of the conveyor belt to Stuart Street

3.4.34 In the *List of Mines in Great Britain and the Isle of Man* for 1945, the Manchester Collieries Ltd is listed as the owner of the colliery, with JF Carr named as the owner. At that date, 642 were employed underground, and 218 on the surface. In 1953, 350 of those employed underground were trapped temporarily when a fire broke out in the main winding engine house. As a result of the intense heat generated by the fire, a winding cable snapped causing two coal-carrying cages to crash to the bottom of the shaft. The miners were rescued via another shaft, which lay some 40 yards from the main shaft (*The Times* 17 October 1953)

3.4.35 Reorganisation and reconstruction of the pit was completed in 1958 when four faces were in operation in two seams; three faces in the 6-feet thick Roger Seam and one face in the 3' 8"-thick Crombouke Seam. The two shafts, now both 900-yards (822.96m) deep, had insets at 730 (667.51m) yards. From each of these, two level horizons were driven, one pair in a northerly direction below Newton Heath and into the Moston area and the other pair westerly below Holt Town and Ancoats.

3.4.36 The seams lay in a gradient of 1 in 1½ to 1 in 2½ and were worked so that roadways were level. Every face was fully mechanised, coal being won by a 150hp BJD Anderton shearer, cutting a 30-inch wide slice of coal on its run from the lower level main gate to the higher level tail gate. On the return journey it ploughed the coal into the face conveyor. The faces were supported by hydraulic props and link bars.

3.4.37 In the 1960s there were press reports that the colliery was causing serious subsidence in the areas that overlay the shafts. There was damage in the Bradford area, and the Bradford Road gasholder tilted so much that it could only be filled to half its capacity (*The Times* 17 August 1962). The threat of subsidence in the area was such that Manchester Corporation expended some £3,000,000 on the sinking of foundations as a precaution against subsidence (*The Times* 29 October 1963). However, it appears that other problems were eventually responsible for the closure of the mine. It began to lose money in 1966, and reasons given for its subsequent closure were geological faults, an underground fire, and the failure to keep the expensive coal-carting machinery running during each shift.

3.4.38 The final closure of the colliery was announced in 1968 (*The Times* 8 June 1968), although large reserves of the coal remained (Hayes 2004, 115; Warrender 2007, 114). At that date, nearly 1,500 miners were employed, and daily output was averaging 2,130 tons of saleable coal. The winding gear was demolished in 1973, and any other machinery, which was considered not worth salvaging, was buried on the site (Warrender 2007, 115).



Plate 12: Demolition of Bradford Colliery, 1973

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3.5 BRADFORD IRONWORKS

3.5.1 The origins of the firm of Richard Johnson & Nephew can be traced to 1773, when James Howard started in business as a pin-maker and wire-worker on Markersted Lane in Manchester. By 1817, Howard's business had passed into the ownership of John Johnson, and then to his two sons, Richard and William. By 1838, the firm was trading under the name of Richard Johnson & Brother, who had premises on Lees Street in Ancoats, and offices at 27 Dale Street (Whellan 1853, 176). The firm expanded rapidly during the 1840s, as they diversified from producing just wire; an advertisement of 1848 promoted the firm as 'manufacturers of flour machines, wheat screens, separators, elevator cans and belts, sacks, riddles, sieves, brushes, provers, sack tackle, chain, mill chisels, tacks, and every description of wove wire and wire work' (Seth-Smith 1973, 19). In 1851, the firm famously supplied half the iron wire for the first submarine cable that was laid between Dover and Calais in 1851.

3.5.2 In 1853, Richard Johnson & Brother purchased land adjacent to Bradford Colliery with the intention of building an ironworks. This housed puddling furnaces to transform pig iron produced in a blast furnace into wrought iron that could be used for manufacturing wire. In addition to the puddling furnaces, the Bradford Ironworks contained mechanical hammers and rolling mills that were required to process the iron ready for producing, or drawing-out, wire. This final stage in the manufacturing process was carried out at the firm's old works on Lees Street in Ancoats. In 1858, Richard Johnson & Brother supplied the sheathing wire for the first trans-Atlantic cable, which was laid during the 1860s (Plate 13).



Plate 13: The steamship Great Eastern laying the trans-Atlantic cable in 1866

 © OA North: March 2011

3.5.3 The earliest method of manufacturing wire was to roll bars of iron, copper or brass into long flat strips, approximately ¼" thick, which were then slit lengthwise into strips of square section. These were converted into round wire by drawing through a series of holes in a steel die-plate. The drawing of rod into wire had been carried out from early times on a block, or drum, on which the wire was coiler on a vertical axis, providing the tension necessary to pull the wire through the die (Singer *et al* 1958, 620).

3.5.4 Whilst this traditional method of wire production persisted to some degree throughout the nineteenth century, more efficient and productive processes were demanded to serve the growth of the mechanical and electrical engineering industries (*ibid*). In particular, the advent of the telegraph, and the successful experiments by Samuel Morse in the 1830s, caused an abrupt increase in the demand for wire. During that period, the rolling of hammered bars in grooved rolls was well established. To cater for the telegraph wire, grooved rolls, known as the Belgian train, were adopted generally; these comprised a series of decreasing apertures of constantly changing section, from square successively to diamond, oval and circular.

3.5.5 The continuous rolling train comprised 16 two-high rolling stands, arranged with their axes alternately horizontal and vertical, driven by a system of fixed gears. Wrought iron bars of 1 1/16 inch square section, weighing up to 100lb and pre-heated in a continuous furnace, were rolled to ¼" rod. The mill was capable of producing 20 tons in ten hours (Benson 1893, 77-93).

3.5.6 The manager of the Bradford Ironworks at this date was George Bedson, who was responsible for the introduction of several important technological advances that revolutionised the wire-making industry. In particular, in 1860, Bedson introduced the first continuous galvanising plant. The success of this new process led the firm to extend their works in 1864, and land on the west side of Forge Lane was developed as a new galvanising plant. At the same time, the firm persuaded the Lancashire & Yorkshire Railway to build a new goods yard on adjacent land in return for guaranteeing a minimum traffic of 200 tons per week to and from the ironworks (Seth-Smith 1973).

3.5.7 Another key technical innovation introduced by Bedson was the first continuous wire rod mill that enabled 100lb pieces of iron rods to be drawn in a single length (Johnson and Nephew 1947). This was installed in the Bradford Ironworks in 1862, and offered considerable improvements on the Belgian train (Singer *et al* 1958, 621). The mill consisted of a long series of rollers placed in pairs, alternately horizontally and vertically, with each pair of rollers incorporating a groove through which the iron rod passed (Plate 14). On passing through the rollers, the rod was reduced in section and extended proportionally in length, before being delivered to the next pair of rollers, where the process was repeated. The gearing of the rollers was arranged so as to give a higher speed to each successive pair of rolls, in order to pass the increased length of rod through as quickly as it was produced. The mill was equipped with a gas furnace to heat the iron immediately prior to being passed to the rolling mechanism (Seth-Smith 1973, 54).

 © OA North: March 2011

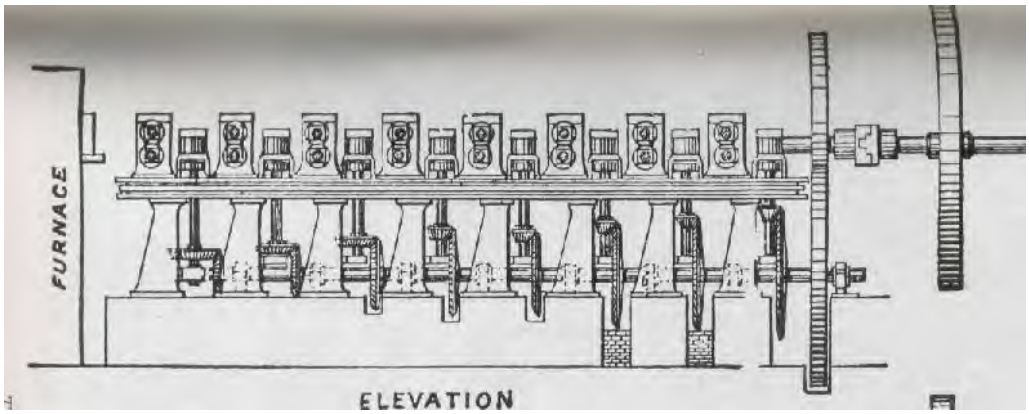


Plate 14: Schematic section view of Bedson's continuous wire rod mill

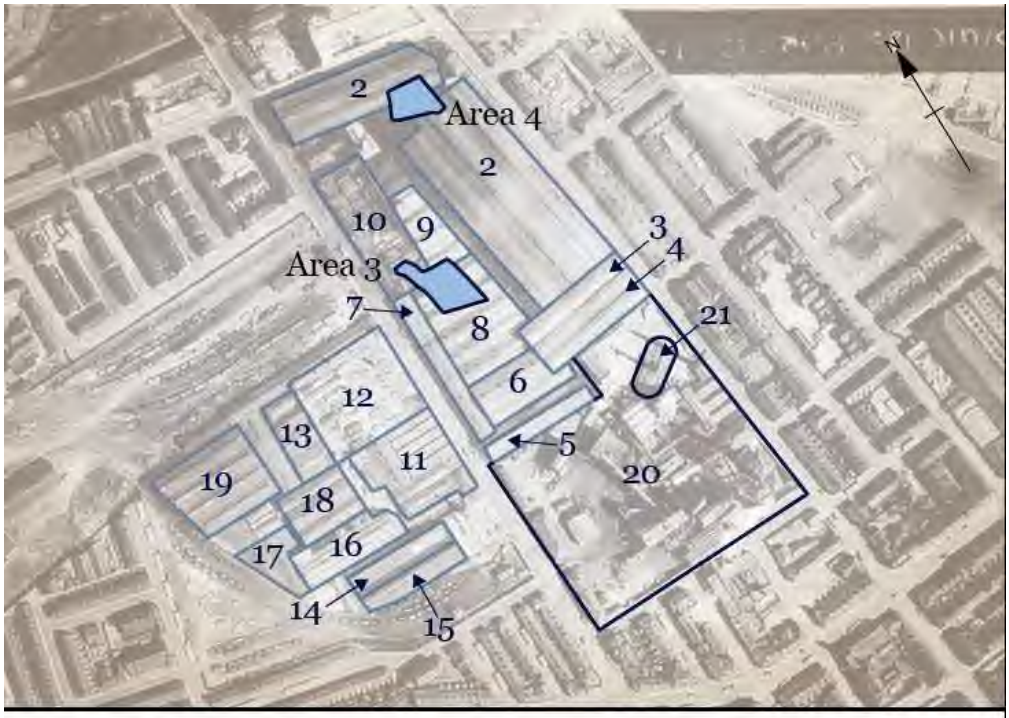
3.5.8 It was during this period that William Johnson died and, in 1865, Richard Johnson decided to form a partnership with his nephew, leading to the formation of Richard Johnson & Nephew. In that year, building on their reputation for supplying the sheathing wire for the first trans-Atlantic cable (*Section 3.5.2 above*), Richard Johnson & Nephew secured the contract to supply all the wire for the Cincinnati Bridge in America. Hundreds of coils of wire, one-eighth of an inch in diameter, were produced, each coil containing between 12,000 and 16,000 feet of wire. Other international commissions at this time included an order from the Indian government for 700 tons of telegraphic wire. In 1870, the firm supplied wire for the laying of the West Indies and the Panama cable, the China and Carpentaria cable, and also supplied 1,200 tons of wire to the Post Office (Seth-Smith 1973, 58-64).

3.5.9 At this date, Bradford Ironworks was described in an article printed in the *Manchester Evening Ne*ws: 'Now Bradford may be described as a thriving industrial community. Nevertheless, it is, to speak mildly not a nice place. If Bradford were in the United States it would doubtless have a daily newspaper of its own, two large boarding houses and a bank. Being in England, however, it has a public house, a Local Board of Health, a medical hall and several very bad smells…the works at Bradford covers some 10 or 12 acres, and there are employed between 500 and 600 hands. Twenty boilers of an aggregate of 800 horses power supply steam to ten engines of from 20 to 100 horses power each. Thus, Johnsons is a small kingdom of itself…' (*Manchester Evening News* 1870).

3.5.10 A trade directory for 1879 lists Richard Johnson & Nephew as wire drawers and manufacturers, galvanisers, telegraph engineers, and telegraphic and fencing contractors (Slater 1879, 117). In his *Brief Historical and Descriptive Notes*, published in 1882, Leo Grindon accredits Messrs Johnson with producing from 280 to 300 tons of telegraph wire every week at their works at Bradford. He also noted that the works covered between ten and twelve acres, provided employment to 600 men, and 'are not likely to be second to any of their own kind' (Grindon 1882, 33). It was in 1882, however, the firm ceased producing their own iron, and the wire-drawing processes were transferred from the old Lees Street works to Bradford, which focused solely on manufacturing iron and steel wire. A short time later, the firm diversified into the production of copper wire, which became an important part of the firm's

business. On the introduction of barbed fence wire, the firm also secured the sole rights of manufacture in the United Kingdom, and so laid the foundation of what became an important branch of their business

3.5.11 The outbreak of the First World War led to a rise in the demand for wire, and particularly barb wire. In order to meet this demand, a new rod mill was built at the Bradford works, occupying land between the canal arm and Mill Street, subsuming housing on Benson Street, Kara Street, Iceland Street (Figs 6 and 7). The resultant layout of the works is shown in Plate 15.



Bradford Ironworks

1 - Engineering department
2 - Wire rod mill and warehouse
3 - Patenting department
4 - Cleaning department
5 - Annealing department
6 - Wire Mill
7 - Works canteen
8 - Warehouse
9 - Cut lengths department
10 - Billet storage yard
11 - Barb department
12 - Galvanising department

Bradford Colliery

20 - Bradford Colliery
21 - Brick kiln

Plate 15: Layout of the Bradford Ironworks superimposed on an aerial view of 1946

3.5.12 The company maintained their position at the forefront of the industry into the mid-twentieth century. In 1956, the firm produced the major portion of copper tape and steel armouring that was used in the construction of the first trans-Atlantic telephone cable (Johnson and Nephew 1947). However, in the face of increasing competition from overseas, the works eventually closed in the 1980s and their works demolished.

3.6 BRADFORD MILL

3.6.1 Bradford Mill was probably established in the early 1840s. The earliest plan of the mill is the Bradford tithe map of 1845, which describes the site as Plot 51, a 'factory, yard and land unbuilt upon', owned and occupied by William Pritchard and Brothers. This firm is listed in a trade directory for 1841 and manufacturers of smallwares, although their business address is given as Nicholas Croft in Manchester (Pigot 1841, 83).

3.6.2 The tithe map of 1845 shows the mill complex to comprise two buildings: a rectangular block, which probably represents the main processing area, situated immediately to the north of the present study area; and a smaller, L-shaped range to the south, within the area targeted for excavation. A circular feature adjacent to the L-shaped range is likely to represent a small gasometer, intended to supply gas lighting in the mill.

3.6.3 The site is named 'Bradford Mill (small wares)' on the Ordnance Survey first edition 6": 1 mile map of 1848 (Fig 4). This shows a similar configuration of buildings, although the putative gasometer is not depicted, and a triangular pond, or reservoir, appears to have been added to the east of the buildings. Benson Street, which lay immediately to the south of the mill complex, is not shown, although this street had been laid out by 1863, when it is listed in Slater's trade directory for that year, together with Bank Street, Hawke Street, Holt Street and Moss Street (Slater 1863). By this date, the mill was occupied by Edward and Robert Pritchard, who are listed in trade directories as manufacturers of umbrellas, smallwares, fringes, float, orris lace, sewing cottons, and knittings (*eg* Manchester Mercantile Directory 1854, 152).

3.6.4 Bradford Mill appears to have been extended during the second half of the nineteenth century, although by the time of the Ordnance Survey map of 1893, the site of Bradford Mill is taken up with larger industrial buildings, which are unlabelled (Plate 16); it is of note that the mill is not listed in Worrall's *Cotton Spinners' and Manufacturers' Directory* for 1891, nor in Slater's *Directory of Manchester and Salford* for 1895. However, an entry in Slater's trade directory for 1903 (Slater 1903, 419), which lists William Waite, Sons & Atkinson Ltd as hemp spinners (Baltic stores), may be identified as the occupiers of the mill; this firm also occupied manufacturing premises on the south side of Stuart Street, a short distance to the east of the present study area (*op cit*, 513). It seems possible that the mill buildings in the study area were actually used for storage purposes by this date, and the firm's manufacturing premises were based in their Stuart Street premises. The firm appears to have vacated Bradford Mill by 1909, as an entry in a trade directory for that year lists the Arrow Chemical Co Ltd as the occupants, and identified the premises as Baltic Mills (Slater 1909, 466). However, this firm's occupancy of the mill appears to have been short-lived, as the building is not listed in Slater's trade directory for 1911. Nevertheless, the layout of the mill is shown as unchanged on subsequent editions of Ordnance Survey mapping between 1908 and 1932, but by the time of the 1951 Ordnance Survey map, the buildings had been replaced with a large building labelled 'works'.

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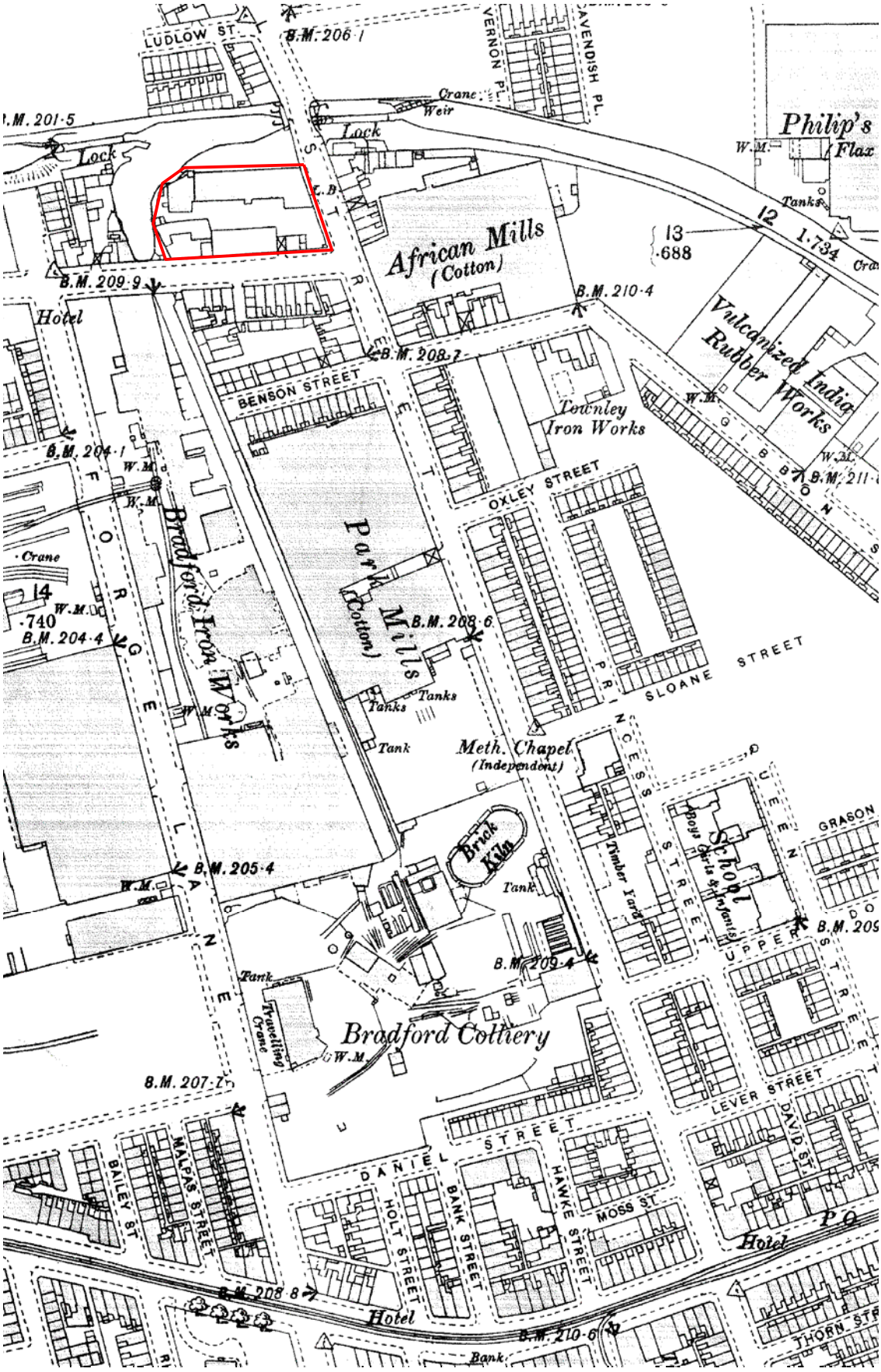


Plate 16: Extract from the Ordnance Survey 25": 1 mile map of 1893, marking the outline of Bradford Mill

3.7 PARK MILLS

3.7.1 Murray Sharp is listed in a trade directory for 1853 as a manufacturer of ginghams on Poland Street in Ancoats, although it is uncertain precisely when Park Mills were built and put into production. The firm of Murray Sharp & Co is listed as manufacturers of 'checks, ginghams and mixed goods' at Park Mills in Bradford, with offices at 28 George Street, in trade directories from the 1860s (Slater 1863, 428; Slater 1876, 38; Slater 1879, 44; Slater 1883, 70). The wording of this entry suggests that Park Mills was either an integrated cotton spinning and weaving factory, or purely a weaving shed. This is clarified by a trade directory for 1891 (Worrall 1891, 125), which lists Murray Sharp Ltd at Park Mills, and accredits the firm with operating 630 looms, indicating that the mill was intended purely as a weaving factory.

3.7.2 Other textile manufacturers in the area during this period included The African Mills Company, which is listed in a trade directory for 1883 as 'manufacturers only' of cotton goods (Slater 1883, 66), John Collinson & Co at Reservoir Mills, with 200 looms weaving ginghams, checks, stripes and ticks (Worrall 1891, 123), and Robert Marsland's Bradford Mill on Gibbon Street, which housed some 75,000 spindles (*op cit*, 125).

3.7.3 Park Mills (cotton) is first shown on the Ordnance Survey first edition 1:500 map of 1890, and the 1:2500 map of 1894 (Plate 16). However, the subsequent edition of Ordnance Survey mapping, published in 1908, shows Park Mills to have been replaced with rows of housing. South of Benson Street is an east/west-aligned road named Kara Street with houses on its north side. Further to the south are three long north/south-aligned rows of houses, the easternmost fronting Mill Street, and to the west of this fronting the west and east sides of Iceland Street. Some of this housing was short lived, however. A photograph of the area taken in 1904 (Plate 17) shows the back-to-back houses on the north side of Benson Street to have been demolished, and those on the south side of the street in a derelict condition.



Plate 17: Derelict housing on Benson Street in 1904, shortly before demolition

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4. EXCAVATION RESULTS

4.1 INTRODUCTION

4.1.1 This section presents the results obtained from the archaeological excavation. In total, five areas of the site were targeted for detailed excavation (Fig 2), based on the results obtained from the initial programme of evaluation trenching (OA North 2010):

- Area 1 investigated the south-eastern part of the site, and was targeted on the remains of buildings situated around the pit bank of Bradford Colliery and the colliery brickworks, which were established in the 1870s. It was envisaged that buried structural remains in this area would include the foundations for at least two generations of steam-powered winding engines, their associated steam-raising plant, ventilation equipment, and headstocks;
- Area 2 was targeted on the steam-power plant for Park Mills;
- Area 3 was placed across the eastern part of the site, and was targeted on one of the main processing areas within the former Bradford Ironworks. It was intended specifically to investigate further the buried remains of a network of flues, which were exposed in an evaluation trench, and clearly formed part of the forge area within the ironworks as shown on a plan of 1879;
- Area 4 was targeted on another primary processing area of Bradford Ironworks, which was built during the twentieth century, and was intended specifically to investigate further the buried remains of a network of flues exposed in an evaluation trench;
- Area 5 was intended to investigate the moat associated with Bradford Old Hall, exposed in trenches excavated by GMAU in 2002, and the elements of Bradford Mill that lay within the study area.

4.1.2 Following on from the excavation of the five targeted trenches, an additional area (Area 6) was placed a short distance to the north-west of Area 1. This was intended to investigate a building seemingly associated with the colliery depicted on mid-nineteenth-century mapping, and the canal arm.

4.2 AREA 1 – BRADFORD COLLIERY

4.2.1 Area 1 measured 100 x 25m, and was targeted on the footprint of Bradford Colliery and its associated brickworks, situated in the south-eastern part of the development area (Figs 3-9). The area was excavated to a maximum depth of 58.39m aOD, and revealed substantial structural remains of the former colliery, representing several phases in its development. Notwithstanding the damage to the buried remains of nineteenth-century fabric by more recent structures, several key components of the colliery complex were identified, including a boiler house and an engine house for the winding gear.

4.2.2 A layer of yellowish-grey clay was exposed at a depth of approximately 1.2m below the modern ground surface across much of the area almost certainly representing the natural drift geology. This layer was cut by a series of structures pertaining to the colliery; no remains of an earlier date were identified during the course of the excavation.

4.2.3 The earliest structural remains were identified in the eastern part of Area 1 (Plate 18). This consisted of a passageway (***1003***), which measured approximately 21 x 4.3m, and was constructed largely from machine-pressed bricks, although it had evidently been repaired and remodelled slightly on several occasions. The passageway was aligned broadly north-west/south-east (Fig 10), and appeared to connect the boiler house at the north-western end with an engine room to the south-east. However, it was not possible to elucidate the full extent of the passageway as constructed, as the southern end had been destroyed by later development. Nevertheless, it seems possible that it had originally connected with the pit bank to allow the transfer of coal directly to the boiler house.



*Plate 18: Looking south across passageway **1003***

4.2.4 An east/west-aligned service pipe, clearly of modern origin, had been inserted through passage ***1003***, dividing it into two components. North of the pipe, the surface was four brick-courses thick and enclosed from the north-west by a curved wall that survived to a height of eight courses. Physical evidence for several repairs and alterations were identified in the fabric of this wall, represented by different types of mortar: the lower courses of brick were bonded with a blue/grey lime-based mortar; the upper courses with a black/brown sandy mortar. A section of the surface was ramped, presumably for coal tubs or carts (Plate 19). For the most part, the walls forming the sides of the passage overlay the brick floor, indicating them to be of a later construction. The exception was the ramped surface, the construction of which clearly post-dated the walls. The surface in the southerly portion of the passage incorporated at least two courses, each representing different phases of repair.



Plate 19: The ramp for coal tubs or carts, forming part of passageway ***1003***

4.2.5 The eastern wall of passageway ***1003*** was abutted by two raised brick platforms (***1004*** and ***1006***), which both comprised machine-pressed bricks bonded with a dark grey to black mortar, indicative of a late nineteenth- or early twentieth-century construction date (Plate 20). Each platform measured 8 x 3m, and was seven brick-courses thick; platform ***1006*** additionally incorporated a pad of reinforced concrete in its centre, which probably represented a later addition. It seems possible that these platforms were intended as machine bases, perhaps associated with the steam-powered winding engine, and were evidently of a slightly later date than passageway ***1003***.

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*Plate 20: Looking east across platforms **1006** and **1004***

4.2.6 Excavation in the north-eastern part of Area 1 (Plate 21) exposed the remains of a substantial east/west-aligned surface of brick construction (***1000***), which had been encountered in an initial evaluation trench (OA North 2010). Excavation exposed the entire footprint of the structure, the location of which corresponded with the position of a boiler house depicted on historical mapping (Fig 10). Surface ***1000*** comprised a mixture of hand-made, machine-pressed and refractory bricks, founded upon both the natural drift geology and sandstone blocks, and had a maximum thickness of eight brick courses. The surviving dimensions of surface ***1000*** were 30 x 6m, although the western edge had been destroyed during the construction of the coal-preparation plant in the late 1940s.



*Plate 21: Looking north across boiler house **1000** during excavation*

4.2.7 The excavated remains of the boiler house contained five boiler beds, each surviving to a height of between one and three courses of bricks above the floor; the upper surface of the walls were exposed at a depth of 0.45m below the modern ground level. Each boiler bed was faced with a single skin of refractory bricks, many of which were stamped 'Glenboig', with a possible scar of a central, single-skin refractory brick wall within one of the floors, suggesting that Lancashire-type boilers had been employed. A perpendicular wall at the northern end of the boiler house, flush with the eastern section of the trench, related to a structure housing the flue, or possibly an economiser between the boilers and the chimney.

4.2.8 A north/south-aligned gully (***1001***) was identified running along the western edge of the boiler room ***1000***. Gully ***1001*** measured 19.42 x 0.4m, although its northern end had been destroyed by twentieth-century developments. The gully was founded upon the natural clay geology, and was constructed from machine-pressed bricks that were laid in stretcher bond (Plate 22). It seems possible that gully ***1001*** had been linked to the blow-down pipes from each of the boilers, and was intended to carry waste water away from the boiler house.



*Plate 22: Looking north along gully **1001***

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4.2.9 Two machine bases (***1010*** and ***1013***) were exposed to the south of platform ***1006*** (Plate 23). Base ***1010*** measured 3.60 x 2.60m, and base ***1013*** measured 5.70 x 5m. Both structures were seven-brick courses high, and comprised machine-pressed bricks bonded with cement-based mortar, founded upon re-deposited levelling clay. Three wooden blocks were implanted into the surface of base ***1010***, and were perhaps intended to underlie machine feet, insulating vibrations of an operating machine. Two iron holding-down bolts, designed to secure the machines to their bases, were also laid into same surface. The remains of a platform (***1009***) composed of hand-made bricks, and a cobbled surface (***1011***), were located slightly above the east and south sides of base ***1010***. Founded upon re-deposited clay and rubble, these surfaces may have provided access to the machinery on the bases. Though ***1009*** was constructed from hand-made bricks, the stratigraphic relationship between the surface and relatively modern bases indicates that the bricks must have been re-used. Machine bases ***1013*** and ***1010*** were enclosed by two east/west-aligned walls: ***1008*** to the north; and ***1015*** to the south (Fig 10). Both walls were constructed from machine-pressed bricks and bonded with a black bitumen mortar. Wall ***1008*** was a substantial wall, measuring 1.70m wide, suggesting that it had been intended to have a load-bearing capacity.



*Plate 23: Looking north across machine bases **1010** and **1013***

4.2.10 A brick structure (***1012***) was exposed between machine bases ***1010*** and ***1013***. Structure ***1012*** comprised from machine-pressed bricks bonded with cement-based mortar, measured 1.7 x 1m and survived to a height of seven courses. An iron valve mechanism was built into the south face of ***1012***, possibly allowing the control of air into a small chamber to the north of the structure (Plate 24). The chamber was filled with a black sooty material, suggesting that it had been associated with a flue.



*Plate 24: Detail of valve mechanism built into structure **1012***

4.2.11 Wall ***1015*** was constructed from machine-pressed bricks in English Garden Wall bond with a black bitumen mortar, indicative of a late nineteenth- or twentieth-century construction date. Excavation revealed that the north face of the wall survived to a depth in excess of 1.70m (Plate 25), and comprised fabric that incorporated evidence for at least two phases of construction. An entrance had originally connected rooms to the north and south of the wall, although this entrance had been blocked subsequently, and the entire wall raised in height by several courses of brick. The first phase of construction, contemporary with the entrance, predated machine bases ***1010*** and ***1013***, as the levelling clay upon which the bases were founded was stratigraphically later than the blocking of wall ***1015***.

4.2.12 Excavations to the south of wall ***1015*** revealed a deep, brick-lined pit (***1016b***), which measured 3.5 x 1.4m (Plate 26). A brick floor was exposed at a depth of 3.5m. The upper part of the pit was filled with demolition material, consisting largely of brick and concrete rubble, whilst the lower fill was contaminated heavily with diesel/oil. The presence of oil and the depth of the pit implied that this structure had contained a diesel engine, at least during its final phase of use.

4.2.13 Situated to the east and west of pit ***1016b*** were two comparatively shallow brick-lined chambers (***1016c***). These chambers each measured 3 x 1.70m, and were excavated to a depth of 0.24m. The chambers were filled with re-deposited clay, similar to that underlying machine bases ***1010*** and ***1013***. It is probable that these were machine beds located either side of the diesel engine in ***1016b***.



*Plate 25: The north-facing elevation of wall **1015***



*Plate 26: View of the interior of engine room **1016b***

4.2.14 Excavation to the south of chambers ***1016c*** revealed another large brick-lined room (***1016a***), aligned east/west and extending into the eastern section of the excavated trench (Plate 28). Room ***1016a*** was 3.60m wide and exposed to a length of 9.28m. The walls of the room comprised machine-pressed, frogged bricks in English Garden Wall bond with a black bitumen mortar, and appeared to be of a single build; the extant fabric provided no physical evidence for remodelling. The floor of the room was also of brick construction, and incorporated a brick-covered drain aligned east/west along the centre. It seems likely that room ***1016a*** had housed the steam-powered winding engine for Deep Pit (No 1 shaft). Access to the room was through an east/west-aligned passage (***1020***) and a wooden-framed door inserted into the western wall of the room, the remains of which survived *in-situ* (Plate 27). The brick-lined passage survived to a height of 15 brick courses, and was 1m wide. Along its course, the passage connected with a north/south-aligned passage, which would have originally continued north across the colliery (Fig 10). Slots for iron girders ran at chest height along the inner face of the passage walls. It seems possible that the floor level was later raised above the girders, allowing water pipes to run underneath. All brick structures in this complex were identified as belonging to a single phase of construction. Modern concrete blocks (***1029***) had since blocked off access through these passages, which subsequently put the engine room out of use.

4.2.15 In the centre of the excavated area, to the north of passage ***1020***, excavations exposed an east/west-aligned brick-built gully (***1017***), composed of machine-pressed bricks and black bitumen mortar (Plate 29). The gully measured 2 x 0.48m x 0.25m deep, and was flanked on either side by brick surfaces laid in stretcher bond. It was clear that the gully originally ran under passageway ***1003***, although is likely to have been of a contemporary build.



*Plate 27: Looking east across engine room **1016a** and connecting passages **1020***

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*Plate 28: Looking west into engine room **1016a***



*Plate 29: Looking west at gully **1017** and platforms **1006** and **1004***

4.2.16 A north/south-aligned bricked corridor (***1026***) was exposed to the west of the boiler house ***1000*** (Fig 4). The corridor measured 20 x 1.80m, and survived to a height of nine brick courses (Plate 30). Corridor ***1026*** was constructed from machine-pressed bricks in English Garden Wall bond with a white cement-based mortar. A later cut for a pipe ran up the length of corridor, truncating a section of the east wall. Regularly spaced sockets for iron girders were identified along the length of the corridor, indicating that the pipe ran under the surface level, with a floor raised above the height of the girders. Abutting ***1026*** from the west were a series of east/west-aligned brick walls (***1027*** and ***1025***), which were clearly contemporary with corridor ***1026*** (Plate 31). These walls had been heavily truncated from the west by modern concrete piling. The features almost certainly represented twentieth-century modifications to the colliery complex, and were probably associated with the documented expansion in the late 1940s.



*Plate 30: Looking north across corridor **1026***

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*Plate 31: Looking north-east across walls **1027**, **1025** and corridor **1026***

4.2.17 Three structures (***1018***, ***1019*** and ***1023***) of reinforced concrete were exposed in the northern and western parts of the excavated trench (Plate 33). The largest of these was ***1019***, which measured 17 x 3m, and was aligned north/south (Fig 11). Structure ***1023*** was aligned north-west/south-east, and measured 14 x 1.20m, and structure ***1018*** was aligned north-east/south-west and measured 5 x 1.2m. These all seemingly formed components of the coal-preparation plant, perhaps coal baths, which were developed in the 1940s. A brick platform (***1024***) located to the west of corridor ***1026*** is also be assigned to this phase (Plate 32). Constructed with brick, concrete and rebar, the platform measured 2.2 x 2.55m and 0.50m high, and was presumably intended as a foundation base of a large item of machinery.

4.2.18 Two other structures (***1022*** and ***1030***) were exposed in the same location as the coal baths. Structure ***1022*** was of concrete and brick construction, and measured 1.30m long, one brick-course wide and one brick-course high (Plate 35). It abutted the north-west side of bath ***1023***. Structure ***1030*** comprised a concrete platform, flanked by two brick walls. A cast-iron pipe and a ceramic pipe ran north/south through the concrete platform. The whole structure abutted and blocked off the south end of corridor ***1028*** (Plate 34). These structures similarly represented the remains of the coal-preparation plant that was developed in the 1940s.

4.2.19 A reinforced concrete brick block (***1029***) was exposed at the south end of Area 1, blocking passageway (***1020*****)**. The block measured 3 x 1.80m, and survived to a height of 1m. The materials employed in the construction of the block were very similar to those used for ***1022*** and ***1030***, suggesting it to be of a contemporary date.

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*Plate 32: Possible 1940s machine base **1024***



*Plate 33: Looking north-west at concrete coal baths **1018** and **1023***



*Plate 34: Looking north at structure **1030***



*Plate 35: Brick feature **1022***

4.2.20 Several large concrete platforms, clearly of modern construction, were exposed in the western part of Area 1. One of these platforms measured 12 x 6.5m, and probably represented a base for large winding engines. These concrete-based versions, likely to be powered by electricity, would have replaced the winding engines of the early twentieth century.

4.2.21 The latest structures exposed in Area 1 were concrete piles that were aligned north/south across the site (Fig 4), and numerous service trenches. Both the piles and the service trenches cut through a significant amount of the colliery remains. These features probably post-dated the demolition of the colliery in 1973.

4.3 AREA 2 – PARK MILLS

4.3.1 Area 2 measured 25 x 20m, and was excavated to a maximum depth of 1.5m. It was targeted on a rectangular-shaped building attached to the southern end of the main mill block (Fig 13), which was established in the early 1860s as a cotton weaving factory (*Section 3.7 above*). In addition, it was anticipated that the demolished remains of early twentieth-century workers' housing that occupied the site subsequently could also be exposed within the excavated area (Fig 6). However, whilst all the physical remains of the former houses had been destroyed entirely by subsequent development, some *in-situ* foundations of Park Mills were exposed, and at least two developmental phases were identified.

4.3.2 A deposit of yellowish-grey clay (***2025***) was exposed at a depth of approximately 1m below the present ground level. This was almost certainly the natural geology; most of the structural remains exposed in Area 2 were cut into this layer of clay.

4.3.3 Amongst the earliest structural remains exposed in the trench were the foundations of a wall (***2006***), which was aligned broadly east/west across the southern side of Area 2 (Plate 36). The wall was constructed from hand-made bricks with varying header/stretcher bonding. Wall ***2006*** survived to a height of three brick courses, and measured 19 x 0.5 m (Fig 13). The west end of the wall had been truncated by modern intrusions (***2024***), and the east end continued beyond the edge of the excavated area. The position of this wall corresponded with one of the external walls of the former mill (Fig 13).



Plate 36: Looking east across Area 2, showing the surviving remains of Park Mills

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4.3.4 A series of structures associated with the former mill were exposed to the north of wall ***2006*** in the eastern part of the trench (Plate 37). These included the fragmentary remains of a wall (***2001***), measuring 2.10 x 0.36m, and composed of hand-made bricks that were bonded with a sandy mortar. This was exposed in the north-eastern corner of the excavated area, and was aligned broadly north/south (Fig 13). Wall ***2001*** survived to a height of *c* 0.10m.

4.3.5 The western side of wall ***2001*** was abutted by a single row of flagstones (***2003***), which were associated with a single course of hand-made bricks along their northern side (Fig 13). It is likely that flagstones ***2001*** represented the top of a stone-capped drain. This was associated with another drain (***2005***), which comprised hand-made bricks bonded with a soft, sandy mortar. Drain ***2005*** had a slate and stone base, and was 0.4m deep; it is likely to have been stone-capped originally, although no trace of this survived. The drain was filled with a deposit of mixed clay and iron-stained brick rubble.

4.3.6 The southern side of drain ***2005*** was abutted by the remains of a surface (***2004***) composed of hand-made bricks. The bricks were not uniform in shape or size, suggesting that they were re-used. The remains of another surface (***2018***) were exposed to the west of drain ***2005***, although this comprised flagstones rather than bricks. Surface ***2018*** was flanked by rows of hand-made bricks. It is likely that ***2005*** represented a corridor that originally extended south-west across the floor of the mill building.



Plate 37: Walls and structures exposed at the eastern end of Area 2

4.3.7 Two walls (***2020*** and ***2023***), exposed in the western half of Area 2, also appeared to represent elements of the original structure. Walls ***2020*** and ***2023*** were both aligned east/west (Fig 13), and comprised hand-made bricks set in a

fine sandy mortar. Wall ***2020*** measured 6.5 x 0.36m, and wall ***2023*** measured 1.5 x 0.5m; both walls survived to a height of three brick courses. The eastern end of both walls had been destroyed entirely by demolition, and they were also cut to the west by a modern service trench (***2021***), which was aligned north/south across Area 2.

4.3.8 Two structural elements revealed during the excavation clearly represented a remodelling of the mill complex. Wall ***2002***, exposed adjacent to the eastern edge of the excavated area, measured 1.6 x 0.42m and survived to a single brick course in height. The fabric of the wall comprised hand-made frogged bricks bonded with a hard white mortar, and abutted the east side of wall ***2001***. A brick-lined channel (***2019***), exposed close to the northern edge of the excavated area, was similarly an addition to the original mill building (Fig 13). Channel ***2019*** measured 9.7 x 1.85m, and was aligned east/west, but turned 90 degrees along its course, extending beyond the northern edge of the excavated area (Plate 38). The channel had been infilled with brick rubble, and was contaminated with a concentration of diesel/oil.



*Plate 38: Looking west along channel **2019***

4.3.9 Twentieth-century redevelopment of the site, presumably associated with the expansion of the Bradford Ironworks in *c* 1914, was represented by the remains of six stanchion bases (***2007 – 2012***), which were aligned broadly east/west across the excavated area (Fig 13). The bases were of brick and concrete construction, and each measured 1.26 x 1.15m and survived to an average height of 0.5m (Plate 39).



*Plate 39: Looking north-west at stanchions **2009**, **2010** and **2011***

4.3.10 Of a similar construction date to the stanchions in the northern part of the excavated area were two large concrete/brick blocks (***2013/2014***), which measured 4.15 x 2.40m. At the same location, a surface (***2015***) composed of machine-made brick was exposed, bonded to block ***2013***. Surface ***2015*** was bonded with a hard, black bitumen mortar. Holding-down bolts were present on top of block (***2013***), indicating these structures were possible machine beds.



*Plate 40: Possible machine bed **2013** and surface **2015***

4.3.11 The latest features exposed within Area 2 included a modern service trench (***2021***) and a series of large intrusive cuts (***2024***) that extended across the west end of the trench. Feature ***2024*** truncated walls ***2020***, ***2023***, ***2006*** and brick channel ***2019***. These features were filled with concrete and rebar.

4.4 AREA 3 – BRADFORD IRONWORKS

4.4.1 Area 3 measured 35 x 25m, and exposed the remains of a primary processing area within the historic core of Bradford Ironworks (Fig 5). The area was excavated to a maximum depth of 3.10m below the modern ground surface, to a height of 57.20m aOD. The exposed remains survived *in-situ* and were relatively well preserved. The most prominent features comprised the foundations for a row of four Lancashire boilers, and two pairs of regenerative furnace chambers and associated flues. Several phases of construction were identified across the site, which corresponded with the phases of development that spanned the development of the ironworks.

4.4.2 The earliest features exposed in the excavated area appeared to have been cut into a layer of yellowish-grey clay. However, it is probable that concentrated and continuous development of the area had churned up the natural geology to such an extent that no natural deposits survived at this level.

4.4.3 The earliest structural remains were revealed in the south-east corner of the excavated area, and included a north/south-aligned flue (***3020***) composed of hand-made bricks bonded with a soft, sandy mortar (Plate 39). Flue ***3020*** survived to a maximum height of 0.40m, and measured 7.66m x 0.78m, although it continued beyond the southern edge of the excavated area. The remains of a second flue (***3022***) joined flue ***3020*** towards the southern edge of the excavated area (Fig 14); the two flues were seemingly of a contemporary build. Both sections of flues overlay a stone-capped drain (***3025***), which was cut into the underlying geology, and was aligned north-east/south-west (Fig 14). The sides of the drain were of a similar construction to the flues, comprising hand-made bricks bonded with a soft, sandy mortar.

4.4.4 The fragmentary remains of two surfaces (***3023*** and ***3018***), both composed of hand-made bricks, were exposed on either side of flue ***3020*** in the southern part of the excavated area (Fig 14). The surviving remains of surface ***3023*** measured 2.5 x 0.9m, and was one-brick thick; this surface had been cut subsequently by a drain (***3021***). The surviving remains of surface ***3018*** measured 1.60 x 1.20m, although unlike surface ***3023*** it incorporated several different levels. This surface was cut subsequently by a twentieth-century drain (***3017***) of concrete construction.

4.4.5 Flues ***3020*** and ***3022***, drain ***3025***, and surfaces ***3023*** and ***3018*** all seemingly represented elements of the original ironworks. However, little historic fabric pertaining to other original features as depicted on historical mapping, including the original furnaces, survived *in-situ*, and had presumably been destroyed by the redevelopment of this part of the ironworks in the twentieth century (Fig 15).

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*Plate 41: Looking south across flue **3020***



*Plate 42: Looking west across surface **3018** and drain **3017***

4.4.6 Excavation in the northern part of the area revealed the remains of the foundations for a series of four Lancashire boilers (Plate 43), which had been associated with two pairs of regenerative furnace chambers. Each of the four individual boiler bays were aligned east/west, and were separated by 1m wide, brick-lined passage that ran the full length of each structure (Fig 14). The bank of boilers had been charged at their eastern end, and the flues channelling exhaust gases to the works chimney were situated at the western end.



*Plate 43: Looking north-east across Lancashire boiler beds **3000**, **3002**, **3004** and **3011***

4.4.7 At the northern end of the boiler bank was boiler bay ***3000***, which was poorly preserved as large elements had been destroyed by demolition activity. The extant structure measured 8.90 x 1.60m, and survived to a maximum height of 0.90m (Plate 44). Boiler bay ***3000*** was built on a surface (***3001***) of machine-pressed bricks, which had been laid in stretcher bond and were severely degraded due to exposure to the high temperatures generated in the boiler.

4.4.8 Situated adjacent to ***3000*** was boiler bay ***3002***, which measured 9 x 2.15m, and survived to a maximum height of 1.10m (Plate 45). This boiler bay had also been built on surface ***3001***. The adjacent boiler bay (***3004***) was similarly 2.15m wide, and survived to a length of 8.50m and a height of 0.90m.

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*Plate 44: Looking east across boiler bay **3000***



*Plate 45: Looking north-west across the south face of boiler bay **3002** and surface **3003***

4.4.9 Surface (***3005***) was probably the most enigmatic of all the surfaces that lined the corridors between the boiler houses. It had been constructed in two sections, each with a different bonding pattern. In the west part, the bricks were laid header to header, whilst in the eastern part the bricks were laid stretcher to stretcher. In the eastern section, the surface was overlain by a series of east/west-aligned partitions (***3005a***). The partition walls were only one brick width wide, and one brick course high. The reason why the surface was divided in such a way is unclear, although it may have facilitated the use of wheeled carts or coal tubs (Plate 46).



*Plate 46: Looking east across surface **3005***

4.4.10 The southerly of the two small boiler bays was ***3011*** (Plate 45), which had been constructed upon a brick surface (***3005***). This boiler bay had a width of 0.97m, and survived to a height of 0.95m (11 brick courses), although the eastern end had been destroyed by later development, resulting in the surviving length being reduced to 7.78m. The southern side of the structures had also been destroyed, leaving only the remnants of burnt, crushed brick. The top course of bricks in the extant parts of the structure had survived partially along the northern edge of the boiler bay. These bricks had been chamfered into a smooth curved profile, designed perfectly to support the curved surface of the boiler. Excavations also exposed a single layer of rectangular ceramic tiles overlying the central core of the boiler house. Each tile measured 0.23 x 0.11 x 0.02m.



*Plate 47: Looking east at boiler house **3011**, showing the highly fired core*



Plate 48: Detail of chamfered boiler mounts

4.4.11 All four of the boiler housings were constructed from a combination of standard and refractory bricks. The lower courses of the structures comprised machine-pressed refractory bricks, designed to withstand high temperatures and conduct heat. The upper courses were comprised mostly of standard machine-pressed bricks. The majority of the bricks were crumbly, degraded and discoloured, reflecting exposure to high temperatures. There was no surviving mortar in any of the structures. The two central boiler bays were

constructed around a highly fired ceramic core, designed to retain its structural integrity under high temperatures. Excavations revealed that all surfaces underlying the houses were built upon a foundation layer of cement and clay.



*Plate 49: The eastern end of boiler house **3002** in Area 3*

4.4.12 In the eastern half of Area 3, excavations revealed a surface (***3006***) of machine-pressed bricks, which covered an area of 8.60 x 1.15m, and was aligned north/south along the eastern end of the boiler bays (Plate 48). This surface was slightly concaved, and enclosed completely by a narrow brick wall that curved around its southern end. The wall had survived to a maximum height of 0.40m (three brick courses).

4.4.13 The northern end of surface ***3006*** continued to the northern section of the excavated trench. This surface may have provided access to the rear of the boilers, although a secondary purpose for the passage was also identified. An iron bar (1.25 x 0.1 x 0.06 m) was found running from the back of boiler bay ***3000*** to the eastern wall of ***3006*** (Plate 50). The bar was built into both structures, acting to stabilise them under the weight of the actual boilers, and counteract the effect of heat expansion. It is likely that the iron bar would have been duplicated along the length of the passage, providing support for each boiler bay. In addition, a reclaimed railway track (2.33 x 0.15 x 0.06m) was found to have been built into the eastern passage wall of ***3006***, in between the surface and the first brick course. Like the iron bar, it is likely that the track was duplicated along the length of the passage in order to strengthen the structural integrity of ***3006***.

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*Plate 50: Looking south-west across passage **3006** and the boiler houses in Area 3*



*Plate 51: Looking south down passageway **3006** showing supporting iron bars*

4.4.14 Excavations exposed a north/south-aligned drain (***3008***) running along the western end of the four boiler bays (Plate 50). The drain comprised a concrete base, and was flanked along the western edge by a single line of machine-pressed bricks. At the northern end of drain ***3008*** was a cast-iron valve mechanism, which measured 1.80 x 0.08m. Just to the north of the valve, the drain dropped beneath surface ***3007*** through a brick arch. It is likely that drain ***3008*** was contemporary with the boiler house and associated flues.



*Plate 52: Looking north at drainage system **3008** in Area 3*

4.4.15 To the south of the boiler houses, excavations exposed the remains of two east/west-aligned pairs of regenerative chamber flues (Plate 53); the construction typified Siemens' original regenerative furnace system, as shown in the patented design of 1856. Each flue exhibited the remnants of an original arched chamber packed with refractory bricks in an open Flemish bond chequered pattern. The two pairs of flues were separated by a 1.80m wide concrete surface (***3014***), which was laid up against the south wall of flue ***3013*** and the north wall of flue ***3015***. All of flues were truncated from the east by a later phase of construction within the ironworks. All flues were similarly truncated from the west by a modern service pipe running north/south along the western section of the excavated trench. Further excavations revealed the flues continued westwards, under service pipe ***3010***, towards the City of Manchester Stadium.



*Plate 53: One of the two pairs of regenerative chamber flues (**3016** and **3015**), Area 3*

4.4.16 The only flue with an intact archway was flue ***3016*** (Plate 54). The arch measured 0.88m wide, and was excavated to a depth of 1.39m. Seven courses of refractory bricks in Open Flemish bond were exposed inside the arch. Along the exterior roof of the arch were two small rectangular holes, presumably for ventilation purposes. This arch was reinforced on its south side by a flanking refractory brick wall, measuring 3.50 x 0.4m.

4.4.17 With the exception of ***3016***, all of the flues were poorly preserved. The most northerly flue (***3012***) was truncated by a modern cut and service pipe **(*3010***). Flue ***3012*** measured 5.3 x 0.87m, and exceeded a depth of 1.80m. It was abutted from the south by flue ***3013***; flue ***3013*** was not excavated due to the potential collapse of the structure. A notable feature of flue ***3012*** was the presence of a dark grey molten residue coating the inner face of the northern chamber wall. It is likely that this residue was a by-product of metal-working and evidence that a very intense heat once passed through flue.

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*Plate 54: Looking west at the complete cross-section of regenerative chamber flue **3016***

4.4.18 Flue ***3015***, located to the south of concrete surface ***3014***, measured 4.11 x 1.17m, and exceeded a depth of 1.36m. Like flues ***3012*** and ***3013***, the original archway was not intact. The inner face of the south wall was coated with the same molten material as seen in flue ***3013*** (Plate 55).

4.4.19 Excavations revealed flues ***3015*** and ***3013*** had been blocked from the east by a later north/south-aligned wall (***3030***) composed of machine-pressed bricks. The wall measured 5 x 0.80m and was over 2m high. Wall ***3030*** had a 0.30m wide concrete-filled cavity running through its centre (Plate 56). It seems possible that the wall was an early twentieth-century construction designed to permanently block off and put out of use the regenerative flue system (Plate 57).

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*Plate 55: The internal northern face of regenerative chamber flue **3015***



*Plate 56: Wall **3030** with a concrete cavity cutting flue **3015** from the east in Area 3*

4.4.20 The archaeology exposed in the western half of Area 3 can be attributed to the second half of the nineteenth century. The Lancashire boiler houses and the regenerative flue system are evidence that during this period, the ironworks underwent significant technological and structural developments.



*Plate 57: The east end of flue **3015**, with later wall **3030** running across the back*

4.4.21 The most prominent feature in the eastern half of Area 3 was a large brick-lined room (***3024***), which measured 3.90 x 2.50m with a depth of 1.90m (22 brick courses). The bricks were machine-pressed and bonded with a black bitumen mortar. As the room was filled with a diesel-type fuel, it seems likely that (***3024***) was a machine room or a fuel tank container. At least two phases of construction were identified in the brickwork.

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*Plate 58: Looking south-west across Area 3, showing brick-lined room **3024***

4.4.22 The north wall of the room was originally built with an arched window measuring 0.95 x 0.60m (Plate 59). From this window a brick-lined channel (***3028***) of corresponding width extended northwards from the room (Plate 60). The walls of the channel were two brick widths wide, and survived to a height of 0.70m (eight brick courses). The channel was filled with a thick, black fuel deposit, suggesting that this structure may have been the means by which fuel was channelled into fuel tank ***3024***. Running off ***3028*** to the west were four brick-lined compartments of unknown function (***3039***). The two largest compartments measured 2.50 x 60m, and had survived to a height of 0.50m. Compartments ***3039*** were constructed from machine-pressed bricks with a concrete mortar. A concrete surface was found to surround each compartment, probably the foundation for a brick floor.

4.4.23 Fuel tank container ***3024*** and associated channel ***3028*** were seemingly early twentieth-century constructions, belonging to a phase later than that of the Lancashire boilers and regenerative flue system.

4.4.24 The brickwork in the northern wall of ***3028*** showed that the arched window was blocked in a secondary phase of construction. Any access to the room in this phase would have been through a 0.60m wide entrance exposed to the west of the blocked arch. Excavations also exposed a degraded iron-plated brick passage (***3026)*** running at a slope from the entrance along the outside of the northern wall of ***3028*** (Plate 59). The passage measured 5.73 x 0.60m**.** Built into the southern passage wall of ***3026*** were the remains of a timber post, probably part of a mechanism associated with the function of slope.



*Plate 59: The north wall of **3024**, showing blocked window with channel **3028***

4.4.25 Directly to the north of passage ***3026*** excavation revealed a machine-pressed brick and concrete mortar compartment complex (***3027***). In total, 12 separate compartments were identified, each one founded upon a concrete surface. The compartments had a total measurement of 5.64 x 4m. The dividing brick walls had survived to a maximum height of 0.30m (three brick courses).

4.4.26 Several of the compartments had been filled with concrete, providing evidence for multiple phases of use. Access to the compartments would have been through an open passage running down the centre of the complex. It is possible that ***3027*** housed several small machines, associated with expansion of the ironworks in *c* 1914. The blocking of the arched window in ***3028*** and the construction of passage ***3026*** can be attributed to the same phase.

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*Plate 60: Looking south along channel **3028***



*Plate 61: Looking east along iron-plated passage **3026** along the north wall of **3028***



*Plate 62: Looking north at compartment complex **3027** in Area 3*



Plate 63: Looking south-west across the south end of Area 3

4.5 AREA 4 – TWENTIETH-CENTURY EXPANSION OF BRADFORD IRONWORKS

4.5.1 Area 4 measured approximately 30 x 25.5m, and was excavated to a maximum depth of 3.2m. It was targeted on the site of the main processing area in the twentieth-century extension to Bradford Ironworks, subsuming the site of former housing on both sides of Iceland Street and Kara Street (Figs 6 and 7), where a series of flues had been exposed during the initial programme of evaluation trenching (OA North 2010). However, excavation revealed that the area had been disturbed heavily by modern development, although important archaeological remains pertaining to another regenerative furnace were exposed at depth. The unstable condition of the exposed structures precluded manual excavation and cleaning of the remains, and archaeological recording was thus carried out from the top of the trench.

4.5.2 Most of the area targeted for archaeological excavation was sealed by thick layers of reinforced concrete, presumably representing the final use of the buildings that had occupied the site. The southern part of the area was sealed by two discrete concrete surfaces (***4005*** and ***4006***), and another concrete slab (***4002***) ran west from the centre of the eastern side of the excavated area for 12m (Fig 16). Another linear concrete slab (***4001***) ran 18.2m west from the eastern edge of the excavated area to the north of slab ***4002***, and the north-west corner was also covered by a reinforced concrete slab (***4000***). Between concrete slabs ***4401*** and ***4002***, the ground had been disturbed to a depth in excess of 3m by the insertion of a large, modern drain running east/west across the trench (Fig 16).

4.5.3 The north and north-eastern parts of the trench had also been disturbed by a large modern intrusion that was bounded by concrete slabs ***4000*** and ***4001***. These modern features had been cut into a layer of clay, which almost certainly represented the natural geology; the surface of the natural clay was observed at a depth of 3.2m.

4.5.4 Situated immediately beneath concrete slab ***4001*** was a curving wall (***4021***) composed of machine-pressed bricks (Fig 16). Wall ***4021*** survived to a height of *c* 3m, and had been laid in stretcher bond. The fragmentary remains of three flues (***4009***, ***4010*** and ***4011***) were observed at the base of this wall; the flues appeared to be integral to the fabric of wall ***4021***, representing a single phase of construction. Flue ***4011*** was 1.1m wide and flue ***4009*** 0.6m wide, and both were constructed from refractory bricks with arched roofs (Plate 64). Flue ***4010*** was 0.6m wide and, similarly, comprised refractory bricks, but also incorporated a concrete lintel.

4.5.5 The vestiges of a fourth flue (***4008***) were exposed in the north-western corner of the excavated area. Flue ***4008*** was aligned north-west/south-east, with a noticeable fall towards the north-west. Whilst the exposed structure was isolated physically, it may have linked originally to flue ***4011***.



*Plate 64: The remains of flues **4009** - **4011** within wall **4021**, looking south*

4.5.6 The remains of two further flues (***4012*** and ***4018***) were observed beneath concrete slab ***4001***. Flue ***4012*** appeared to be a continuation of flue ***4009***. Similarly, flue ***4018*** is likely to have been a continuation of flue ***4010***, and although at this point it had an arched roof of refractory brick, the concrete lintel seen in ***4010*** may be reinforcement at the point where the flue dropped downwards.

4.5.7 Situated to the east of concrete slab ***4006*** was rectangular-shaped surface ***4007*** composed of machine-pressed bricks, covering an area measuring 7.5 x 4m, with a large room (***4015***) to its north-east (Plate 65); upon excavation this room flooded immediately from the remains of a flue to the south. The room measured roughly 9.5m square and had a brick floor situated at a depth of *c* 2.5m below the level of floor ***4007***. The structural remains of the room had been damaged by modern development, probably during the remediation works carried out in 2000. Nevertheless, sufficient historic fabric survived to demonstrate that the walls and floor of the room had been lined with refractory brick, and it had been filled with large refractory bricks with double holes through them, some of which survived beneath concrete slab ***4002***. These were stacked upright on top of each other on small spacer tiles with small gaps between them and indicated that this room had been a Siemens-type regenerator. At the north and south sides of this room were sloping surfaces (***4019*** and ***4020***) composed of refractory brick 'chutes', which were probably the remains of the air intake and exhaust gas outflow for the regenerator. Immediately adjacent to and running parallel to the south-west wall was a 1.1m wide arched roofed flue (***4016***).

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Plate 65: Trench 4 looking east. Regenerator bricks can be seen below the concrete in the centre

4.5.8 A 1.7m wide flue (***4013***) was observed running north-west out of the regenerative chamber below concrete slab ***4002***, which stepped down on its north side. A second 0.75m wide flue (***4017***) ran parallel to this to the east, with a third 1.1m wide flue (***4014***) running north-east. All three of these flues were lined with refractory brick, but all had the upper levels truncated so it was not possible to ascertain the character of the original roof construction.

4.5.9 The eastern side of room ***4015*** was lined with a single-skin wall (***4004***), which was aligned north-west/south-east, and composed of machine-pressed bricks. The core of the wall comprised standard bricks with refractory brick lining on both sides. To the immediate north-east was a flue (***4003***) running parallel to the wall. This was 1.2m wide, built from refractory brick and had an arched roof. It ran south-east and then split off to the south, south-east and east, beyond the confines of the excavated trench.

4.6 AREA 5 – BRADFORD MILL

4.6.1 Area 5 measured 50 x 30m, and was aligned east/west across the site of part of a nineteenth-century textile mill (Fig 10), and the northern edge of a twentieth-century expansion of Bradford Ironworks. The trench was also targeted on the projected line of the moat that encompassed Bradford Old Hall. The excavated area was dominated by an 8.2m wide cobbled road (***5001***) aligned east/west along the trench (Plate 66). This comprised squared granite setts laid onto a hardcore base with bitumen, and represented the surface of the former Philips Park Road. Below the road ran three brick-built sewers, which were inspected using remote camera by engineers on site during the course of the excavation.



Plate 66: The excavated remains of Philips Park Road, looking east

4.6.2 Kerbstones remained *in-situ* in some places along the road sides. To either side of the road were electricity, gas and water services including, on the south side, a large asbestos water pipe, and, on the north side, a later concrete-section sewer. The remains at the western end of the trench had been destroyed by a large modern cut, which probably represented one of the trial trenches excavated by GMAU in 2002.

4.6.3 On the south side of Philips Park Road was the northern wall (***5002***) of the twentieth-century expansion of Bradford Ironworks. Wall ***5002*** comprised machine-pressed bricks, and was aligned east/west with cast-iron column bases at intervals along its length. Immediately to the south of the wall was a series of reinforced concrete slab bases, presumably representing internal floors and working surfaces within the ironworks. The construction of these had largely destroyed any earlier remains, although fragmentary remains of the nineteenth-century houses were exposed. These included wall ***5006***, which was exposed in the south-eastern corner of the excavated trench (Fig 17). Wall ***5006*** was aligned broadly north/south, and comprised hand-made bricks bonded with a lime-based mortar. The foundation courses of the wall incorporated stone and slate, and had been cut into the natural drift geology. Another wall (***5005***), similarly composed of hand-made bricks, was exposed to the west. Wall ***5005*** survived to a height of 1.5m, and may have formed part of a fireplace (Plate 67).



*Plate 67: Possible fireplace **5005**, looking north-west*

4.6.4 Situated to the west of walls ***5005*** and ***5006*** was a 0.85m wide stone-flagged surface (***5004***), with the remains of brick walling on either side. This appeared to be the vestiges of a north/south-aligned passage or small alley between two houses (Plate 68), which presumably afforded access from Benson Street to yards at the rear of the houses.

4.6.5 Two square hand-made brick structures (***5003***) with concrete internal settings lay to the west of surface ***5004***. These were composed of the same type of hand-made brick as walls ***5004*** and ***5006***, suggesting that they were of a contemporary build, and perhaps represented internal features within a house.

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Plate 68: Remains of possible alleyway, looking north-west

4.6.6 A large block of concrete had been inserted into the south part of wall ***5002***. This appeared to be associated with a rectangular structure (***5000***), which measured 3 x 1.2m, and composed of machine-pressed bricks. This structure abutted wall ***5002***, and contained ash and cinders, with its western end covered by flagstones and a brick surface. A cast-iron pipe ran through it, suggesting that it was gas-fired in some way, and was contemporary with the twentieth-century expansion of the ironworks.

4.6.7 To the north of the road was an east/west-aligned wall (***5016***), composed of hand-made bricks, which formed the southern external wall of the nineteenth-century textile mill. In its centre the wall changed from brick to stone at a point that corresponded with a small branch turning north off the road into the mill, suggesting a 9.5m wide entrance into a covered loading bay. Inside the loading bay, on the north side of wall ***5016***, was a sunken rectangular structure (***5011***). This measured 6 x 3.6m, was 0.5m deep, and was built mainly from hand-made bricks with the later addition of a wall at its west side composed of machine-pressed brick and a concrete floor with a drain. These structures represented the remains of a weighbridge (Plate 69).

4.6.8 The weighing mechanism had been removed, although fragments had been discarded into the structure during demolition. Two brick channels ran into the structure, one to the east and another to the north, probably to allow access for maintenance and calibration. Immediately to the east of the structure, and to the north of the eastern access channel, was a series of brick walls that connected into the weighbridge. These were constructed from both hand-made and machine-pressed bricks, and appeared to have been subject to several phases of repair or remodelling.



*Plate 69: Weighbridge **5011** looking south-west*

4.6.9 Situated to the west of the weighbridge was a surface (***5012***) of machine-pressed engineering bricks, with a ceramic drain cutting north-west/south-east along its western side. To the west of this was a surface of thick stone slabs (***5013***). This area had been disturbed heavily by the construction works carried out in 2002, but it was considered likely that the stone surface, which had two narrow brick wall footings running parallel north/south within it, represented the base of a steam engine. A second floor surface of engineering bricks (***5014***) with a linear stone setting may have formed the base of machinery or a boiler. This had been disturbed at its south side by a modern rectangular brick structure (***5015***), which may have represented the base of later machinery.



Plate 70: Floor surfaces at the west end of the nineteenth-century mill, looking east

4.6.10 Situated to the east of the weighbridge was a surface (***5010***) composed of engineering bricks and flagstones, which appeared to represent an entrance from the main working area to the loading bay and weighbridge. A north/south-aligned wall (***5009***) of hand-made bricks separated the two areas. The working area consisted of a stone-flagged floor (***5008***) into which stone bases for machines had been set (Plate 71). Along the southern edge were three stone settings, each measuring 0.8 x 0.37m, with 'I'-shaped indentations in the top. To the east of these three was a stone block, measuring 1.5 x 0.6m, with four holding-down bolts and a groove cut around its top edge. To the north of the three stone settings were a further two settings, each measuring 0.9 x 0.7m with 'I'-shaped indentations and a wooden 'stop' to the immediate south. Above the flagstone floor a later rough floor surface of hand-made bricks (***5007***), presumably re-used, had been laid (Plate 72).



*Plate 71: Stone machine settings within flag floor **5008**, looking east*

4.6.11 A series of three parallel trenches was excavated through the remains of the textile mill in order to find any remains of Bradford Old Hall. A fourth trench was then excavated across the first three at 90 degrees and was then expanded into a larger area that measured 40 x 8.5m from the western end of the trench

to half way across flagstone surface ***5008***. No remains of the hall or moat had survived. At the western end of the trench were reinforced concrete beams sitting on large concrete piles, the construction of which had removed any earlier remains. Below the remains of the textile mill was a large brick sewer running east/west with a branch heading off to the south, presumably linking into the sewers beneath Philips Park Road. This was excavated to a depth of 3.4m, and had destroyed any remains of Bradford Old Hall, its moat and associated stone-built revetment.



*Plate 72: Flagstone floor **5008** with overlying brick floor **5007**, looking south-east*

4.7 AREA 6 – THE CANAL ARM

4.7.1 Area 6 comprised a linear trench, measuring 50 x 12.5m, which was aligned north-west/south-east and placed a short distance to the north-west of Area 1 (Fig 2). It was intended to investigate the pit head area around the shaft shown on early nineteenth-century mapping (Fig 3).

4.7.2 A thick deposit of clay (***6004***) exposed at the northern end of the excavated trench almost certainly represented the natural drift geology. This had been cut by a wall (***6002***), the fragmentary remains of which probably represented the vestiges of nineteenth-century buildings that had occupied the area around the colliery shaft. Wall ***6002*** comprised hand-made bricks bonded with a lime-based mortar, and had a maximum width of 0.6m. The wall survived for a length of 4.6m, running south-west from the eastern edge of the trench. No associated structures or remains were exposed.

4.7.3 The terminus of the canal arm (***6001***) was observed at the northern end of the trench, cutting into natural clay ***6004***. The canal channel was at least 10m wide, although the eastern edge continued beyond the excavated area. The canal channel had a depth of 2.7m, and was filled with gravel and rubble (***6005***), which almost certainly represented the infilling of the canal in the mid-twentieth century.

4.7.4 Backfilled material ***6005*** was overlain by a surface (***6000***) composed of machine-pressed bricks. The exposed remains of surface ***6000*** measured 5.35 x 1.5m, extending south-westwards from the eastern edge of the excavated trench. The function of this surface remains uncertain, although it was clearly of a late twentieth-century date.

4.7.5 A large cut (***6003***) exposed at the southern end of the trench was filled with modern rubble and debris, including plastic bottles, crisp packets and hazard-warning tape, indicative of modern activity. The function of this cut is uncertain, although it is likely to have derived from the remediation works carried out in 2000.

4.8 THE FINDS

4.8.1 A very small assemblage of artefacts was recovered from the archaeological investigation. The bulk of the assemblage dates to the late nineteenth and twentieth centuries. Pottery dominated the assemblage, with lesser amounts of clay tobacco pipe, and fragment of ceramic building material. The bulk of the assemblage was derived from demolition layers in Area 5 and, as such, is considered as unstratified. Most of the objects were domestic in function and of relatively low status.

4.8.2 In conclusion, the small finds assemblage is of limited archaeological significance, and does not contribute to a broader understanding of the site. In all probability, the finds represent the dumping of domestic refuse on the site during the later nineteenth and twentieth centuries.

5. CURATION AND CONSERVATION

5.1 RECIPIENT MUSEUM

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

Museum of Science and Industry in Manchester
Liverpool Road
Manchester

5.1.2 Arrangements were made with the museum prior to the commencement of the excavations for the deposition of the complete site archive, and the museum curator has acknowledged her willingness to accept the archive.

5.2 CONSERVATION

5.2.1 There are no conservation requirements.

5.3 STORAGE

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

5.4 DISSEMINATION

5.4.1 The complete results obtained from the archaeological investigation at Sportcity are incorporated in this final excavation report. In addition to Manchester City Council, copies of the report will be forwarded to the Museum of Science and Industry in Manchester, the Sportcity Visitor Centre, and the Greater Manchester Historic Environment Record.

5.4.2 In order to disseminate the results obtained from the archaeological investigation to a local and national audience, the County Archaeologist for Greater Manchester recommended that a summary of the key findings are synthesised into an illustrated booklet, which should be published as part of the *Greater Manchester's Past Revealed* series. This was considered to be the most appropriate format in which to disseminate the important results obtained from the investigation of the site. The booklet has been produced, and forms Volume 4 in the *Greater Manchester's Past Revealed* series.

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6. DISCUSSION

6.1 BRADFORD OLD HALL

6.1.1 Although the 2002 excavation revealed some remains of the medieval moat and its stone-built revetment at depth in the immediately adjacent area, no remains were observed in 2010. The present excavation, moreover, demonstrated that the construction of a modern sewer system along the northern edge of Philips Park Road had destroyed any buried remains of the moat. Further to the north, the construction of Bradford Mill in the early 1840s had completely destroyed any buried remains of the medieval hall.

6.1.2 A larger industrial works had seemingly replaced the original mill by 1951. This new building sat on reinforced concrete beams, which were in turn sat on concrete piles. At this point the piles were very deep, not bottomed at a depth of 3.6m, and it is likely that the soft fill of the moat necessitated excavation and deep piling to carry the beams and the building above them.

6.2 THE CANAL ARM

6.2.1 Cartographic evidence has indicated that the western arm of the moat was probably incorporated into the Ashton Canal as a pound reservoir during the late eighteenth century. The canal arm had been expanded by 1845 to link Bradford Colliery with the main line of the canal, providing direct access to the Manchester canal network and its associated mills and factories.

6.2.2 It seems likely that the canal arm may also have been utilised as a receptacle for water pumped out of the colliery workings once the deep shafts had been sunk in 1854. It is possible that the continued use of the canal as a drain ensured the retention of the canal arm for many years after more efficient modes of transporting bulk cargo had been developed.

6.2.3 The canal arm came off the main Ashton Canal just above Lock 6, and continued southwards in a straight line to the pit head of Bradford Colliery. It remained in use until the mid-twentieth century, but was infilled subsequently. It remains uncertain precisely when this occurred, although it is likely to have been associated with the closure of Bradford Colliery in 1968, and final demolition in 1973. The excavation of Area 6 exposed a section of the canal, which was observed at a depth of 2.7m below the modern ground surface, although it was not well preserved. The eastern wall of the canal channel was also identified in one of the initial evaluation trenches that were placed across the site. The wall was exposed at a depth of 2.5m below the modern ground surface, measured 0.6m (2ft) wide, and was built using a combination of stone and brick (OA North 2010).

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6.3 BRADFORD COLLIERY

6.3.1 The archaeological investigation of Bradford Colliery has provided an opportunity to compile an historical account summarising the development of a key industrial site in East Manchester, enhanced with a detailed record of the surviving buried remains. Whilst there are several published sources that examine in detail aspects of the colliery, and particularly the machinery that was employed (Hayes 2004), there is a notable absence of an holistic account of the colliery. This is perhaps surprising given the importance of the colliery to the history of the area, and the wealth of documentary evidence for its development that is available in various archive repositories.

6.3.2 The excavation did not encounter any of the pit shafts, nor were the underground workings exposed to provide information on the methods of mining that had been employed. However, the sixteenth- and seventeenth-century pits almost certainly exploited the Upper Coal Measure seams that outcropped close to the surface. These workings may have been in the form of bell pits, with the miners working outwards from a central shaft, which was rarely excavated to a depth greater than 10m. Typically, no supports were used, and mining ceased when the pit became too dangerous to continue, or collapsed. Individual bell pits were thus short-lived, although new shafts were often sunk adjacent to an abandoned working (Plate 73).

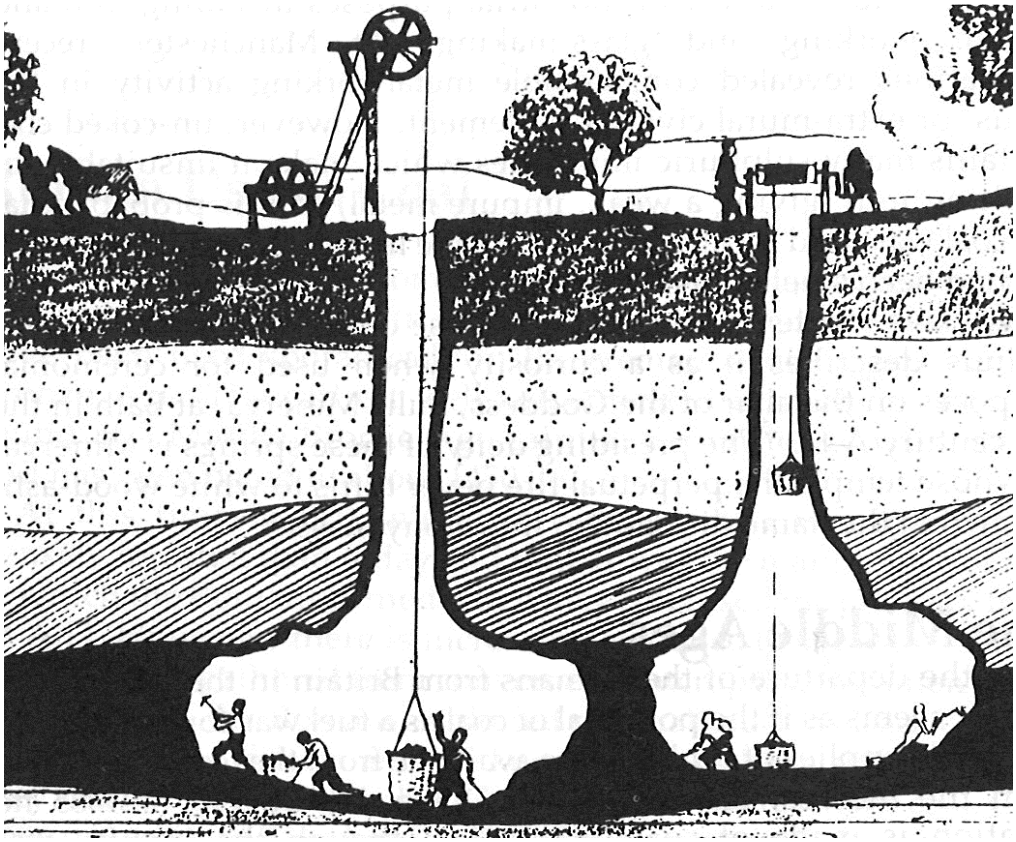


Plate 73: Cross-section of typical bell pits

6.3.3 An alternative that allowed a larger area to be mined, and to a greater depth, was the technique of 'pillar and stall'. A method of mining coal that was prevalent until the nineteenth century. Long, parallel rows of coal, known as the stalls, were removed to leave equally long parallel pillars of coal supporting the rocks above the seam. A variation of the pillar and stall method was the bank system. The characteristic feature of the bank was that is was developed between two access gates, which were extended as necessary to provide the required ventilation. Pillars of coal were left on either side of the bank for support (Plate 74). The length of each bank was limited to a degree by haulage considerations. Waste material was packed into the space created from mining, known as the 'gob' (Sawyer 1886). This method evolved into the modern technique of longwall mining, whereby a wall of coal is extracted in a single slice.

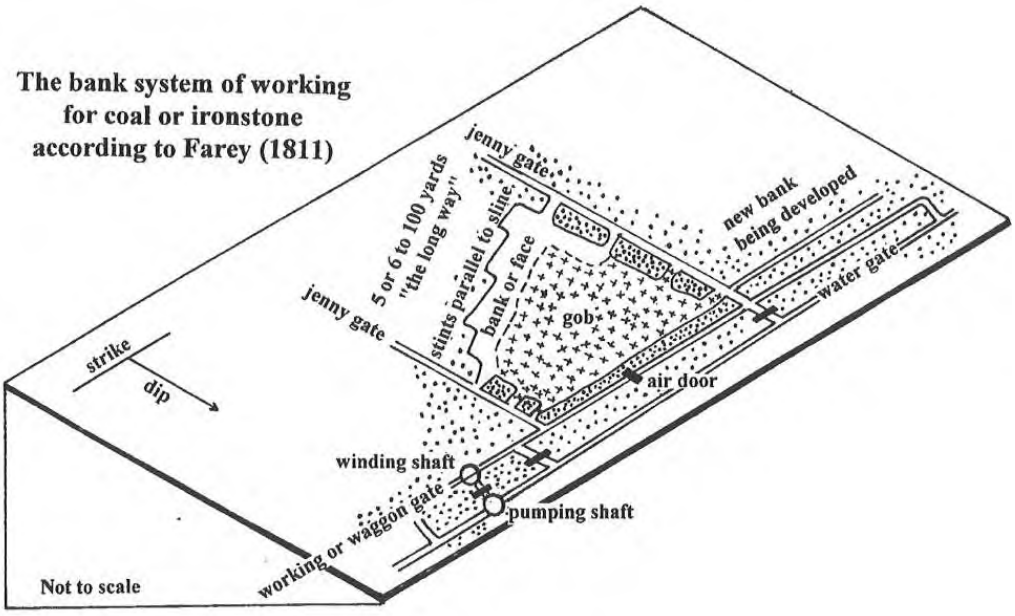


Plate 74: Schematic illustration of the bank system of mining (after Farey 1811)

6.3.4 Analysis of the available eighteenth- and early nineteenth-century mapping that shows the underground workings at Bradford Colliery suggests that the bank system of mining may have been employed. The characteristic layout of this method is depicted quite clearly on a plan produced in 1854, showing the workings excavated in the Three Quarters Mine (Plate 75). Similarly, the annotation added to the plan of 1761 shows a layout of underground workings in the Bradford Four Feet seam that is broadly consistent with the bank system of mining (Plate 3). However, during the twentieth century, the more efficient method of longwall mining had been adopted at Bradford Colliery, presumably reflecting the availability of more sophisticated machinery (Hayes 2004).



Plate 75: Plan of 1854, showing workings in the Three Quarters Mine at Bradford Colliery

6.3.5 The archaeological excavation did not reveal any structures that could be associated firmly with the early period of mining at Bradford Colliery. Whilst this was probably a consequence of the extensive redevelopment of the colliery's plant during the twentieth century, it may also be a genuine reflection of the lack of surface infrastructure required up to the mid-nineteenth century. In this respect, it is of note that documentary references have indicated that access down Forge Pit, the earliest deep shaft at the colliery, was afforded by a manually powered capstan as late as the 1855 (*Section 3.4.13 above*).

6.3.6 The earliest remains exposed during the archaeological excavation dated to the second half of the nineteenth century, during the period when the colliery was operated by Thomas Livesey and a series of partners; the origin of the modern colliery, and its emergence as the largest coal mine in the Manchester Coalfield may certainly be attributed to Livesey. The most extensive remains from this period were the housings for the five Lancashire boilers, which were exposed along the eastern edge of the excavated area. The exact date at which the boiler house was erected remains uncertain, although the use of bricks stamped with the 'BC' trademark suggests that it may not have been before 1874, when the colliery brickworks was put into production. The fabric of the boiler house also incorporated refractory bricks bearing the stamp of the 'Star Works, Glenboig'. These were the products of a significant fireclay industry that developed from the 1830s in Lanarkshire, Scotland (Douglas and Oglethorpe 1993, 19). However, the Star Works in Glenboig was not established until 1872, and remained in production as an independent factory until 1882 when the company amalgamated with the Glenboig Fireclay Company to form the Glenboig Union Fireclay Company Ltd. It would thus

appear possible that the refractory bricks employed in the boiler house at Bradford colliery had been supplied during the period 1872-82. The boiler house had certainly been constructed prior to the measured survey carried out in 1888 by the Ordnance Survey for the production of their 1:500 plan of the area (Fig 10).

6.3.7 The surviving fabric of the boiler house provided evidence for several alterations and repairs. This included the apparent addition of a sixth boiler at the northern end of the boiler house in the early twentieth century. The principal function of the boilers was to raise the steam required by the engine that powered the winding gear for the shaft sunk initially by Thomas Livesey in 1854, and known subsequently as Deep Pit. The brick-built foundations for the building that housed this engine were also exposed during the excavation, together with a series of brick platforms (***1004***, ***1006***, ***1008***, and ***1009***) that may have housed associated machinery.

6.3.8 The colliery brick kiln that was built in 1874 was a specific target of the excavation. However, the excavation demonstrated that all physical remains of this kiln had been destroyed entirely during the redevelopment of the colliery surface plant after 1945. However, the majority of bricks used in the construction of the colliery structures, and in the late nineteenth- and early twentieth-century elements of Bradford Ironworks, were stamped with the 'BC' trademark.

6.3.9 Physical evidence for the development of the colliery during the twentieth century was provided by the remains of several structures exposed during the excavation. These included a long, narrow brick structure (***1026***), situated to the west of the boiler house, which probably formed part of the coal-preparation plant. Associated structures included an engine bed (***1024***) situated at the southern end of ***1026***, which may have powered the coal screens or washing plant.

6.3.10 In the south-eastern part of the excavated was a series of brick platforms with small basements (***1016***a-c). These were of later construction than the boiler house and engine beds to the north, and may have been associated with the documented installation of electrical plant in 1900. Two engines were installed to power the screening plant, and one to power the carpentry shop. The electric generators were probably driven by diesel- or oil-powered engines. More machinery may have sat in passage (***1016***d) with the cables running from it along this passage, the base of which was covered with armour wire stripped from electrical cabling.

6.3.11 The majority of the excavated remains pertained to the reorganisation of the colliery, and the redevelopment of the surface plant that was carried out after 1945. In particular, the concrete foundations for the updated coal-preparation plant were exposed, together with the tower to house the new winding gear. These structures were very substantial and their construction had removed any earlier remains in the immediate vicinity.

6.4 BRADFORD IRONWORKS

6.4.1 Bradford Ironworks was established in 1854, and the original part of the works was investigated in Area 3. The works was expanded subsequently, including the addition of a new wire rod mill that was built in *c* 1914 across the area east to the east of the canal arm, overlying the former Park Mills and the late nineteenth-century workers' housing. This element of the ironworks was targeted by excavation Area 4.

6.4.2 The remains exposed in Area 3 represented an 'island' of surviving structures, the surrounding areas having been disturbed heavily during the groundworks associated with the construction of the City of Manchester Stadium in 2000. A plan of the works dating to 1873 shows the excavated part of the works to have been a semi-circular-shaped building that contained a series of boilers around the periphery, serving individual furnaces (Fig 14). These were linked to a network of adjoining flues, which led to a detached chimney on the southern side of the building. The plan shows the position of steam-powered helve hammers and the forge train in the centre of the building. However, evidence from the excavation demonstrated that this arrangement had been remodelled considerably during the late nineteenth century. The individual boilers had seemingly been superseded by a bank of three larger boilers.

6.4.3 Situated adjacent to the boilers were the remains of several arched flues, each of which contained carefully laid stacks of firebricks. They were set in two pairs (***3015-16***), and vented into a small chimney to the immediate east (***3015***), a characteristic feature of regenerative furnaces.

6.4.4 The introduction of regenerative furnaces was one of the most important stages in the development of furnace technology, and enabled many ironworks to expand dramatically. Following the Salford-based physicist James Joule's discovery, in 1845, that the mechanical equivalent of heat could quantify how heat could be converted into mechanical work, several of his contemporaries saw its potential for application to industry. Among them was Carl Wilhelm Siemens (later Sir (Charles) William Siemens), a German, working in England for his elder brother Ernst's communications technology company. His first attempt in heat conservation was to construct a regenerative condenser, providing superheated steam to a four horse-power steam engine belonging to John Hick of Bolton in 1847. A modified version was applied to the steam engine of Messrs Fox, Henderson, and Co, of Smethwick, in 1849, and although both had limited success, Siemens was awarded a gold medal by the Society of Arts in 1850 for his endeavour, acknowledging the value of the principle. During the early part of the next decade, he, and younger brother Frederic, changed the focus of their work to furnace design. Working initially with the iron industry, the brothers adapted the principles of their regenerative condenser to create a regenerative furnace. As outlined in the original patent of 1856 (British Patent 2861), entitled 'Improved arrangement of furnaces which improvements are applicable in all cases where great heat is required', the furnace worked by:

'arranging smelting and heating furnaces....that the products of combustion on their passage from their place of combustion to the stack or chimney shall pass over an extended surface of brick, metal or other suitable material imparting heat thereto...The result of this arrangement is that the air or other materials of combustion are nearly heated to the degree of temperature of the fire itself, in consequence whereof an almost unlimited accumulation of heat or intensity may be obtained' (British Patent 2861).

6.4.5 This original furnace design contained two pairs of regenerative chambers beneath the furnace, each packed with bricks in open Flemish bond, *ie* a chequer-pattern of unbonded brick, stacked in such a way that gases could pass through (Plate 76). Hot exhaust gases leaving the furnace flowed downwards through one pair of regenerative chambers, imparting a substantial part of their heat to the brick checkerwork, on their way to the chimney, Once the bricks were sufficiently hot, the direction of gas flow in the system was reversed by a series of valves to allow the hot bricks to heat up the gas and air entering the furnace via the other pair of chambers, whilst the exhaust gases re-heated the opposing pair. This pre-heating of gases gave a considerable reduction in fuel, William Siemens suggesting the figure was as high as 70-80% (British Patent 1320).

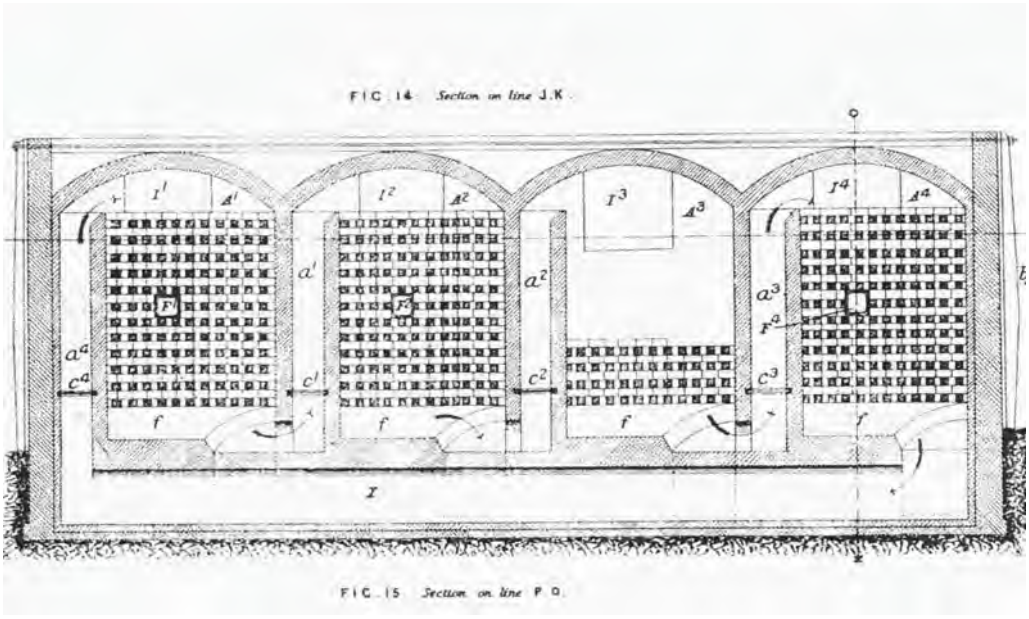


Plate 76: Cross-section of Siemens' regenerative furnace from their patent of 1861

6.4.6 A second breakthrough in the Siemens re-designing of the furnace was the removal of the coal-powered fireplace, and its replacement with a gas supply, located away from the furnace. Both the modifications to the furnace and method of gas supply were patented by the Siemens brothers in 1861 (British Patent 167, 1861).

6.4.7 The use of producer gas brought better quality and reliability, and a further increased saving in fuel costs, even over the remarkable saving of the original furnace of 1856, as the gas producer units could be fuelled with 'slack', the lowest grade of extracted coal, available far more cheaply than the higher

grades required previously. This had a benefit not only in the areas of the coalfields, like St Helens and Bristol, where huge quantities of slack could be procured extremely cheaply, but also areas like South Staffordshire, where only the lower grade could be mined in any quantities, reducing the cost of fuel from 12s 6d per ton to 3s or 4s (Siemens 1862, 35). Gas producers also used less fuel; a furnace smelting steel in Gorton in 1865, which had previously been consuming 7cwt of coal, only required 4cwt, 1qtr, 5lbs of slack to produce the same quantity of steel (Betts Brown 1866, 142).

6.4.8 The slack, coal, or alternatively even coke dust, lignite, or peat (Siemens 1862, 26) was heated gently on an inclined fire-grate, fed from above with slack, via a hopper onto an inclined brick plane. An arch of firebrick above the grate, and heated by it, imparted heat to the new coal slack as it travelled down the incline, beginning the decomposition process before it reached the grate itself. When mixed with air rising through the grate, these gases formed carbonic acid gas (H_2CO_3), which then rose through the partially decomposed material above, onto which droplets of water added via a small pipe, the resultant gas comprising carbon monoxide (CO) and hydrogen. This then rose into a flue linked to the regenerative chambers.

6.4.9 With the expansion of the ironworks, the small furnace and associated flues went out of use and were cut off at the eastern side by the construction of a concrete wall faced on either side by machine-made bricks (***3030***). Contemporary with this wall was the addition of room (***3024***), which may have housed a diesel- or oil-powered engine, representing twentieth-century modifications to the works.

6.4.10 The expansion of the ironworks to the east of the canal arm in *c* 1914 involved the erection of a substantial building. The main structure excavated within this building was another Siemens-type regenerative furnace. This was the culmination of William Siemens work on heat regeneration in the iron and glass industries from the 1840s and by the time of its installation in Bradford Ironworks in *c* 1914 would have been at the cutting edge of regenerative technology. The chamber lay below the furnace and was heated by gas power generated in a nearby chamber and the exhaust gases exiting the furnace. The entire chamber was filled with a lattice work of specially designed fire bricks with double hollows in them which sat on small spacer tiles and were stacked from floor to ceiling. The sloping passages at the north and south sides of the chamber controlled, via fans, the direction of the flow, which was reversed regularly in a similar fashion to that in the regenerative flues seen in Area 3. Although no dividing wall was observed during excavation there would have originally been a wall splitting the chamber into north and south halves. The wall, along with most of regenerative brick lattice work, had been removed by disturbance associated with the remediation work in 2000. It was observed in an area were the heat retaining bricks had survived below a later concrete base that at the bottom of the bricks were a series of interlocking cast iron plates. It was estimated by Siemens that this type of structure made the furnace 80% more efficient on fuel.

6.5 BRADFORD MILL

6.5.1 The earliest cartographic evidence for this mill is provided by the tithe map of 1845, which shows two principal buildings and a probable gasometer. However the footprint of these structures lay beyond the boundary of the present study area. Excavation in this part of the site was focused on a building depicted on late nineteenth-century mapping, seemingly representing an expansion of the mill complex.

6.5.2 At the western end of the works the stone-flag floor (***5013***) appeared to represent an engine bed, perhaps with the engine sitting between the two parallel rows of brick foundations within the stone surface. The level of disturbance in this area precluded an accurate picture to be formed for the set-up of the engine and associated machinery, but it seems possible that the flywheel may have been positioned to the north, driving lineshafting that ran behind the weighbridge, and powering the machinery to the east. This would all have been overhead lineshafting carried by brackets on cast-iron columns. The processing area to the east contained the settings for several machines, which were presumably powered by lineshafting.

6.5.3 The remains of the weighbridge uncovered within the excavated trench were of a similar construction to the rest of the early phase of the building, with some later alterations. This aligned with a short branch of Phillips Park Road to the south, suggesting a covered loading bay. The two passages leading into the weighbridge itself from the north and east can also be related to its original phase of construction, and presumably facilitated access to the mechanism for maintenance purposes.

6.5.4 Later modifications to the building included improvements to the weighbridge system, and in particular to a small structure to the immediate north-east of the weighbridge. The original power system in the western part of the building appears to have been replaced, probably by a diesel engine situated within a brick housing (***5015***), and the floor surfaces rebuilt in engineering brick with drains inserted through the original stone engine bed. It also appears that at some point the function of the processing area to the east was altered with the machines removed and a new floor surface laid over the original stone one. This floor (***5007***) was very rough and constructed from re-used bricks, possibly from demolition within the western part of the works during the late nineteenth-century remodelling. The rough nature of the construction suggests that the area was used for storage.

6.5.5 The road to the south was Phillips Park Road, which was laid in 1863. It ran east/west from Mill Street, opposite the entrance to African Mills, to the canal arm to the west. It was built from granite sets laid onto a deep base of hardcore and clay with bitumen, and had three brick sewers running beneath it. This sturdy construction shows it was built for heavy traffic and was intended to be a long term feature with workers' housing being built along its south side during the 1860s, together with Benson Street, which lay parallel.

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6.6 WORKERS' HOUSING

6.6.1 Workers' housing had been constructed along Benson Street in the early 1860s, with further housing erected on Kara Street and Iceland Street between 1890 and 1904. No physical remains of the workers' housing survived in Area 2, and only very fragmentary remains were revealed in the southern part of Area 5. These had survived as small 'islands' of earlier remains, set within the natural clay geology between the concrete floors of the twentieth-century ironworks. These remains comprised two square brick 'pits' with concrete bases, both of unknown function but commonly observed within workers' housing, the flag floor and two brick walls of what appeared to be an alley between two houses, and the east and west walls of a cellar with a possible fireplace in it.

6.6.2 The lack of survival of housing remains above the remains of the earlier Park Mills within Area 2 may be due to the flimsy construction of late nineteenth-century workers' housing compared to that of the slightly earlier mill. Although there is a suggestion that at least some of the houses around Phillips Park Road were cellared (walls ***5005*** and ***5006***), it is clear that those around Area 2 were not.

6.7 PARK MILLS

6.7.1 Park Mills was established in the early 1860s as a cotton-weaving factory. The surviving foundations of the mill that were uncovered during the excavation comprised hand-made bricks, bonded with a crumbly, white, lime-based mortar, characteristic of mid-nineteenth-century construction.

6.7.2 The excavation uncovered the south-east part of Park Mill with the external south-east and north-east walls surviving, although heavily disturbed. The later expansion of Bradford Ironworks across the site had caused a lot of disturbance and three large cuts for concrete piles had removed any remains at the western side of the area. A series of smaller concrete stanchions with brick above running across the southern side of area 2 can also be related to this phase of expansion.

6.7.3 A brick-floored corridor appeared to extend around the inner perimeter of the building with a stone-flagged corridor running south-west into the centre of the building and stepping down to the south-west. It may be that the north-east side was the entrance way into the mill, and the stone-flagged corridor the route into the weaving sheds themselves.

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APPENDIX 1: PROJECT DESIGN

March 2010

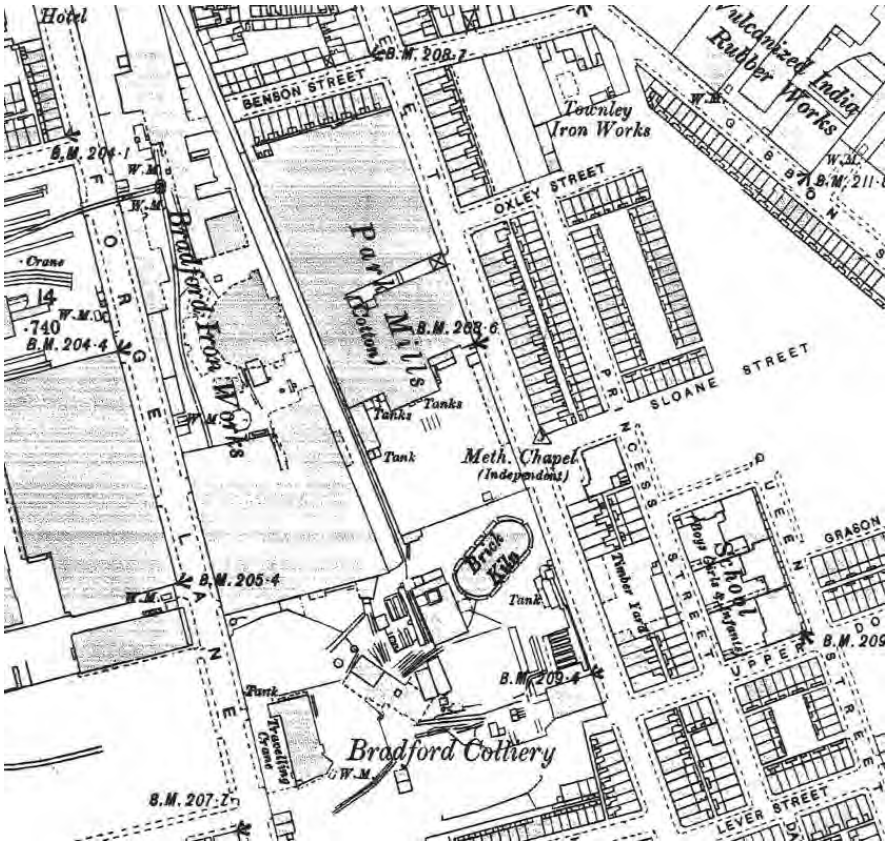
Oxford Archaeology North

SPORTCITY,

BRADFORD,

MANCHESTER

ARCHAEOLOGICAL EXCAVATION PROJECT DESIGN



Extract from the Ordnance Survey map of Bradford, 1894

Proposals

The following project design is offered in response to a request from Mr M Grace, of Turner and Townsend Project Management Ltd, acting on behalf of Manchester City Council, for a programme of archaeological excavation in advance of the proposed remediation of land bounded by bounded by Manchester City football stadium, Alan Turing Way, the Ashton Canal and Ashton New Road, in the Bradford area of Manchester.

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1 BACKGROUND

1.1 CIRCUMSTANCES OF PROJECT

1.1.1 In January 2010, Oxford Archaeology North (OA North) was commissioned by Manchester City Council to carry out an archaeological investigation of land bounded by the Manchester City football stadium, Alan Turing Way, the Ashton Canal and Ashton New Road, in the Bradford area of Manchester (centred on SJ 869 986). The programme of archaeological work was required to inform and support an application by Manchester City Council to carry out a proposed scheme of remediation, which will inevitably cause major disturbance to existing ground levels and the destruction of any buried remains that may survive across the site.

1.1.2 The site is of considerable archaeological interest, as it formed an important centre of industrial activity from the mid-nineteenth century onwards. In particular, the sites of the moat associated with the medieval Bradford Old Hall, the former Bradford Colliery, Bradford Ironworks, and two nineteenth-century textile mills lie within the area of proposed remediation, and any below-ground remains of these sites would be of considerable industrial and social archaeological interest if they survive.

1.1.3 In order to secure archaeological interests, the County Archaeologist for Greater Manchester, who provides archaeological planning advice to Manchester City Council, recommended that a programme of archaeological investigation was carried out to support the application for the remediation of the site. The scope of the archaeological works required was specified in a brief devised by the County Archaeologist which, in the first instance, allowed for detailed historical research of the application site, and the excavation of 11 targeted evaluation trenches to establish the presence or absence of buried remains.

1.1.4 The recommended programme of archaeological investigation was carried out by OA North in January 2010, and confirmed that buried remains of archaeological interest survive *in-situ* across the site. In particular, buried structural remains of buildings pertaining to the former colliery and its associated brick works, the former Bradford Ironworks, the steam power-plant of Parks Mill, and Bradford Mill were exposed. Following consultation with the County Archaeologist for Greater Manchester, it was recommended that these buried remains merited a programme of further archaeological investigation. This project design is for the appropriate scheme of works.

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1.2 OXFORD ARCHAEOLOGY

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

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

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

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2 AIMS AND OBJECTIVES

2.1 ACADEMIC AIMS

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

2.2 OBJECTIVES

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

- ***Archaeological Excavation:*** to open up five excavation areas (Figure 1), which will be targeted on the buried remains of archaeological interest that were exposed in the evaluation trenches;
- ***Post-excavation and Report Production:*** the site records, finds and any samples from the excavation programme outlined below will form a checked and ordered site archive as outlined in the English Heritage guideline document *Management of Archaeological Projects* (2nd edition, 1991). Following compilation of the project archive a report will be produced. This report will make recommendations publication of the results, as appropriate;
- ***Archive Deposition:*** the results of the excavation will form the basis of a full archive to professional standards, in accordance with current English Heritage guidelines and the *Guidelines for the Preparation of Excavation Archives for Long Term Storage* (UKIC 1990). The project archive represents the collation and indexing of all the data and material gathered during the course of the project;
- ***Dissemination:*** the results obtained from the excavation will be disseminated to the wider public via an appropriate level of publication.

3 METHOD STATEMENT

3.1 SITE SET-UP

3.1.1 The following work programme is submitted in line with the aims and objectives summarised above. As an initial stage in the programme of works, the area for archaeological investigation, including the part of the site that will be used for spoil stockpiling, will be fenced off using Herras-type fencing. A CAT-Scan of the site will be carried out to locate any services present within the five excavation areas, and welfare facilities will be delivered.

- Area 1 lies in the south-eastern part of the site, and it targeted on the remains of the headstock area of Bradford Colliery and the colliery brickworks (Figure 1). Any buried remains of the colliery buildings around the headstock, which are likely to include the foundations for at least two generations of steam-powered winding engines for both the up and down shafts, their associated steam-raising plant, ventilation equipment, and headstocks. The proposed excavation area will measure 100 x 35m, plus a small addition to investigate the remains of a building that was exposed partially in evaluation Trench 10. The depth of the excavated trench is likely to range from 0.5m along the eastern side, to depths in excess of 2m along the eastern side;

- Area 2 is targeted on the steam-power plant for the former Park Mill, and is intended to investigate further the remains exposed in the eastern part of evaluation Trench 7. It is proposed that an area measuring 25 x 20m will be excavated to a depth of approximately 1.75m below the modern ground surface;

- Area 3 lies in the eastern part of the site, and is targeted on one of the main processing areas within the former Bradford Ironworks. It is intended to investigate further the buried remains of a network of flues, which were exposed in evaluation Trench 6, and clearly form part of the forge area within the ironworks, as shown on a plan of 1879. The proposed area will measure 65 x 55m, and will be excavated to a depth of approximately 2m below the modern ground surface;

- Area 4 is targeted on another, later, primary processing area within the former Bradford Ironworks. It is intended to investigate further the buried remains of a system of flues, which were exposed in evaluation Trench 3 and 12. The proposed area will measure 35 x 25m;

- Area 5 lies in the northern part of the site, and is targeted on a section of the medieval moat associated with Bradford Old Hall. It is also intended that the trench further investigates elements of the early nineteenth-century textile factory that occupied this part of the site and was exposed in evaluation Trench 1, and the eastern edge of the canal arm. The proposed area will measure 50 x 30m, and will be excavated to a depth of approximately 1m below the modern ground surface, although a section across the medieval moat could be considerably deeper.

3.2 FIELDWORK

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

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

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

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

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

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

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

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

3.2.9 ***Environmental Sampling:*** the strategy for palaeo-environmental sampling will be developed on site, in consultation with appropriate specialists, as necessary. The environmental sampling strategy will therefore evolve from as discussion between those specialists and the field team and will be in accordance with current best practice. In broad terms, however, the sampling strategy will be aimed at recovering palaeo-botanical, palaeo-zoological and pedological evidence. It is anticipated that environmental samples (bulk samples of 30 litres volume, to be sub-sampled at a later stage) will be collected from stratified undisturbed deposits and will particularly target negative features.

3.3 POST-EXCAVATION

3.3.1 Post-excavation work will comprise the following:

- checking of drawn and written records during and on completion of fieldwork;
- production of a stratigraphic matrix of the archaeological deposits and features present on the site, if appropriate;
- cataloguing of photographic material and labelling of slides, which will be mounted on appropriate hangers;
- cleaning, marking, bagging and labelling of finds according to the individual deposits from which they were recovered. Any finds requiring specialist treatment and conservation will be sent to an appropriate Conservation Laboratory. Finds will be identified and dated by appropriate specialists;
- assessment of all artefacts, biological samples and soils recovered from the site, providing recommendations for further analysis. In particular, more detailed analysis of any paleo-environmental material recovered from the moat associated with the medieval Bradford Hall may be required, together with some application of scientific dating techniques, such as radio-carbon assay. Consideration will also be given to possible investigative procedures such as pottery residue analysis and glass composition;
- assessment of any technological residues recovered will be undertaken, providing recommendations for further analysis.

3.4 ARCHIVE/REPORT

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

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

3.4.3 ***Report:*** four bound and one unbound copy of a written synthetic report will be submitted to the archaeological curator (GMAU) for comment within six weeks of completion of fieldwork. The report will include:

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

3.5 COMMUNITY INVOLVEMENT

3.5.1 An integral element of the archaeological investigation will be disseminating the results to the local community and wider public. The most appropriate means of achieving this will require discussion once the excavation is in progress, allowing the health and safety implications of inviting the public on to site to be assessed. Other options may include public presentations, or sessions delivered to local schools. As a minimum, however, OA North will ensure that laminated information boards are placed on the boundary fencing throughout the course of the excavation. The information boards will provide a summarised account of the historical development of the area, and the purpose of the excavation. The possibilities of linking the boards to a temporary exhibition in the Sportcity Visitor Centre will also be explored and discussed with the Sportcity Estate Manager.

3.5.2 In addition, guided tours can be held for special interest groups during the course of the excavation programme. These groups may include local archaeological and historical societies, such as MRIAS, representatives of Manchester planning department, and Manchester City Council senior management and staff.

3.6 PUBLICATION

3.6.1 It is anticipated that the results obtained from the programme of archaeological excavation will be of considerable local and regional interest, and will merit formal publication. The precise format of this publication will need to be discussed further with the County Archaeologist towards the end of the excavation programme once the nature and extent of the archaeological resource of the site has been established more precisely. However, a local booklet in the '*Greater Manchester's Past Revealed*' series is most likely to represent an appropriate form of publication.

3.7 OTHER MATTERS

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

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

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

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

3.7.4 A written risk assessment will be undertaken in advance of project commencement, and copies will be made available on request to all interested parties.

3.7.5 ***Insurance:*** evidence of Public Liability Insurance to the minimum value of £5m, and Professional Indemnity Insurance to the minimum of £2m, will be provided prior to the commencement of the archaeological works.

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

3.7.7 ***Contingencies:*** if there are more complex or generally deeper deposits than can be anticipated from the evidence available, there may need to be a corresponding increase in costs, which will be subject to agreement with the Client and the archaeological curator. Similarly, there will be a recourse to a contingency if there is any requirement to fully excavate any human remains

that may be present. These contingency costs are in accordance with the Institute for Archaeologists' guidance.

3.7.8 ***Confidentiality:*** the report is designed as a document for the specific use of the Client, for the particular purpose as defined in the project design, and should be treated as such; it is not suitable for publication as an academic report, or otherwise, without amendment or revision.

4 WORK TIMETABLE

4.1 An eight-week period should be allowed to carry out the excavation of the proposed areas.

4.2 A report will be submitted within six weeks of the completion of the fieldwork.

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

5 STAFFING PROPOSALS

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

5.2 The excavation is likely to be directed by **Chris Wild BSc** (OA North Project Officer). Chris has developed considerable expertise of industrial buildings and excavating historic industrial sites, particularly in Manchester, since joining OA North in 1991. His major role is involved in buildings recording and excavation, most especially relating to vernacular and industrial usage. In recent years, Chris was instrumental in the archaeological recording and excavation requirements associated with the Murrays' Mills Major Repair Project in Manchester, and co-authored the academic monograph that represented the culmination of the project. Chris has also carried out numerous archaeological evaluations and excavations of workers' housing in Manchester

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in recent years, including those on Bengal Street, George Leigh Street and Bradley Street in Ancoats, and Minshull Street in Piccadilly. Most recently he completed a major programme of archaeological works in the Angel Meadow area of Manchester, which was again focused on the buried remains of eighteenth- and nineteenth-century workers' housing. Chris is also an accomplished archaeological surveyor, with extensive experience of total station survey, reflectorless total station survey using the TheoLT AutoCAD interface, and GPS survey. Chris also directed the programme of initial evaluation trenching at Sportcity.

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

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

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

6 MONITORING

6.1 Monitoring meetings will be established with the Client and the archaeological curator at the outset of the project. Monitoring of the project will be undertaken by the Greater Manchester County Archaeologist, or his representative, who will be afforded access to the site at all times.

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ILLUSTRATIONS

Figures

Figure 1: Site location

Figure 2: Location of the excavation areas

Figure 3: Location of the excavation areas superimposed on Johnson's map of 1820

Figure 4: Location of the excavation areas superimposed on the Ordnance Survey 6": 1 map of 1848

Figure 5: Location of the excavation areas superimposed on the Ordnance Survey 25": 1 mile map of 1893

Figure 6: Location of the excavation areas superimposed on the Ordnance Survey 25": 1 mile map of 1908

Figure 7: Location of the excavation areas superimposed on the Ordnance Survey 25": 1 mile map of 1922

Figure 8: Location of the excavation areas superimposed on the Ordnance Survey 25": 1 mile map of 1932

Figure 9: Location of the excavation areas superimposed on the Ordnance Survey map of 1951

Figure 10: Detailed excavation plan of Area 1, superimposed on the Ordnance Survey 1:500 map of 1891

Figure 11: Detailed excavation plan of Area 1, superimposed on an early twentieth-century plan of Bradford Colliery

Figure 12: Detailed excavation plan of Area 1, superimposed on a plan of Bradford Colliery of *c* 1930

Figure 13: Detailed excavation plan of Area 2, superimposed on the Ordnance Survey 1:500 map of 1891

Figure 14: Detailed excavation plan of Area 3, superimposed on a plan of Bradford Ironworks of 1873

Figure 15: Detailed excavation plan of Area 3, superimposed on the Ordnance Survey 25": 1 mile map of 1908

Figure 16: Detailed excavation plan of Area 4, superimposed on the Ordnance Survey 25": 1 mile map of 1922

Figure 17: Detailed excavation plan of Area 5, superimposed on the Ordnance Survey 25": 1 mile map of 1893

Figure 18: Detailed excavation plan of Area 5, superimposed on the Ordnance Survey 25": 1 mile map of 1922

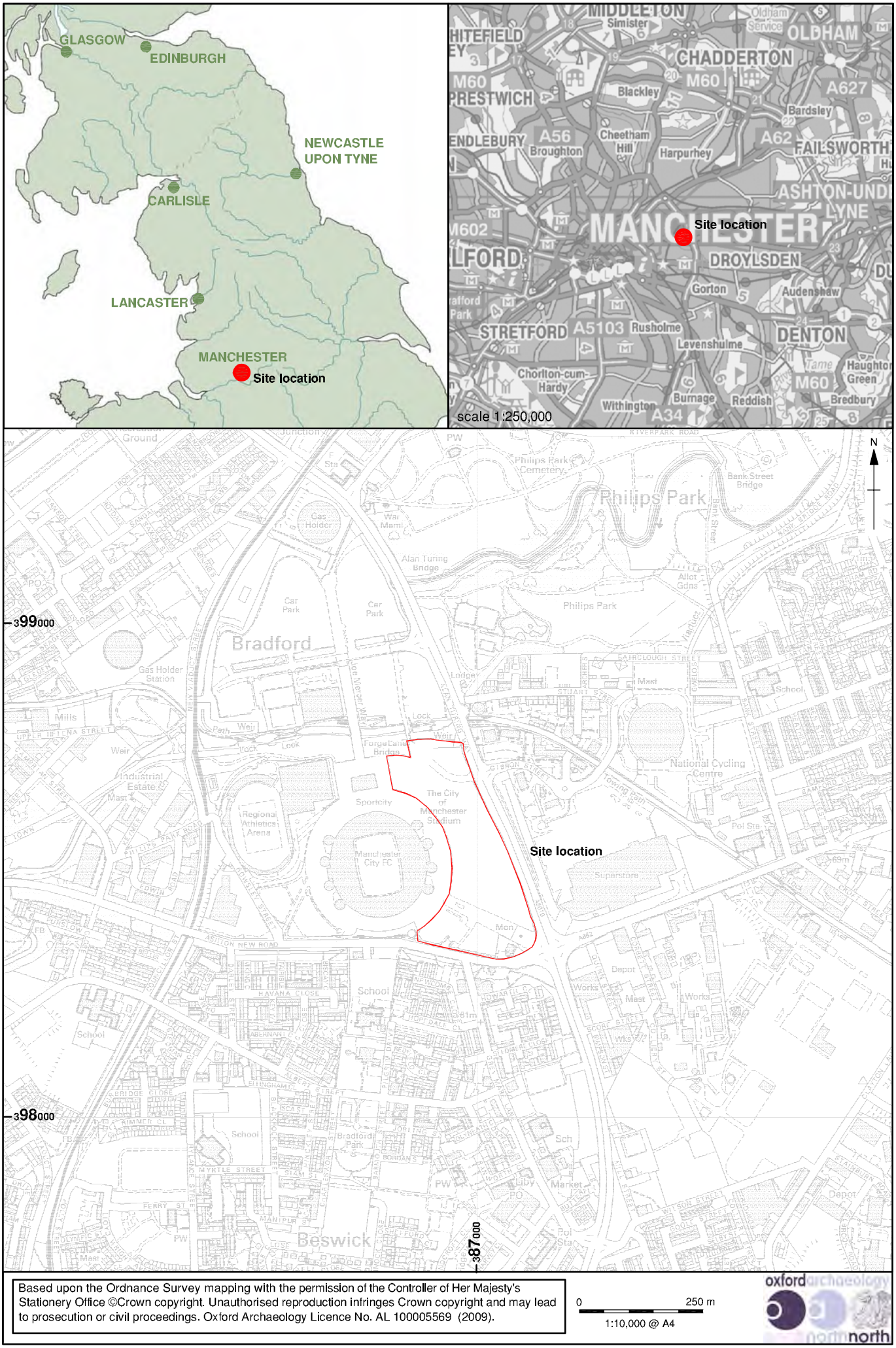


Figure 1: Site location

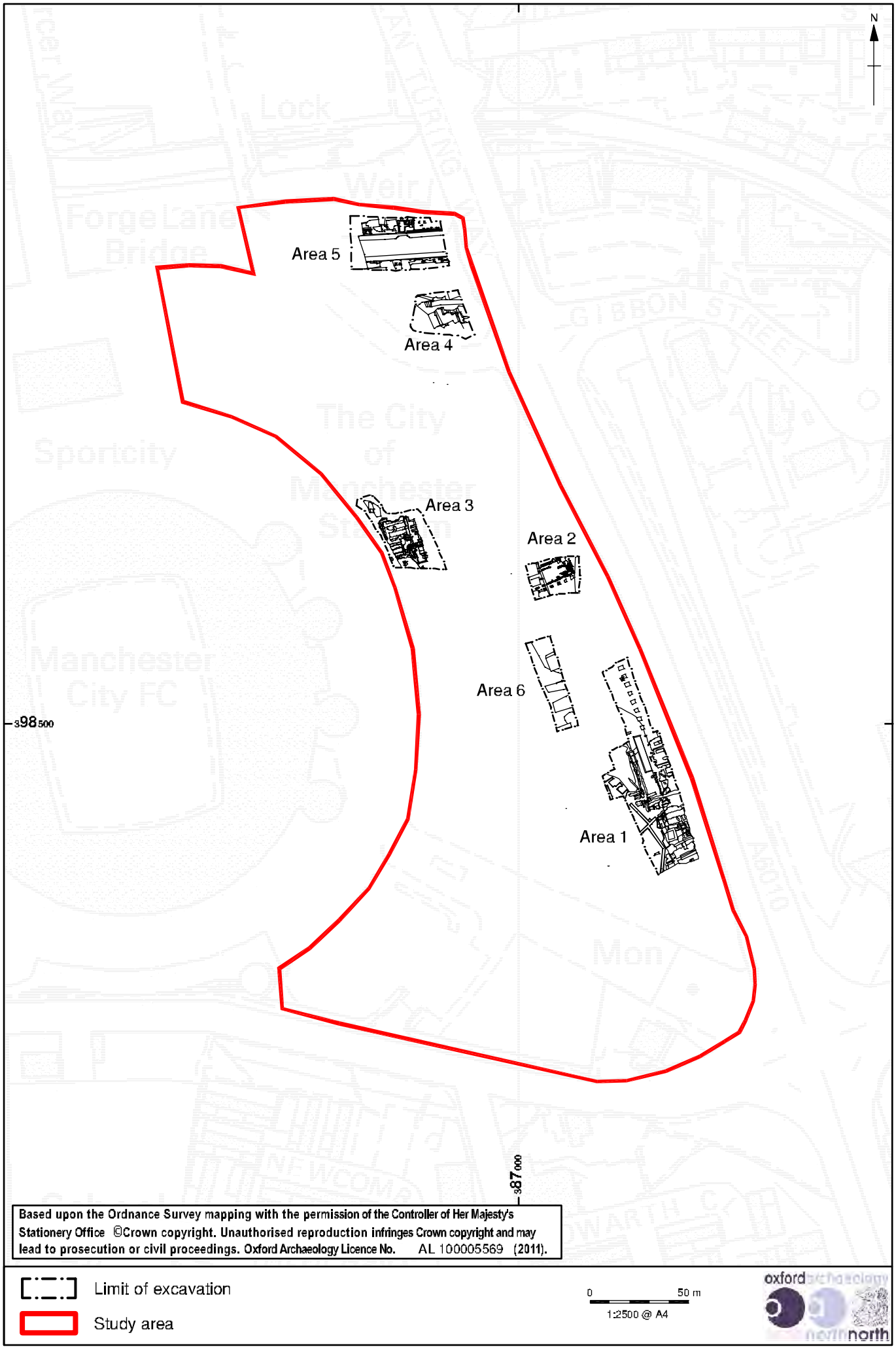
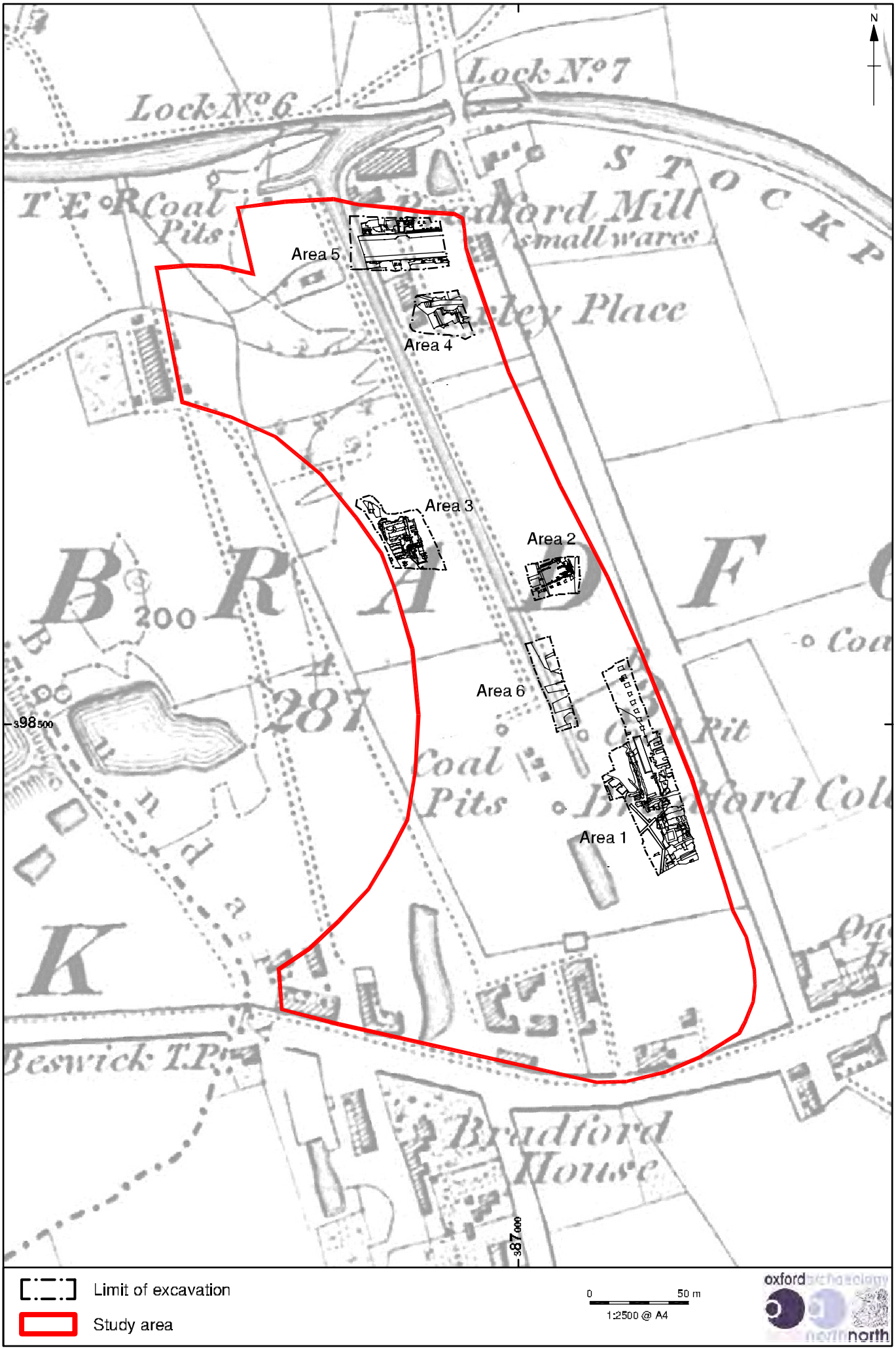


Figure 2: Location of the excavation areas



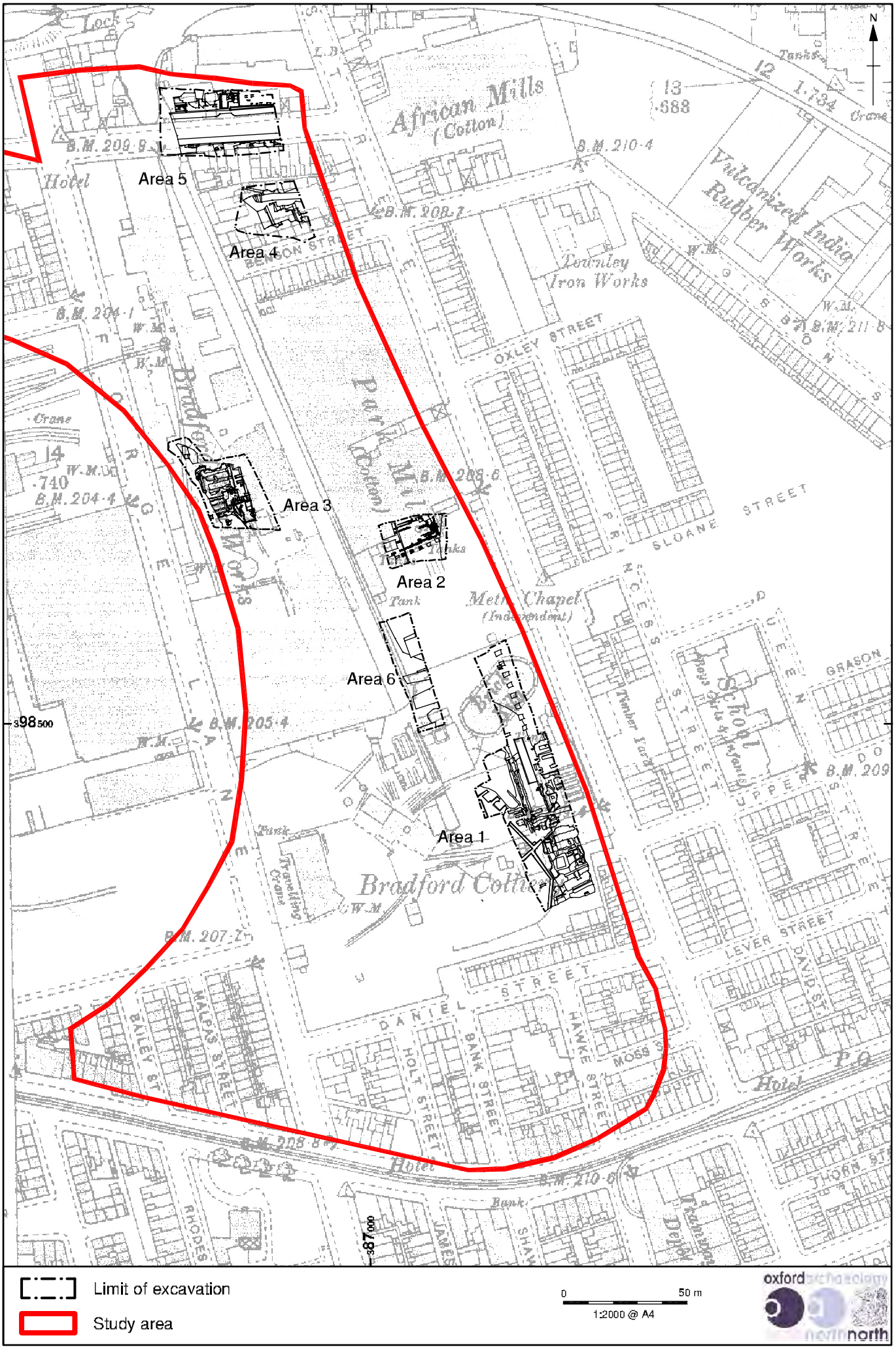
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Figure 3: Location of the excavation areas superimposed on Johnson's map of 1820



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Figure 4: Location of the excavation areas superimposed on the Ordnance Survey 6":1 mile map of 1848



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Figure 5: Location of the excavation areas superimposed on the Ordnance Survey 25":1 mile map of 1893

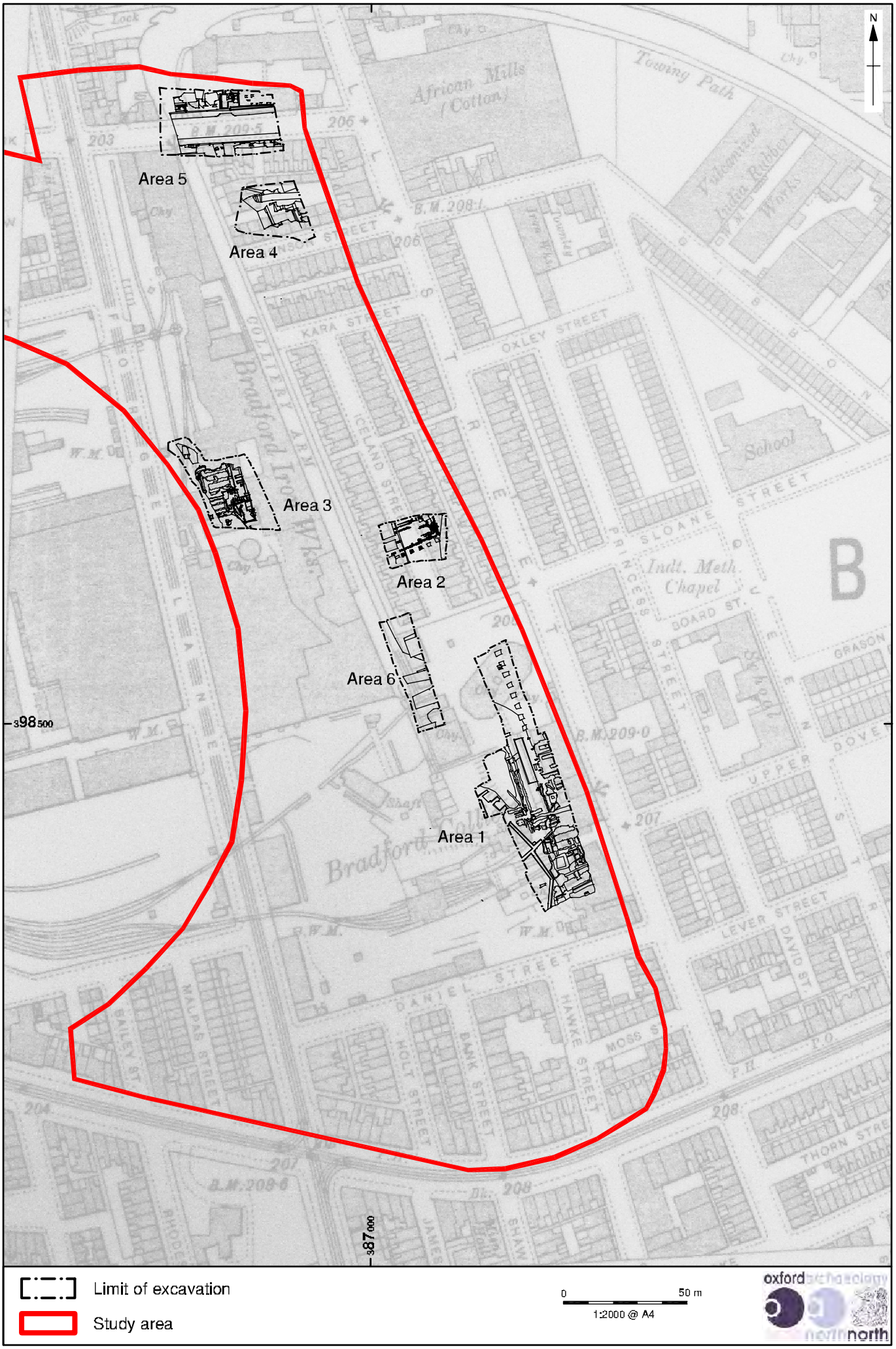
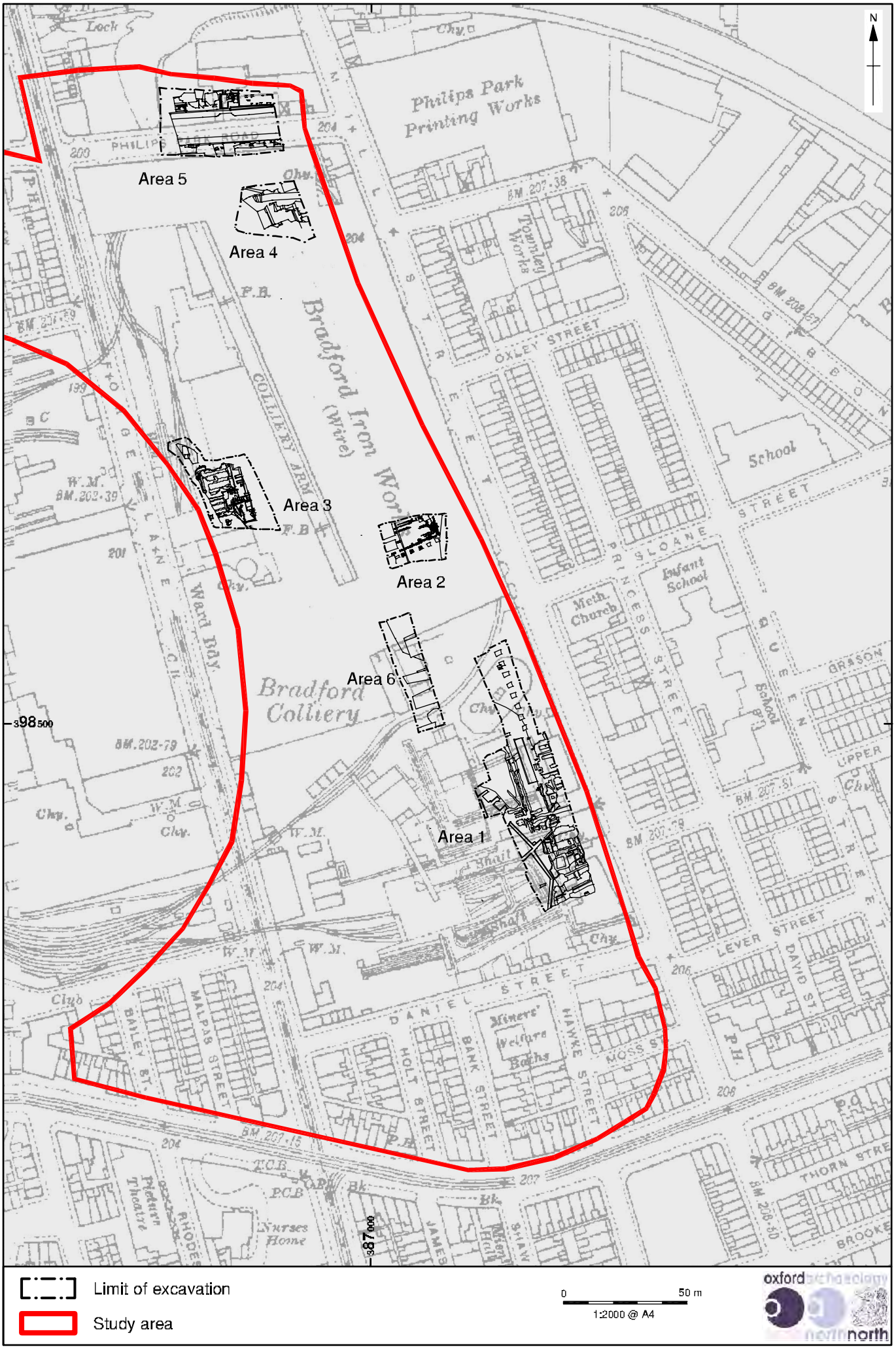


Figure 6: Location of the excavation areas superimposed on the Ordnance Survey 25":1 mile map of 1908



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Figure 7: Location of the excavation areas superimposed on the Ordnance Survey 25":1 mile map of 1922



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Figure 8: Location of the excavation areas superimposed on the Ordnance Survey map of 1932

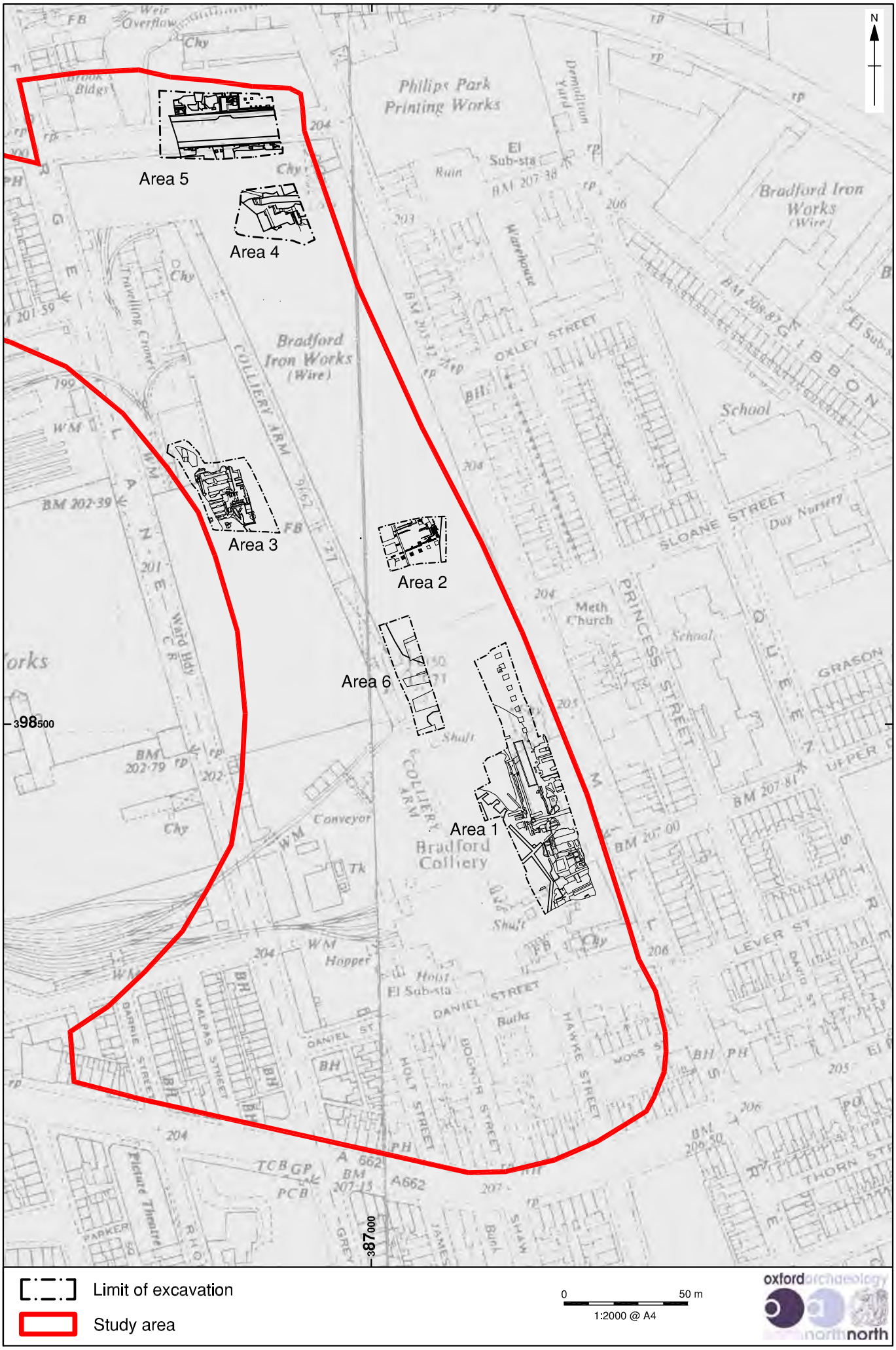


Figure 9: Location of the excavation areas superimposed on the Ordnance Survey map of 1951

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Figure 10: Detailed excavation plan of Area 1, superimposed on the Ordnance Survey 1:500 map of 1891

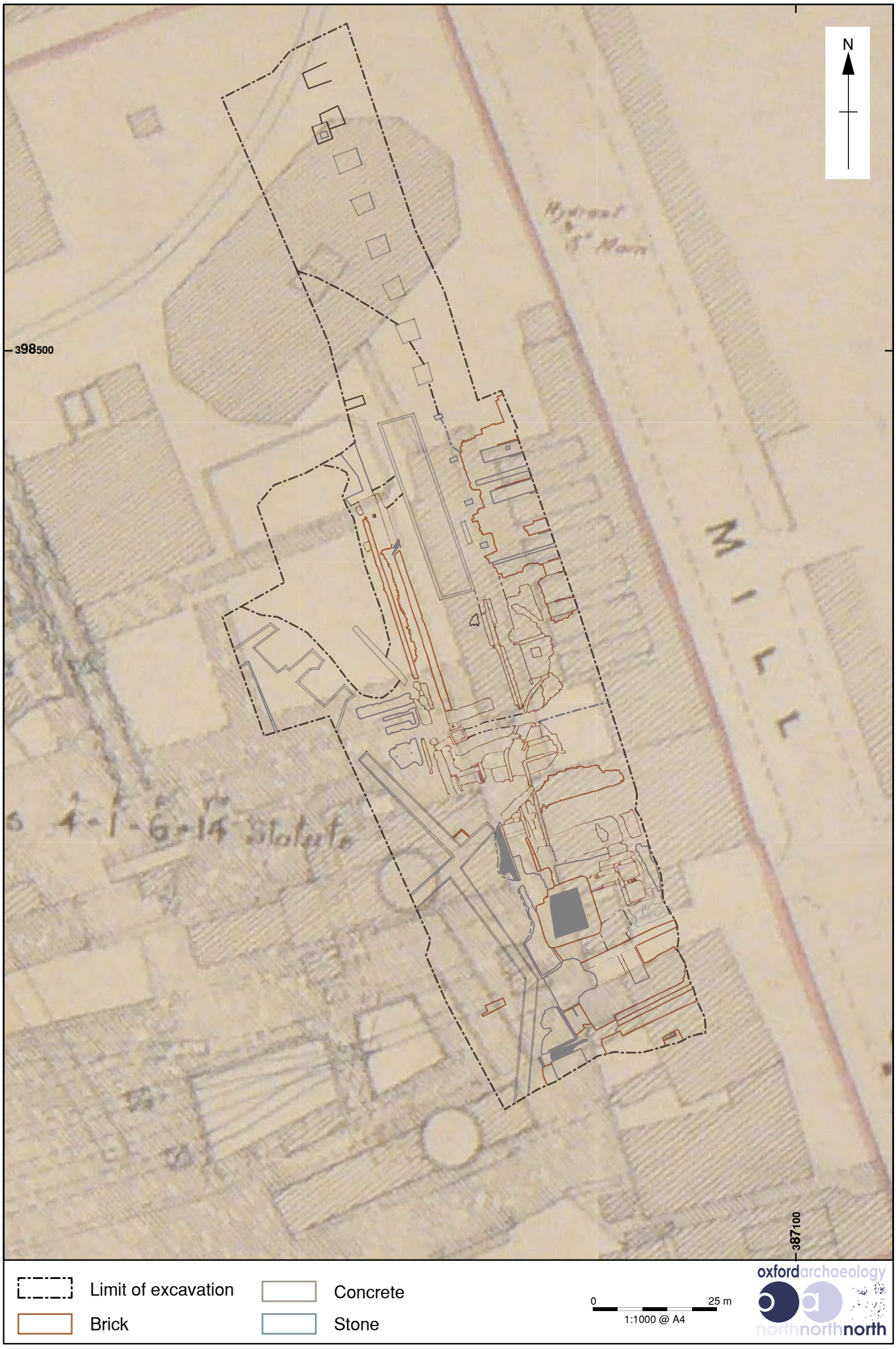


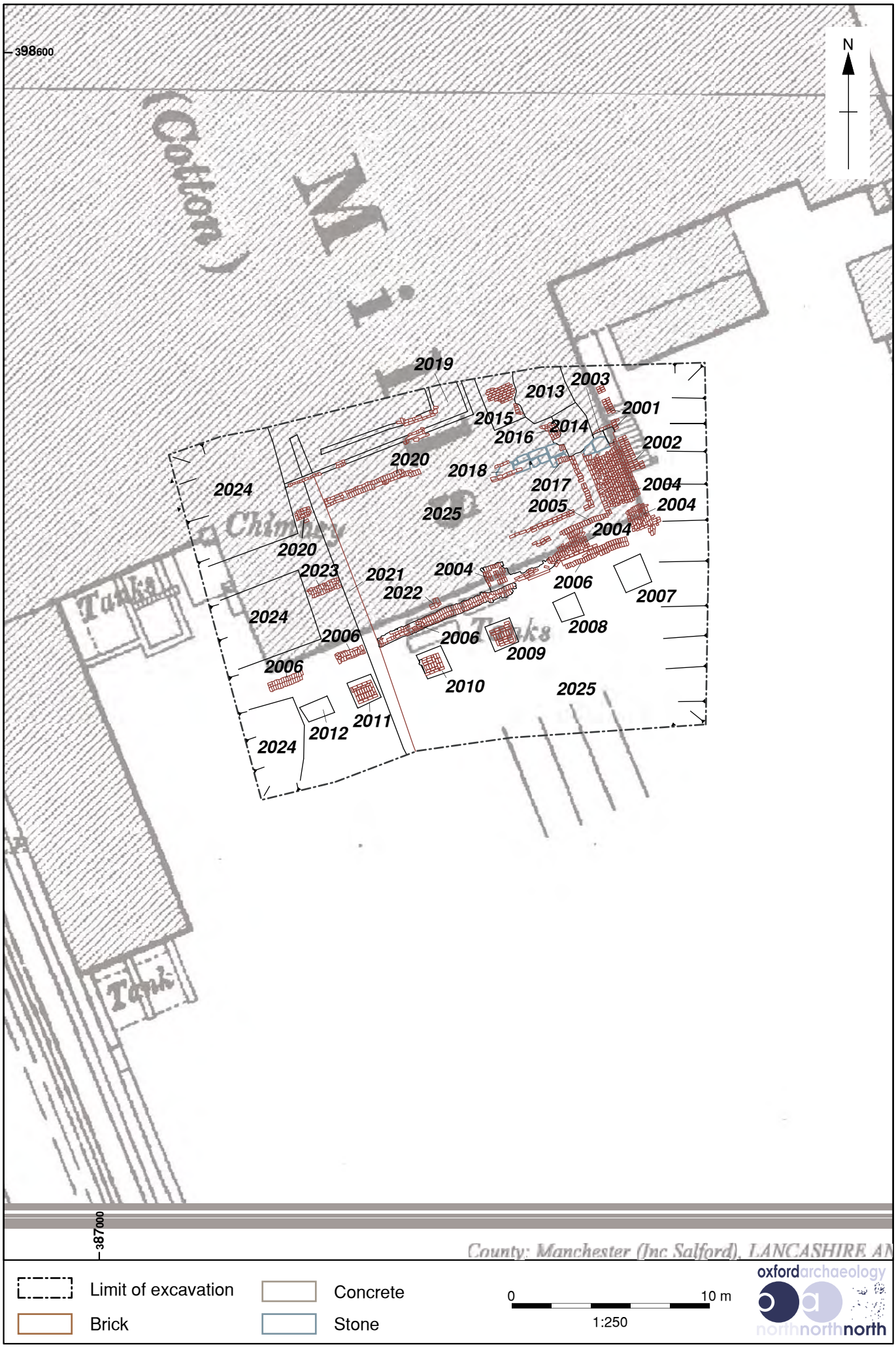
Figure 11: Detailed excavation plan of Area 1, superimposed on a early twentieth-century plan of Bradford Colliery

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Figure 12: Detailed excavation plan of Area 1, superimposed on a a plan of Bradford Colliery *c* 1930

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Figure 13: Detailed excavation plan of Area 2, superimposed on the Ordnance Survey 1:500 map of 1891



Figure 14: Detailed excavation plan of Area 3, superimposed on a plan of Bradford Ironworks of 1873

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Figure 15: Detailed excavation plan of Area 3, superimposed on the Ordnance Survey 25":1 mile map of 1908

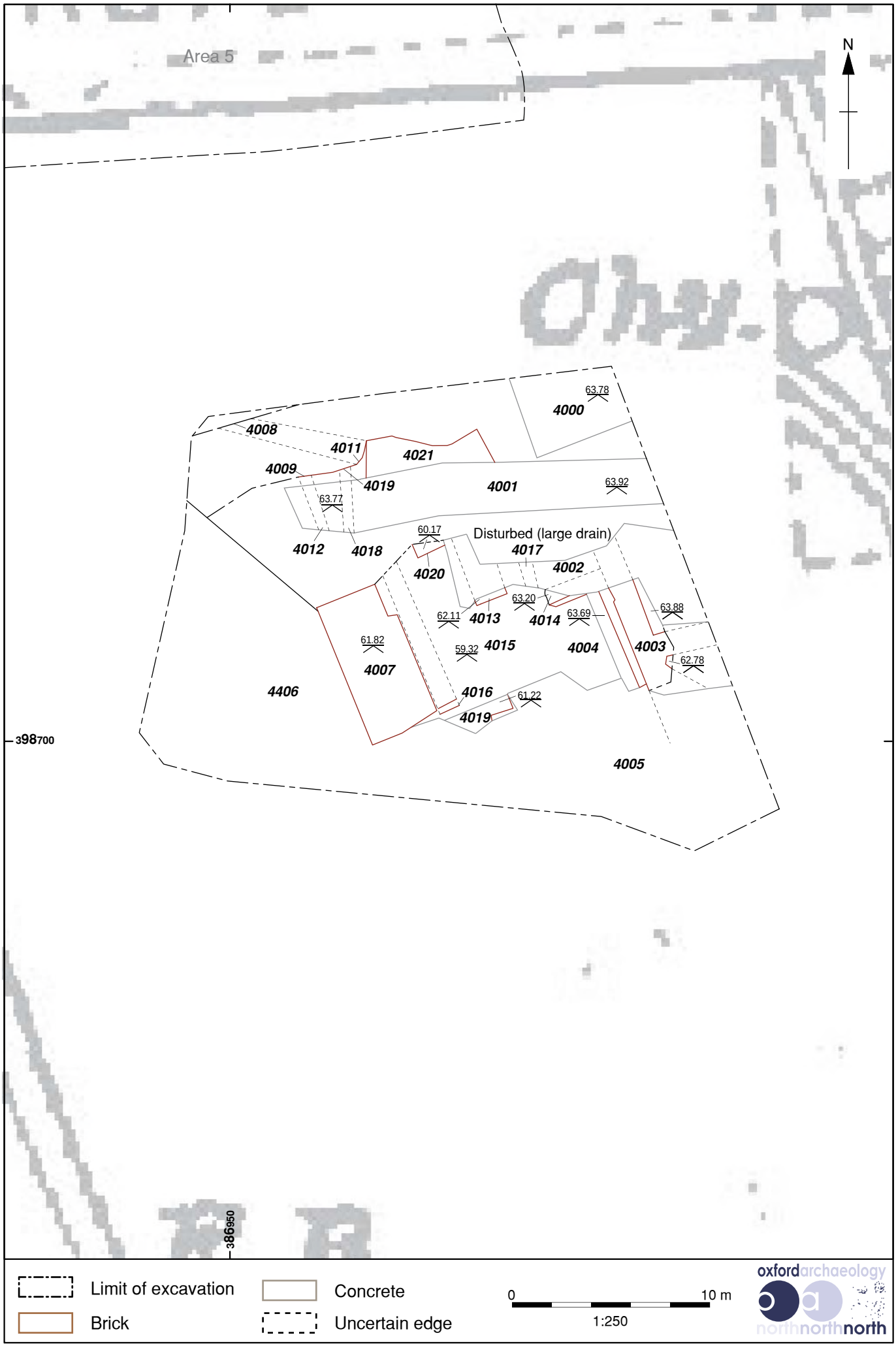


Figure 16: Detailed excavation plan of Area 4, superimposed on the Ordnance Survey 25":1 mile map of 1922

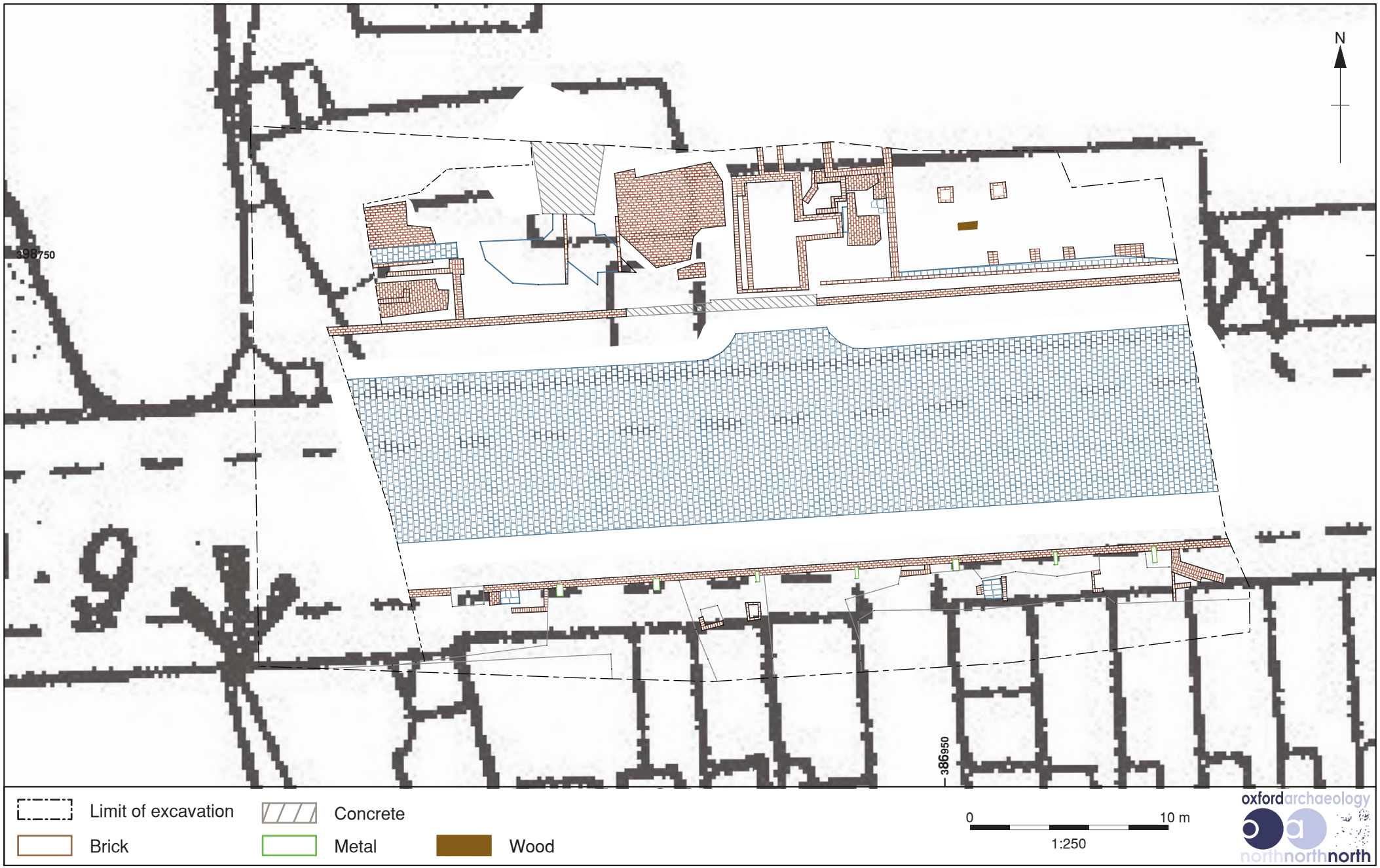


Figure 17: Detailed excavation plan of Area 5, superimposed on the Ordnance Survey 25": 1 mile map of 1893

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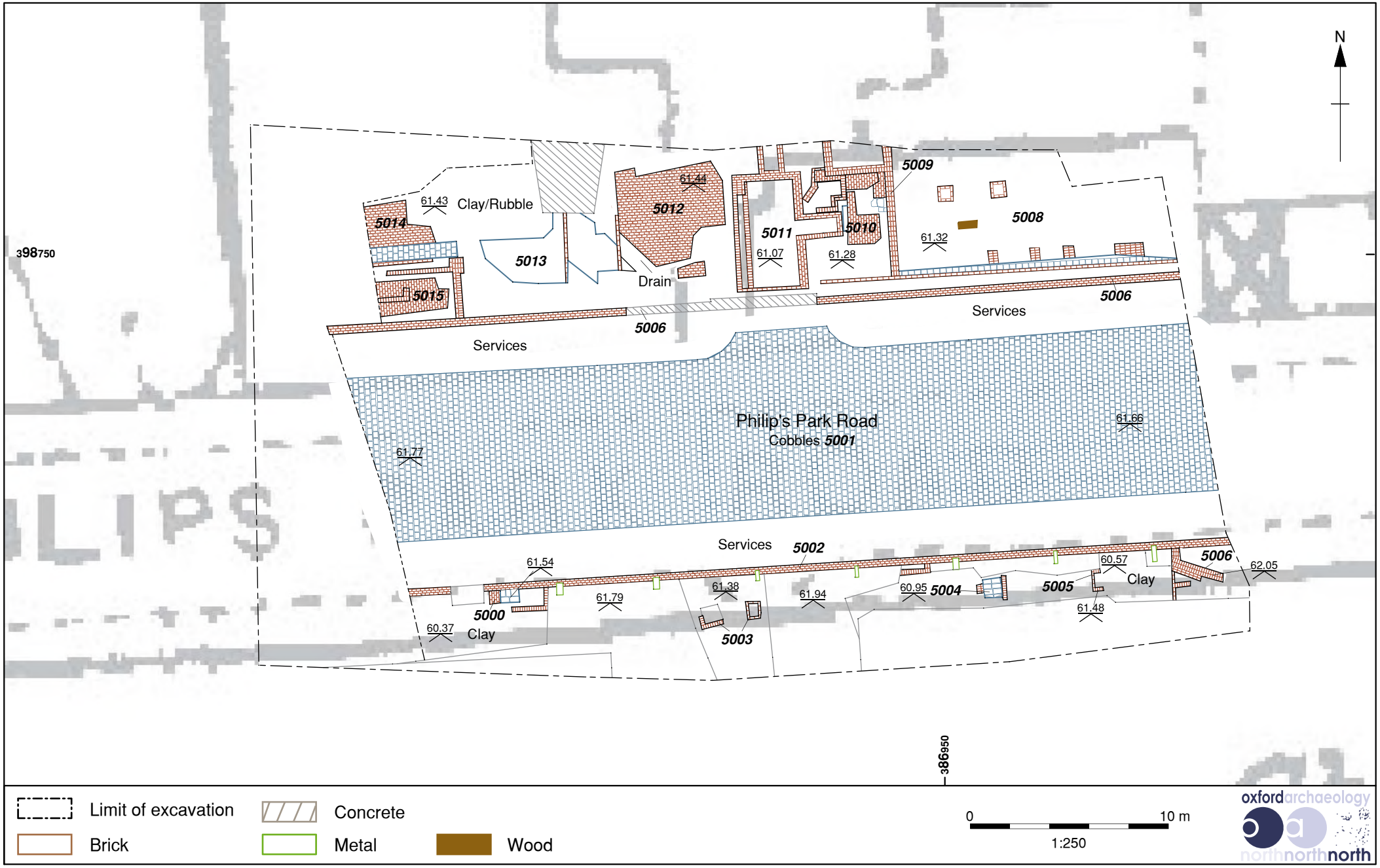


Figure 18: Detailed excavation plan of Area 5, superimposed on the Ordnance Survey 25": 1 mile map of 1922



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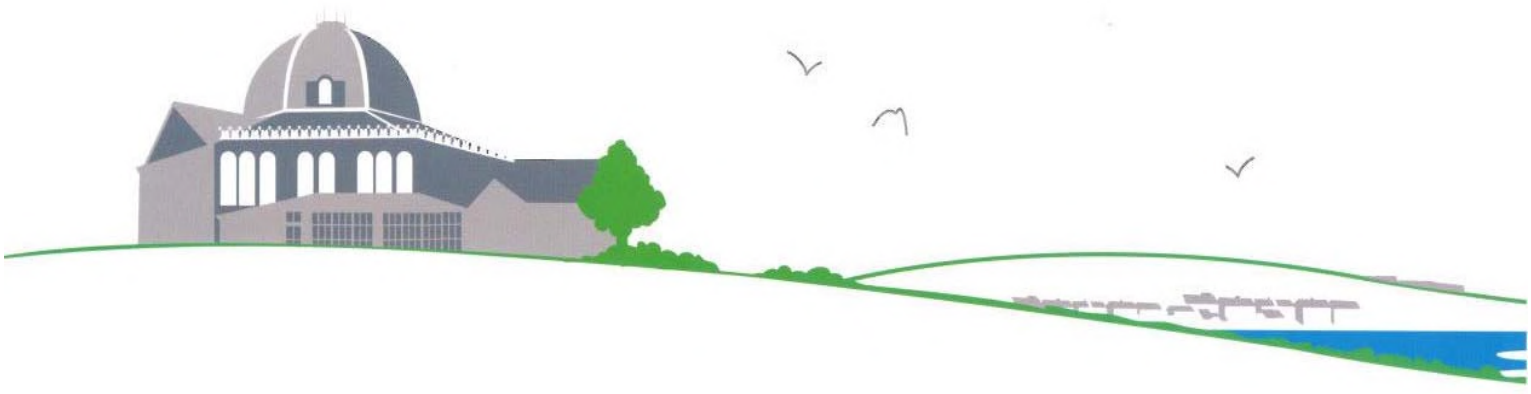
Appendix 4 Phase 1 Ecology Survey

Penny Anderson Associates Ltd
CONSULTANT ECOLOGISTS

OVG EUROPE LIMITED

PROJECT BRADFORD, MANCHESTER

ECOLOGICAL APPRAISAL



OVG EUROPE LIMITED

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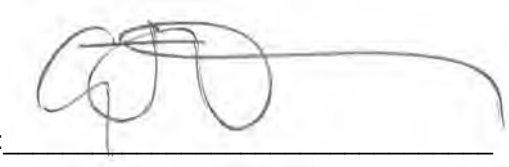
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This project has been undertaken in accordance with PAA policies and procedures on quality assurance.

Signed: 

Penny Anderson Associates Ltd
CONSULTANT ECOLOGISTS

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SUMMARY

Penny Anderson Associates Ltd was commissioned by BuroHappold Engineering on behalf of OVG Europe Limited to carry out an extended Phase 1 habitat survey at a site referred to as Project Bradford, Manchester, where there are proposals for development.

The extended Phase 1 habitat survey was carried out on 21st June 2019. Habitats were assessed based on the plant species present, with the results reported and presented on an annotated Phase 1 habitat survey map. The habitat map details the location and extent of all habitat types recorded within the site boundary.

An additional and important element of the extended Phase 1 habitat survey approach is to look for evidence of protected species being present and to assess the need for further species-specific surveys. A request was made to the Greater Manchester Ecology Unit for records of protected species, priority species and wildlife sites within 2km of the centre of the site to place the site within a wider ecological setting.

Data returned by Greater Manchester Ecology Unit did not identify protected species recorded within the site with the exception of a single record for little ringed plover, a Schedule 1 species, and one for northern lapwing, a Red listed species of conservation concern, just within or close to the site boundary.

No evidence of nesting birds was found during the survey. All breeding birds are protected by law and a recommendation is made that where possible initial works are carried out outside the bird nesting season (1st March to 30th September). If works are outside this period it is recommended that a suitably experienced ecologist check the site no more than 48 hours prior to works to ensure no active nests are present.

The former car park site comprises six main habitats. The middle of the site is stone hardstanding, with very sparse low-growing plants of ephemeral/short perennial species scattered across the bare ground. The ephemeral/short perennial vegetation increases in cover slightly further out from the centre, containing a high proportion of introduced species such as white and ribbed melilot, common michaelmas-daisy and large-flowered evening primrose amongst the patches of bare ground.

This vegetation grades into the species-rich neutral grassland that has recently developed over the car park with increased grass and forb cover. The grassland has a rather open, skeletal structure with small areas of bare ground showing through. White melilot and michaelmas-daisy are still prominent in the sward along with a range of forbs and grasses, including the local Biodiversity Action Plan species, yellow-wort, which occurs rarely.

A number of upright concrete culverts are scattered across the grassland. Young saplings of a range of woody tree and scrub species have established on the grassland, scattered predominantly around the edges and in a conspicuous line across the middle of the site.

Goat willow and silver birch are the most common species with frequent butterfly-bush. More concentrated areas of the young trees/scrub have developed over the neutral grassland along the north, west and south-western edges of the site, with a small amount of Italian alder, which, being non-native suggests that an element of planting has occurred.

A small area of slightly more established semi-natural broadleaved woodland has developed at the south-east edge. Along the eastern boundary is a line of older, planted small-leaved lime trees with grassy ground flora. A dry, vegetated ditch runs along the north and west sides of the site, within the more wooded grassland areas.

There were no potential bat roost features observed in the trees during the survey, although the habitats on site and along the adjacent canal area would provide suitable foraging opportunity for bats.

Floating water-plantain, listed in Schedule 4 of the Conservation (Natural Habitats, etc.) Regulations 1994 and Schedule 8 of the WCA 1981, had been recorded in Ashton Canal. However, the survey found

that the canal was poor in aquatic vegetation. Additional surveys or special measures for other protected species are not considered necessary.

There are no designated wildlife sites within or immediately adjacent to the site and there are no Special Areas of Conservation or Sites of Special Scientific Interest within the 2km search area. A Local Nature Reserve, Clayton Vale, is located just less than 1km to the east of the site. There are three Sites of Biological Interest: Ashton Canal (West), Rochdale Canal Stott's Lane Ducie Street Basin and Bank Bridge Meadow within the search area. All wildlife sites and records of species returned were considered sufficiently distant and isolated from the site to not be impacted by development proposals.

National Planning Policy requires that opportunities for ecological enhancement are sought within all development proposals, moving towards the aim of 'biodiversity net gain'. A number of potential ecological enhancement measures that could be introduced as part of the re-development of the site are provided.

1. INTRODUCTION

1.1 Penny Anderson Associates Ltd (PAA) was commissioned by BuroHappold Engineering on behalf of OVG Europe Limited to carry out an extended Phase 1 habitat survey at a site referred to as Project Bradford off Alan Turing Way, Manchester (hereafter referred to as the 'site'). The survey was commissioned in relation to proposals for the re-development of the site.

1.2 The extended Phase 1 habitat survey also included a desk study for the site and the area within 2km of its centre. This examined all data records for protected sites, habitats and species held by Greater Manchester Ecology Unit (GMEU).

1.3 This report details the results of the desk study and the extended Phase 1 habitat survey.

Site Description

1.4 The site is approximately 2.35ha in extent. Alan Turing Way lies to the east and the Ashton Canal marks the southern boundary with the tramline to the south of the canal. A service road forms the northern boundary and to the west there is a walkway to the Etihad campus with the Manchester Tennis and Football Centre further west. The site is fenced and in most parts has a border of trees and scrub. The site predominantly consists of hardstanding with areas of neutral grassland and ephemeral/short perennial vegetation. There are no buildings or permanent structures.

Legislative Context

1.5 The text below provides a brief summary of the legislation in relation to the species or species group in England and Wales. The original Acts, Regulations and any amendments should be referred to for the precise wording.

1.6 A range of international and national legislation has been established in the UK to protect important nature conservation sites and priority species. At the international level, European Union (EU) Directives require individual member states to implement their conservation provisions nationally for the benefit of Europe as a whole. These Directives have been transposed into UK law by the Conservation of Habitats and Species Regulations 2017; further details can be obtained from the Joint Nature Conservation Committee (JNCC) web site at www.jncc.defra.gov.uk.

1.7 Other international conventions include: the Bern Convention on the Conservation of European Wildlife and Natural Habitats (1979), which requires the maintenance of populations of wild flora and fauna, giving particular protection to endangered and vulnerable species; and the Bonn Convention on the Conservation of Migratory Species of Wild Animals (1979), which requires the protection of migratory species throughout their entire range. The above conventions are implemented in England and Wales via the Wildlife and Countryside Act (WCA) (1981) (as amended) and Countryside and Rights of Way (CRoW) Act 2000. This legislation also protects important habitats and sites such as Sites of Special Scientific Interest (SSSI).

1.8 At the national level, the UK Post-2010 Biodiversity Framework published in 2012 is the Government's response to the Convention on Biological Diversity (2010). It describes the UK's biological resources, commits a detailed plan for the protection of these resources within the UK's devolved framework across England, Wales, Scotland and Northern Ireland. The document identifies future priorities for nature conservation and adopts a more strategic approach, including ecosystem services and sustainability alongside biodiversity. Despite administrative changes following devolution, there is still an underlying objective of protecting and enhancing a range of priority species and habitats, often still based on the objectives and classifications of the original UK Biodiversity Action Plan. Biodiversity 2020 is England's

national biodiversity strategy. Building on the Natural Environment White Paper published in 2011, this provides a means of delivering the international and EU commitments to biodiversity. Under Biodiversity 2020, Priority Species and Habitats referred to are those of 'Principal Importance' for the conservation of biodiversity in England listed on Section 41 (England) of the Natural Environment and Rural Communities (NERC) Act 2006.

1.9 Finally, the National Planning Policy Framework (NPPF), updated 2019, provides guidance for local authorities on the content of the Local Plans and is a material consideration in determining planning applications. Briefly, with an overall focus on sustainable development, the NPPF states that developments should aim to engender positive outcomes for habitats and biodiversity, with a particular focus on the maintenance and creation of ecological networks. Furthermore, the NPPF also states that any planning proposals for which significant negative impacts on biodiversity cannot be avoided, mitigated or compensated for should be refused. The NPPF states that the planning system should contribute to and enhance the natural environment through a range of actions, including:

- protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils;
- recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services; and
- minimising impacts on biodiversity and providing net gains for biodiversity including establishing coherent ecological networks that are more resilient to current and future pressures.

1.10 To protect and enhance biodiversity and geodiversity, plans should:

- Identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national and locally designated sites of importance for biodiversity; wildlife corridors and stepping stones that connect them; and areas identified by national and local partnerships for habitat management, enhancement, restoration or creation; and
- promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity.

Invasive Species

1.11 Certain non-native species that have been introduced into the UK are regarded as being a threat to native biodiversity. Legislative measures have, therefore, been put in place to prevent the spread of these invasive species in the wild.

1.12 Under section 14 of the WCA 1981 (as amended), it is illegal to introduce plants listed under Part II of Schedule 9 of the WCA into the wild or sell these species. Offences include causing the spread of viable plant material or neglecting to contain or appropriately manage non-native species.

1.13 Commonly introduced Schedule 9 species include non-native cotoneaster species, specifically, small-leaved cotoneaster (*Cotoneaster microphylla*) and wall cotoneaster (*C. horizontalis*), Himalayan balsam (*Impatiens glandulifera*) and Japanese knotweed (*Reynoutria japonica*).

Protected Species

1.14 Details of the protected species legislation relevant to this report can be found in Appendix 1.

2. METHODS

Desk Study

2.1 A request for details of protected species, priority species and wildlife sites within 2km of the centre of the site (SJ 86822 98867) was made to GMEU. The desk study consisted of a consultation exercise whereby statutory and non-statutory authorities were contacted to gather local and site-specific ecological information.

Phase 1 Habitat Survey

2.2 The Phase 1 habitat survey was undertaken by Ecologist Caroline Boffey on 21st June 2019. The surveyor has the appropriate practical experience in survey methods and the required knowledge, skills and experience as set out in Chartered Institute of Ecology and Environmental Management (CIEEM) competency guidelines (CIEEM 2013).

2.3 The Phase 1 habitat survey methodology was based on guidance set out in the *Handbook for Phase 1 Habitat Survey* (JNCC 2010). Habitats were assessed based on the plant species present, with the results reported and presented on an annotated Phase 1 habitat survey map (see Figure 1). This habitat map details the location and extent of all habitat types recorded within the site boundaries. Habitat types were recorded, along with an indication of the relative abundance of each plant species using the 'DAFOR' scale (where D = dominant; A = abundant; F = frequent; O = occasional; R = rare). Common names for species are given in the text and a full list with common and scientific names after Stace (2019) is presented in Appendix 2.

Protected Species Assessment

2.4 The habitat survey was 'extended' (Institute of Environmental Assessment 1995, CIEEM 2017) to include a general assessment of the suitability of the site to support any protected or notable species. Features with suitability for any individual species were noted, together with any incidental field signs.

2.5 During the survey any evidence of the trees being used by nesting birds (e.g. old nest material) was also looked for.

Limitations

2.6 It is important to note that the desk study results provide an indication of the species present in and around the site, but do not confirm current presence or absence of any particular species. Protected species are often under-recorded in county wildlife databases.

2.7 The survey was carried out by an experienced surveyor and access was available to the whole of the site. The day was warm and dry. It is, therefore, considered that there were no significant limitations to the survey.

3. RESULTS

Desk Study

3.1 The desk results returned by GMEU are presented as figures in Appendix 3.

Statutory Protected Sites

Special Areas of Conservation

3.2 Special Areas of Conservation (SAC) are protected sites with strict conservation protection, designated under Article 3 of the European Commission Habitats Directive.

3.3 There are no SAC in the 1km search zone for the site.

Sites of Special Scientific Interest

3.4 SSSI are statutory sites designated to support species of plants and animals that find it more difficult to survive in the wider environment. They represent a selection of this country's best wildlife and geological sites, and cover approximately 7% of the terrestrial area of the country (with over 4,000 sites in England).

3.5 There are no SSSI in the search zone for the site.

Local Nature Reserves

3.6 Local Nature Reserves (LNR) are a statutory designation made under Section 21 of the National Parks and Access to the Countryside Act 1949 by principal local authorities. LNR are sites that contain wildlife and/or geological features that are of special interest locally.

3.7 Manchester has seven LNR, one of which falls within the search area: Clayton Vale, located just under 1km to the east of the site. The LNR covers approximately 57ha consisting of unimproved grassland, woodland, ponds and the River Medlock. The vale has two ponds that are Grade C Sites of Biological Importance (SBI) containing common reed (*Phragmites australis*) and supporting a wide range of aquatic species. The site was originally heavily polluted by industrial waste during the industrial revolution and was purchased by the City Council in 1982 who undertook a major reclamation project, planting over 46ha of native trees.

Non-Statutory Protected Sites

Sites of Biological Interest

3.8 SBI are sites locally important for wildlife. SBI have no statutory legal protection, but do receive some protection through different policies and they must be taken into consideration by the planning authority when planning applications affect the site. SBI are assigned one of three grades:

- Grade A SBI are of county or regional importance (assumes a presumption against development);
- Grade B SBI are those of district importance; and
- Grade C SBI are those of local importance.

3.9 There are three SBI that fall within the search area (see Appendix 3, Map 1). A summary description is given in Table 1.

Table 1 Sites of Biological Importance Within the 2km Search Area

Site Name	Area (ha)	Grade	Description
Ashton Canal (West)	8.5ha	A	Ashton Canal is important for its submerged aquatic flora including grass-wrack pondweed (*Potamogeton compressus*) of local importance.
Rochdale Canal Stott's Lane Ducie Street Basin	8.1ha	A	Rochdale Canal supports regionally important aquatic species, including the submerged nationally important floating water plantain (*Luronium natans*).
Bank Bridge Meadow	1.4ha	C	Bank bridge meadow lies to the south of the River Medlock and consists of semi-improved and amenity grassland and deciduous trees.

Regionally Important Geological and Geomorphological Sites

3.10 Regionally Important Geological and Geomorphological Sites (RIGS) are locally designated sites of local, national and regional importance for geodiversity and protect important Earth Science and landscape features. They are conserved and protected from development and are a material consideration through the planning system.

3.11 There are no RIGS within the search zone for the site.

Protected and Notable Species

Section 41 Species

3.12 Some of the rarest and most threatened species are listed under Section 41 (S41) of NERC as Species of Principal Importance. The Government's Biodiversity 2020 strategy has an ambition to ensure that by 2020 there will be an overall improvement in the status of wildlife and no further extinctions of known threatened species. To achieve this, a range of actions have been identified to help in the recovery of S41 species. (see Appendix 3, Map 5)

Bats

3.13 Table 2 shows the number of each species of bat recorded in the search zone and the proximity to the site of the closest roost for each (see Appendix 3, Map 4).

Table 2 Bat Records from Greater Manchester Ecology Unit

Species		No. Roosts	No. Other Signs	Closest Roost	Closest Sign
Common pipistrelle	*Pipistrellus pipistrellus*	1	12	65m	15m
Soprano pipistrelle	*Pipistrellus pygmaeus*	-	3	n/a	75m
Pipistrelle species	*Pipistrellus* sp.	11	45	75m	45m
Brown long-eared	*Plecotus auritus*	1	-	190m	190m
Daubenton's bat	*Myotis daubentonii*	-	4	n/a	125m
Bat species		1	1	165m	165m

3.14 The majority of the records returned are for pipistrelle species. There are two native species: common pipistrelle (*Pipistrellus pipistrellus*) and soprano pipistrelle (*Pipistrellus pygmaeus*).

The common pipistrelle is one of the UK's most common bat species found in a wide range of habitats including suburban and urban habitats. Soprano pipistrelle is also widely distributed across the UK. Where the distinction between the two species has not been made they are recorded as pipistrelle species (*Pipistrellus* sp.).

3.15 There is a single record for brown long-eared bat (*Plecotus auritus*), which is found throughout the UK and is widespread in the rest of Europe. Daubenton's bat (*Myotis daubentonii*) records are confined to the river Medlock corridor. This species characteristically fly and forage over water sometimes taking prey directly from the water surface (Bat Conservation Trust 2019).

Birds

Table 3 Bird Records (Including Schedule 1 Species)

Common Name	Scientific Name	Number Recorded	Amber	Red	Sch 1
Black redstart	*Phoenicurus ochruros*	1			x
Common bullfinch	*Pyrrhula pyrrhula*	8	x		
Common starling	*Sturnus vulgaris*	10		x	
Dunnock	*Prunella modularis*	5	x		
European herring gull	*Larus argentatus*	1		x	
House sparrow	*Passer domesticus*	8		x	
Kingfisher	*Alcedo atthis*	4	x		x
Linnet	*Linaria cannabina*	4		x	
Little ringed plover	*Charadrius dubius*	10			x
Northern lapwing	*Vanellus vanellus*	10		x	
Peregrine falcon	*Falco peregrinus*	6			x
Redpoll	*Carduelis flammea*	2	x		
Reed bunting	Emberiza schoeniclus	1	x		
Skylark	*Alauda arvensis*	1		x	
Song thrush	*Turdus philomelos*	6		x	
Spotted flycatcher	*Muscicapa striata*	1		x	

3.16 It should be noted that the number of species recorded within desk study data repositories does not necessarily indicate the population size. Less common species may be recorded more frequently because of their interest and rarity and more common species may be recorded less often.

3.17 The Red and Amber conservation status assessment is based on a number of criteria e.g. historical decline, trends in population and range, rarity, localised distribution and international importance (full details of this assessment are in Eaton *et al*. 2015). Table 3 includes those species recorded within the 2km search area that are listed as Red and Amber birds of conservation concern.

3.18 Species are Red listed because of a 50% decline in their population and Amber listed species are of medium conservation concern and have experienced a reduction of 25% in numbers. Schedule 1 species are protected under the WCA by the Environmental Protection Act 1990. It is an offence to intentionally disturb any of these species during the breeding season without a valid licence.

3.19 The number of European herring gull[1] has fallen over the past 25 years and over half of the UK breeding population is confined to fewer than ten sites. Common starling, house sparrow and song thrush are red listed because of their recent decline although they remain quite widespread in the UK. The skylark population has fallen drastically over the last 30 years thought caused by the use of herbicides and pesticides and a move to winter sown cereal crops that deters late season nesting attempts. Similarly, the northern lapwing has seen a sustained contraction in its numbers and range related to changes in farming practices and intensification. There is a record for a northern lapwing within or very close to the site (see Appendix 3, Map 5). The spotted flycatcher was once considered a common garden nesting species but has experienced a long-term decline since the 1970s. Evidence suggests this is due to poor annual survival rates of first year birds although conditions in their African wintering grounds may have also contributed to their decline. Linnet numbers have dropped substantially over the past few decades, with the UK population estimated to have declined by 57 per cent between 1970 and 2014 (BTO 2019, The Wildlife Trusts 2019: RSPB 2019)

3.20 The preferred habitat for dunnock is well-vegetated areas such as hedges, scrub and deciduous woodland and in urban areas they tend to be attracted to parks, gardens and scrub habitat. Common bullfinch is Amber listed and of medium conservation concern. It is widely distributed in the UK but populations have declined by 36% since 1967 thought to be related to the loss of habitat, agricultural intensification and reduced diversity in woodlands. The numbers of redpoll and reed bunting have also declined, once more thought related to changes in agricultural practices.

3.21 Schedule 1 species recorded are for peregrine falcon (six records), little ringed plover (ten records), black redstart (one record) and kingfisher (four records). The peregrine falcon faced extinction in the UK in the 1960s largely as a result of pesticides. However, they have made a rapid comeback and pairs now nest on high buildings in a number of city centres, including Manchester. High buildings are used by breeding peregrine falcons and breeding at the site is highly improbable, as the site has no built structures.

3.22 The little ringed plover is a summer visitor that first bred in the UK in 1938 and has since successfully colonised a large part of England and Wales. Expansion has been achieved through an exploitation of manmade habitats; especially gravel pits and new reservoirs. There is a record for little ringed plover within the Project Bradford site. It does not specify if this is a recorded sighting or a nesting site. Open brownfield habitats are favoured and breeding at the site is plausible.

3.23 There is a single record for black redstart to the west of the site. This species is a rare breeder, passage migrant and winter visitor with a small population concentrated in London, Liverpool, Sheffield and the West Midlands. There are also records of black redstart breeding in Manchester City Centre and Greater Manchester. The site is outside the Black Redstart Priority Area. This identifies an area in central Manchester where the Schedule 1 black redstart has been recorded. A Species Action Plan (Greater Manchester Biodiversity Project 2009) aims to maintain a breeding population in Greater Manchester.

3.24 Kingfisher nest in burrows in river banks and hunt fish from riverside perches. They are Amber listed as their numbers have declined, thought to be caused by habitat degradation through pollution and unsympathetic management of watercourses. Records are for the River Medlock and Rochdale Canal. Note that the records for Schedule 1 species are not to be placed in the

[1] *See Table 3 for scientific names of bird species*

public domain and the map showing record locations is not included in this report for that reason.

Eurasian Badger

3.25 Eurasian badger (*Meles meles*) and their setts are protected under the *Protection of Badgers Act 1992*. It is an offence to kill or injure a badger, or to damage, destroy or interfere with its sett or to allow a dog to enter a sett.

3.26 There are six records of badger signs (e.g. latrines, runs, foraging activity) within the search zone and 11 recorded setts. (Please note that information related to badger and their setts is confidential and the map provided by GMEU showing the location of the signs is not included in Appendix 3 for this reason).

Water Vole

3.27 The water vole (*Arvicola terrestris*) is protected and a Priority Species in the UK under the WCA, 1981.

3.28 There is a single record for water vole in Clayton Vale LNR.

Common Toad

3.29 The common toad (*Bufo bufo*) is protected and a Priority Species in the UK under the WCA 1981.

3.30 There is a single record of common toad in the search area, located in Clayton Vale LWS to the east of the site.

Slow-worm

3.31 The slow-worm (*Anguis fragilis*) is protected and a Priority Species in the UK under the WCA1981.

3.32 There are two records of slow-worm, the closest at a distance of approximately 1.8km.

Plant Species

3.33 Grass-wrack pondweed (*Potamogeton compressus*) is a threatened aquatic macrophyte species of the pondweed family. It is nationally scarce and declining both in Britain and throughout its range (Birkinshaw *et al*. 2013).

3.34 It has been recorded in the Ashton Canal approximately 1.8km to the south-east of the site (see Appendix, Map 5).

3.35 Floating water-plantain (*Luronium natans*) is listed in Schedule 4 of the Conservation (Natural Habitats, etc.) Regulations 1994; Schedule 8 of the WCA 1981, and on the IUCN Red List it is classified as 'Least Concern'.

3.36 There are two records, both on the Ashton Canal with one approximately 40m from the site.

Pond Mud Snail

3.37 The pond mud snail (*Omphiscola glabra*) is classified as Near Threatened by the IUCN, Vulnerable (RDB 2) in the UK Red Data Books and is a S41 Conservation Priority Species.

3.38 Decline in the population is due to the temporary habitats favoured by the pond mud snail being lost or degraded (Bratton 1991; Buglife 2019).

Schedule 9 Species

3.39 There were no records for non-native invasive Schedule 9 species.

Phase 1 Survey

Site Overview

3.40 The results of the Phase 1 survey are presented in Figure 1, showing the habitats and features within the site and including a buffer zone surrounding the site. Target notes (TN) describe features of interest. A selection of illustrative photographs is presented in Appendix 4.

3.41 The site is a former car park, bounded by metal fencing on three sides, with a concrete wall on the west side along the walkway to the Etihad campus. There is a dry ditch along the north and western edges. The site is accessed by a tarmac road over the canal bridge from the large car park area to the south (Plate1).

3.42 The central area of the site is stone hardstanding with very sparse, scattered ephemeral/short perennial plants (Plates 2 to 5). The ephemeral/short perennial vegetation cover increases further out from the centre of the site and grades into open, species-rich unimproved neutral grassland (Plate 6). Around the edge of the site broadleaved saplings/young trees and scrub has developed (Plates 6 and 7). There has probably been an element of tree planting as indicated by the presence of the non-native species, Italian alder. The tree saplings and willow/butterfly-bush scrub encroaches out into the main part of the site in places, with a distinct line of saplings across the centre of the site (Plate 8). A small area of slightly older semi-natural broadleaved woodland is present on the eastern boundary.

3.43 Along the eastern edge of the site is a line of immature/semi-mature small-leaved limes with grass-dominated vegetation underneath. This line extends outside the site fencing at the south-east corner (Plate 9).

3.44 A number of large concrete circular culverts lie across the site, often with tree saplings growing out of them (Plate 10). There was a small area with dark-coloured mats (Plate 11, TN1) potentially offering refugia for amphibians and reptiles. However, none were seen during the survey.

3.45 To the south, adjacent to the site is Ashton Canal, with semi-natural vegetation of unimproved neutral grassland along the concrete towpath verges and amongst the lock. The footpath extends around the south-east boundary of the site to join the pavement alongside the road, Alan Turing Way. There are two bridges across the canal (Plates 12 and 13, TN3) and areas of semi-natural broadleaved woodland on the southern canal banks (TN5). Concrete walls bound the edge of the canal area separating it from the adjacent tramline. The canal area is well used by the public as a footpath and recreational feature.

3.46 The surrounding land to the east and north of the site is tarmac road and pavement. There is a line of planted Norway maples in large wooden planters along part of the central reservation of the dual carriageway to the east (Plate 14).

Open, Neutral Grassland - Unimproved, with Young Trees/Scrub

3.47 The grassland is an open structure with areas of hardstanding visible, typical of vegetation that has recently developed over man-made substrates (Plates 9 and 15). Creeping bent grass and black medick are abundant, with locally abundant red fescue, frequent Yorkshire fog, common ragwort and the non-native species common michaelmas-daisy. Other non-native plants present include the legume, white melilot, which forms abundant patches across the grassland, occasional ribbed melilot and large-flowered evening primrose that occurs rarely. The garden escapees of lady's-mantle and columbine are present. There are locally abundant patches of the annual grass species squirrel-tail fescue, particularly as the vegetation grades into the ephemeral/short perennial vegetation habitat further into the site.

3.48 The grassland is species-rich, containing a range of grassland forbs including several species favouring calcareous substrates such as rough hawk's-beard, yellow-wort and wild carrot, red clover and patches of oxeye daisy and ribwort plantain are prominent in the sward, with occasional selfheal and perforate St. John's-wort and a number of other grassland species such as tufted vetch and bird's-foot trefoil occurring rarely.

3.49 The habitat contains a total of 16 species listed in the GMEU selection guidelines (Greater Manchester Ecology Unit 2016) as indicator species used in the consideration of sites for selection as Grade 2 Semi-natural Grassland SBI. Also of note is the presence of yellow-wort, a Greater Manchester Biodiversity Action Plan species (Plate 11, TN1).

3.50 The range and abundance of flowering plants present, combined with butterfly-bush scrub provide a nectar resource for invertebrates.

3.51 The site appears unmanaged, which has lead to the development of scattered tree saplings and scrub within the grassland, in particular in a line across the middle of the site (Plate 8). Goat willow and silver birch are the most common species, with frequent butterfly-bush. Other species present, to a lesser extent, include white and grey willow, white poplar and aspen.

3.52 Areas of more concentrated tree saplings/young trees and scrub have developed over the neutral grassland along the northern, western and south-west edges of the site (Plates 6, 7, 10 and 15) where in a few years, if left unmanaged, this will form areas of broadleaved woodland. Again, silver birch and goat willow are the most common species, with occasional to frequent butterfly-bush, occasional white willow and several other broadleaved tree species occurring less frequently. The non-native species Italian alder is present in the area of trees to the north, indicating that a degree of planting has taken place. Semi-natural tree saplings/scrub are more scattered around the south-east and eastern edges of the site.

Ephemeral/Short Perennial

3.53 The grassland area grades into ephemeral/short perennial vegetation further into the site, with an increase in the proportion of bare substrate visible. Creeping bent is the dominant species and squirrel-tail fescue abundant near to the grassland area. Apart from black medick, which is locally abundant, the non-native species of common michaelmas-daisy, white melilot and large-flowered evening primrose are the dominant flowering plants. Ribwort plantain and the annual pineappleweed are occasional in patches, other species occur rarely (Plates 6 and 10).

Hardstanding

3.54 The centre of the site is a large area of stone hardstanding of the former car park, with very sparse, scattered ephemeral/short perennial species (Plates 3 to 6).

3.55 A tarmac road accessing the site from the south has tarmac/stone pavements with unimproved neutral grassland on the wider area on the east and lines of ephemeral/short perennial vegetation along the road and bridge edges to the west (Plate 1).

3.56 Outside the site fencing, to the east, is tarmac pavement, a cycleway and the dual carriageway. To the north is tarmac pavement and a road. A concrete towpath follows the course of the canal and a short section of tarmac path runs alongside the south-east edge of the boundary fencing.

Broadleaved Woodland - Semi-natural

3.57 There is a small area of slightly older semi-natural broadleaved woodland on the eastern boundary, within the site (TN2). Silver birch and goat willow occur frequently, with occasional butterfly-bush, grey willow and aspen. Several other species of broadleaved tree occur rarely.

3.58 External to the site, along the southern edge of the canal are several small areas of semi-natural broadleaved woodland (TN5). Goat willow, other willow species, sycamore and silver

birch are the most frequent woody species with hawthorn and butterfly-bush being occasional. The ground flora is bramble-dominated in places with a patch of ivy and ferns along the canal edge.

Broadleaved Woodland - Plantation

3.59 Along the eastern edge of the site is a line of planted, evenly spaced small-leaved lime trees (Plates 9 and 16). The line of trees continues along the road verge outside the site boundary at the south-east corner of the site.

3.60 The ground vegetation underneath the limes is grass-dominated with abundant red fescue, Yorkshire fog, common couch and occasional tall false-oat-grass. Amongst the forbs, colt's-foot is abundant and dandelion, ribwort plantain and hairy tare frequent. Species diversity is moderately poor and other species are present only at occasional to rare frequency.

3.61 Running down the central reservation of the dual carriageway Alan Turing Way, adjacent to the site, there are regularly spaced large wooden containers with young planted Norway maple; some of the trees are looking unhealthy (Plate 14).

Dry Ditch

3.62 There is a dry ditch running along the north and western edges of the site amongst the denser areas of tree saplings/scrub. The vegetation present is not indicative of the ditch having being wet for extended periods of time and no animal signs were observed along the ditch.

Neutral Grassland - Unimproved

3.63 The other areas of unimproved neutral grassland present are all external to the site boundary, alongside the canal and a small area next to the footpath near the south-east corner. These areas of grassland are more established and managed. The fine-leaved grass red fescue and forbs ribwort plantain and selfheal are all abundant in the sward. Daisy, common ragwort and common michaelmas-daisy occur frequently to abundantly and yarrow and oxeye daisy are locally abundant. Species-richness is moderate. However, 12 of the species recorded are listed in the SBI grassland selection guidelines. A small plant of the Schedule 9 species, wall cotoneaster is present, possibly originated from planting within the local area.

Canal

3.64 The canal stretch adjacent to the site has little aquatic vegetation except a clump of arrowhead (Plate 15, TN4). The canal and towpath provide a recreational facility with walkers, runners, cyclists and narrow boats using the canal and lock.

3.65 The canal sides are concrete and straight-sided, offering no potential for water vole. The two bridges along the canal are intact and appear to offer negligible potential for roosting bats (Plates 12 and 13).

Evaluation

3.66 The desk study identified a single statutory wildlife site, Clayton Vale LNR and a number of protected species within the search area. All sites and records of species returned were considered sufficiently distant and isolated from the site to not be impacted by development proposals.

3.67 The desk study revealed that floating water-plantain had been recorded in Ashton Canal, close to the site. It was not, however, recorded in the stretch of canal adjacent to the site, which was poor in aquatic vegetation.

3.68 The trees within the site, apart from the planted small-leaved lime along the site boundary, were all young. No birds' nests were observed within any of the trees at the time of the survey. The desk study, however, showed a recorded sighting of northern lapwing within or very close to the site and a record for little ringed plover within the site boundary. This is a species that favours this type of brownfield site.

3.69 No potential bat roost features were observed in the trees on the site. The two bridges on the canal stretch adjacent to the site appeared intact, with little apparent opportunity for bats to roost. The desk study, however, recorded a pipistrelle bat roost at 65m from the site and a sighting at 15m away and the canal and areas of trees on site would offer suitable foraging sites for bats.

3.70 The extended Phase 1 habitat survey found the open, unimproved neutral grassland habitat that had developed on the man-made substrate of the former car park to be of nature conservation interest. Although the grassland habitat is typical of sites that have developed over hardstanding and contains a number of introduced species such as melilots and large-flowered evening primrose, it is species-rich and contains 16 species listed in the SBI selection guidelines as indicator species used in the consideration of sites for selection as Gr2 Semi-natural grassland SBI. Of particular note is the presence of yellow-wort, a Greater Manchester Biodiversity Action Plan species. The extent of flowering plants and scattered butterfly-bush within the grassland offer nectar sources for pollinating insects and other invertebrates.

3.71 No non-native invasive Schedule 9-listed plants were observed within the site boundary. There was, however, a small individual plant of wall cotoneaster in the grassland of the adjacent grassland alongside Ashton Canal.

4. RECOMMENDATIONS

Nesting Birds

4.1 No evidence of nesting birds was found. However, all breeding birds are protected by law and it is recommended that initial works are carried out outside the bird nesting season (1st March to 30th September). If winter clearance is not possible, then it is recommended that a suitably experienced ecologist check the site no more than 48 hours prior to works to ensure no active nests are present. If nesting birds are confirmed to be present then works should be postponed in that area until young have fledged and/or nesting had been completed. It may be necessary to cordon off the nest and monitor it until work is completed.

Other Protected Species

4.2 Additional surveys or special measures for other protected species are not considered necessary.

4.3 Artificial light associated with the site development, however, should be situated to avoid light spillage onto the adjacent Ashton Canal as the canal corridor offers suitable foraging habitats for bats and the trees present could provide roost habitats. Daubenton's bats in particular fly and forage over water and the desk study showed a Daubenton's bat record at just 125m from the site. The desk study also showed that common pipistrelle bats were recorded close by, with a roost at 65m and a sighting at 15m away.

Ecological Enhancement

4.4 National Planning policy requires that opportunities for ecological enhancement are sought within all development proposals, moving towards the aim of 'biodiversity net gain'. To achieve this, projects must be considered on an individual basis to ensure that new features, planting and management regimes are suitable for the conditions on site and thus likely to be successful in the longer term. Some potential options are presented for consideration in Table 4.

4.5 The proposed development footprint covers most of the site, however, the bank along part of the southern edge of the site appears from the plans to be outside the development area and retention of the trees/scrub present would create habitats for a range of animals. Management for this area could include selective thinning of the existing young trees/scrub, initially and at periods as the woodland establishes, to allow light to reach the ground layer. Patches of grassland could be retained and managed by annual mowing, after the flowers have set seed and removing the arisings from site.

4.6 The open structure of the species-rich unimproved neutral grassland and lack of a well-formed turf make it unsuitable for transplanting from areas under development. Enhancement of the strips of grassland habitat that remain after development could be obtained by annual mowing, after the flowers have set seed and removing the arisings from site. This will aim to reduce the spread and establishment of trees/scrub on the grassland habitat and also to maintain the low soil fertility of the substrate to enhance conditions for diverse, species-rich grassland to be maintained.

Table 4 Potential Enhancement Measures for Consideration

Enhancement	Description
Bird nest boxes	• Boxes designed for a range of different species are available and could be positioned within planted areas or on built structures depending on the target species. • Particular consideration should be given to providing nesting habitat for Red and Amber List species that may be found in urban and suburban areas such as swift, common house martin, house sparrow and starling.
Bat roost features	• Features incorporated within the structure of new buildings such as: o Self-contained bat bricks in walls o Smalls gaps to provide access to cavities behind surfaces such as fascia boards or hanging tiles o Access slot at apex of gable ends to allow bats to enter roof voids • These types of features would be best placed on the south-west, south or south-east facing elevations. • Self-contained bat boxes mounted on buildings or trees. • New roost features should be at a height of at least 3m and should have a clear flight path for bats to approach them. • (N.B. To qualify as enhancement new roost features would need to be over and above any requirement for replacement habitat that forms direct mitigation for impacts on an existing roost.)
Native species in landscape designs	• Planting schemes used in urban environments often include non-native species. These may be selected for their aesthetic appeal, pollution tolerance, evergreen foliage and low maintenance, and many nectar-bearing exotic species do support insects and provide foraging and nesting opportunities for birds. • However, native species, preferably of local provenance, tend to support greater biodiversity as they have evolved to the local conditions. It is recommended that, wherever practical, native trees and shrubs are selected for landscape designs.
Artificial lighting	• Artificial lighting can be disturbing to wildlife, particularly species such as bats that are nocturnal and adapted to forage in low-light conditions. Even if no roost is present on site, it would be good practice to adopt a sensitive lighting scheme to maximise biodiversity value post-development, with consideration given to the following points: o Directing lamps where they are needed to avoid unnecessary light spillage; o Use of narrow spectrum light sources with low ultra-violet, blue or white wavelength component to minimise insect attraction at lamps; o Avoiding illumination of features and habitats that are likely to have the greatest value to bats, such as tree canopies and ponds; and o Use of timers and/or motion sensors to limit periods of illumination to essential times only. • Further guidance on lighting specifications is provided in publications available from the Bat Conservation Trust website (www.bats.org.uk). This includes the impacts of different types of lighting (RCEP 2009), effects of artificial lighting on bat behaviour (Stone 2013) and guidelines for mitigation (Bat Conservation Trust 2014). • Specifically for this site, light spillage onto the adjacent Ashton Canal should be avoided, as the habitats present within the canal corridor offer suitable foraging opportunities for bats. Daubenton's bats in particular fly and forage over water. The wooded areas could also provide potential roosting sites.

Enhancement	Description
Green roofs	• Green roofs (living roofs) are intrinsically of greater benefit to biodiversity than more traditional roofing methods. • Green roofs can vary in their appearance and character. They can be designed to support low-growing mosses and sedums, wildflowers and grasses.
Off-site habitat enhancements	• The site area is relatively small. Outline details of the proposed redevelopment indicate limited available space for retention or enhancement of existing habitat of interest; it may be necessary to look outside the development boundary to other sites where biodiversity enhancements are more practically achieved.

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6. ABBREVIATIONS

CIEEM	Chartered Institute of Ecology and Environmental Management
CRoW	Countryside and Rights of Way
EU	European Union
GMEU	Greater Manchester Ecology Unit
JNCC	Joint Nature Conservation Committee
LNR	Local Nature Reserve(s)
NERC	Natural Environment and Rural Communities
NPPF	National Planning Policy Framework
PAA	Penny Anderson Associates Ltd
RIGS	Regionally Important Geological/geomorphological Site(s)
SAC	Special Area(s) of Conservation
SBI	Site(s) of Biological Importance
SSSI	Site(s) of Special Scientific Interest
TN	Target Note(s)
WCA	Wildlife and Countryside Act

FIGURE

386700 386800 386900 387000

399000 398900 398800

Apl	Acer platanoides	Norway maple
Tic	Tilia cordata	Small-leaved lime



Legend

- Site Boundary

Habitat

- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Neutral grassland - unimproved
- Open, neutral grassland - unimproved
- Open neutral grassland - unimproved with trees/scrub
- Standing water
- Ephemeral/short perennial
- Hardstanding
- Hardstanding with sparse ephemeral/short perennial
- Fence
- Dry ditch
- Wall
- Young tree/scrub
- Norway Maple
- Circular culverts
- Target Note

British National Grid
Projection: Transverse Mercator
False Easting: 400000.000000
False Northing: -100000.000000
Central Meridian: -2.000000
Scale Factor: 0.999601
Latitude Of Origin: 49.000000

N

ISO A3

0 5 10 20 30 40 Metres

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Project Name: Project Bradford

Discipline: Ecology

Title:

Phase 1 Habitat Map

Scale 1:1,000		Drawing No. Figure 1	
Drawn By MDM	Originator CB	Date 11/07/2019	
PAA Ref. G:\BUHA10_Project_Bradford\Maps\		Revision 1.0	

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APPENDICES

APPENDIX 1

Summary Species Legislation

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SUMMARY OF THE LEGISLATION RELATING TO BADGERS AND THEIR SETTS

Badgers (*Meles meles*) are not an endangered species but have a long history of persecution and cruelty. As such, badgers and their setts are protected under the Protection of Badgers Act 1992 (as amended), which makes it illegal for any person to kill, injure or take a badger. It is also an offence to destroy, damage or obstruct a badger sett, or to disturb a badger whilst it is within a sett. There are also additional offences relating to possession of, buying and selling a dead badger, or anything derived from a badger, and causing a dog to enter a sett.

The Act defines a sett as 'any structure or place which displays signs of current use by a badger'. Setts are defined by English Nature (1995) as 'usually underground tunnel systems providing shelter for badgers, but may include other structures used by badgers such as hay bales, drainage culverts, or cellars'. 'Current use' is more difficult to define but is usually interpreted by the presence/absence of badger field signs over several observations of the sett (Natural England 2006).

Section 15 of the National Planning Policy Framework (NPPF 2018) states that the planning system should contribute to and enhance the natural and local environment by minimising impacts on biodiversity and providing net gains in biodiversity where possible. The NPPF also includes the requirement to contribute to the Government's commitment to halt the overall decline in biodiversity and to promote the reservation, restoration and re-creation of priority habitats, ecological networks and the protection and recovery of priority species populations, linked to national and local targets. Reference is made to Circular 06/2005 *Biodiversity and Geological Conservation - Statutory Obligations and Their Impact within the Planning System* in respect of statutory obligations for biodiversity and geodiversity conservation.

Local authorities in England are required to consider the likelihood of any proposed development adversely affecting badgers' foraging territory, or links between them, or significantly increasing the likelihood of road or rail casualties amongst badger populations. The planning guidance for Wales, Technical Advice Note (Wales) 5, identifies the need to comply with the Protection of Badgers Act 1992.

English Nature, 1995. *Species Conservation Handbook*. English Nature, Peterborough.

Natural England, 2006. *Guidance on 'Current Use' in the definition of a badger sett*. Natural England, Peterborough.

Please note: the above text provides a brief summary of the legislation in relation to badgers for England and Wales and the original Act and amendments should be referred to for the precise wording.

SUMMARY OF THE LEGISLATION RELATING TO BATS

All wild species of bat are protected under the Wildlife and Countryside Act (WCA) 1981, which has also been amended by later legislation, including the Countryside and Rights of Way (CRoW) Act 2000 and the Conservation of Habitats and Species Regulations 2017, and this legislation is applicable to England and Wales. Bats are listed on Schedule 5 of the WCA and are therefore subject to some the provisions of Section 9 which, with the amendments, make it an offence to:

- Intentionally or recklessly disturb a bat while it is occupying a structure or place which it uses for shelter or protection (S9:4b).
- Intentionally or recklessly obstruct access to any structure or place used for shelter or protection by a bat (S9:4c).

There are additional offences in relation to buying and selling (S9:5) any live or dead animal of this species or anything derived from them.

Bat species are also listed under Annexes IIa and IVa of the EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora, also known as the 'Habitats Directive'. Inclusion on Annex IVa means they are consequently identified as European Protected Species (EPS) and protected under the Conservation of Habitats and Species Regulations 2017.

The Conservation of Habitats and Species Regulations 2017 state that a person commits an offence if they:

(a) deliberately capture, injure or kill any wild animal of a European protected species,

(b) deliberately disturb wild animals of any such species, in such a way as –

  (i) to impair their ability to survive, to breed or reproduce, or to rear their young, or

  (ii) in the case of animals of a hibernating or migratory species, to hibernate or migrate, or

  (iii) to affect significantly the local distribution or abundance of the species to which they belong;

(c) deliberately take or destroy the eggs of such an animal, or

(d) damage or destroy a breeding site or resting place of such an animal.

Under these Regulations it is an offence to damage or destroy a breeding site or resting place whether the animal is in occupation or not, and protection extends to all life stages of the animal in question. There are additional offences relating to possession, control and sale of a live or dead bat or part of such an animal.

In addition, seven native British bat species, including the soprano pipistrelle (*Pipistrellus pygmaeus*) and the brown long-eared bat (*Plecotus auritus*), that are frequently found in buildings, are listed as a 'Priority Species' under the under the 2011 biodiversity strategy for England, *Biodiversity 2020: A strategy for England's wildlife and ecosystem services,* under the 2012 UK Post-2010 UK Biodiversity Framework. These Priority Species are also referred to as 'species of principal importance' for the conservation of biodiversity in England and Wales within Section 74 of the CRoW Act 2000, and Sections 41 (England) and 42 (Wales) of the Natural Environment and Rural Communities (NERC) Act 2006.

Section 15 of the National Planning Policy Framework (NPPF 2018) states that the planning system should contribute to and enhance the natural and local environment by minimising impacts on biodiversity and providing net gains in biodiversity where possible. The NPPF also includes the requirement to contribute to the Government's commitment to halt the overall decline in biodiversity and to promote the reservation, restoration and re-creation of priority habitats, ecological networks and the protection and recovery of priority species populations, linked to national and local targets. Reference is made to Circular 06/2005 *Biodiversity and Geological Conservation - Statutory Obligations and Their Impact within the Planning System* in respect of statutory obligations for biodiversity and geodiversity conservation.

Local authorities in England are required to ensure that where significant harm resulting from development cannot be avoided (through locating on alternative sites with less harmful impacts),

adequately mitigated, or, as a last resort, compensated for, planning permission is refused. The commitment to preserving, restoring or enhancing biodiversity is further emphasised for England and Wales in Section 40 of the NERC Act 2006.

Please note: the above text provides a brief summary of the legislation in relation to bats in England and Wales and the original Acts, Regulations and any amendments should be referred to for the precise wording.

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SUMMARY OF THE LEGISLATION RELATING TO BREEDING BIRDS

All wild species of breeding birds and their nests are protected under Part 1 of the Wildlife and Countryside Act (WCA) 1981, as amended by later legislation including the Countryside and Rights of Way (CRoW) Act 2000. This legislation applies in England and Wales.

Part 1 (Section 1:1) of the WCA states that:

> 'If any person intentionally,
>
> (a) kills, injures or takes any wild bird;
>
> (b) takes, damages or destroys the nest of any wild bird while that nest is in use or being built; or
>
> (c) takes or destroys an egg of any wild bird,
>
> he shall be guilty of an offence.'

Part 1 (Section 1:5) of the WCA (amended by the CRoW Act 2000) refers to specific birds listed on Schedule 1 of the WCA, and states that:

> 'If any person intentionally or recklessly,
>
> (a) disturbs any wild bird included in Schedule 1 while it is building a nest or is in, on or near a nest containing eggs or young; or
>
> (b) disturbs dependent young of such a bird,
>
> he shall be guilty of an offence and liable to a special penalty.'

Schedule 1 includes birds such as barn owl (*Tyto alba*), black redstart (*Phoenicurus ochruros*), wood lark (*Lullula arborea*) and Cetti's warbler (*Cettia cetti*). Please refer to the WCA for a complete list of Schedule 1 species.

Some provisions are made to allow the killing and taking of certain species under certain circumstances, as follows:

- Birds listed on Schedule 2 (Part 1) of the Act may be taken or killed outside of the 'close season' for each individual species (the 'close season' is defined by the Act). This includes various wild duck and geese species.
- Birds listed on Schedule 2 (Part 2) of the Act may be killed or taken by authorised persons at all times. This includes species such as carrion crow (*Corvus corone*), black-billed magpie (*Pica pica*), feral pigeon (*Columba livia*) and greater Canada goose (*Branta canadensis*). An 'authorised person' is defined as a person who has written authorisation to undertake the act from the relevant statutory authority. The written authority is in the form of a licence, either a general licence which covers a number of the more typical 'pest' species, or an individual licence for other individual species. In England these licences are issued by Natural England and in Wales by the Welsh Assembly Government.

Please note: the above text provides a brief summary of the legislation in relation to breeding birds in England and Wales and the original Act and any amendments should be referred to for the precise wording.

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SUMMARY OF LEGISLATION RELATING TO WATER VOLES

Water voles (*Arvicola amphibius*) are protected under the Wildlife and Countryside Act 1981, as amended, and this legislation is applicable to England and Wales. Water voles are listed on Schedule 5 of the Act and are, therefore, subject to some the provisions of Section 9 which, with the amendments, make it (in brief) an offence to:

- Intentionally kill, injure or take a water vole (S9:1);
- Intentionally or recklessly damage or destroy or a structure or place used for shelter or protection by a water vole (S9:4a);
- Intentionally or recklessly disturb a water vole while it is occupying such a place (S9:4b); or
- Intentionally or recklessly obstruct access to any structure or place a water vole uses for shelter or protection (S9:4c).

There are additional offences in relation to possessing, controlling (S9:2), and buying and selling (S9:5) any live or dead animal of this species or anything derived from them.

In addition, water voles are listed as a 'Priority Species' under the under the 2011 biodiversity strategy for England, *Biodiversity 2020: A strategy for England's wildlife and ecosystem services,* under the 2012 UK Post-2010 UK Biodiversity Framework. These Priority Species are also referred to as 'species of principal importance' for the conservation of biodiversity in England and Wales within Section 74 of the CRoW Act 2000, and Sections 41 (England) and 42 (Wales) of the Natural Environment and Rural Communities (NERC) Act 2006. Section 15 of the National Planning Policy Framework (NPPF 2018) states that the planning system should contribute to and enhance the natural and local environment by minimising impacts on biodiversity and provide net gains in biodiversity where possible. The NPPF also includes the requirement to contribute to the Government's commitment to halt the overall decline in biodiversity and to promote the reservation, restoration and re-creation of priority habitats, ecological networks and the protection and recovery of priority species populations, linked to national and local targets. Reference is made to Circular 06/2005 *Biodiversity and Geological Conservation - Statutory Obligations and Their Impact within the Planning System* in respect of statutory obligations for biodiversity and geodiversity conservation.

Local authorities in England are required to ensure that where significant harm resulting from development cannot be avoided (through locating on alternative sites with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, planning permission is refused. The commitment to preserving, restoring or enhancing biodiversity is further emphasised for England and Wales in Section 40 of the NERC Act 2006.

Please note: the above text provides a brief summary of the legislation in relation to water voles for England and Wales and the original Acts, Regulations and any amendments should be referred to for the precise wording.

APPENDIX 2

Plant Species List

Appendix 2 Plant Species List

Common Name	Scientific Name	Open, Neutral Grassland - Unimproved, with Young Trees/Scrub	Ephemeral/ Short Perennial	Broadleaved Woodland - Semi-natural (TN2)	Broadleaved Woodland - Plantation	Neutral Grassland - Unimproved	Broadleaved Woodland - Semi-natural (TN5)	Standing Water - Canal
Woody Species								
Ash	*Fraxinus excelsior*	R					R-O	
Ash (sapling)	*Fraxinus excelsior* (sapling)	R	R		R			
Aspen	*Populus tremulous*	R		O				
Bramble	*Rubus fruticosus agg.*	R	R			O	O-F	
Broom	*Cytisus scoparius*			R	R	R		
Butterfly-bush	*Buddleja davidii*	LO-LF	R	O			LO	
Crack willow	*Salix euxina*						O	
Dog rose	*Rosa canina*	R						
Dogwood	*Cornus sanguinea*						LO	
Downy birch	*Betula pubescens* (seedling)	R				R		
Elder	*Sambucus nigra*						R	
Goat willow	*Salix caprea*	LA		F			F	
Goat willow (sapling)	*Salix caprea* (sapling)	R						
Goat willow (seedling)	*Salix caprea* (seedling)	R-O	R					
Grey willow	*Salix cinerea*			O		R	O	
Grey willow (seedling)	*Salix cinerea* (seedling)	R	R					
Hawthorn	*Crataegus monogyna*						O	
Hazel	*Corylus avellana*						R	
Hybrid black-poplar	*Populus x canadensis*	R		R				
Hybrid black-poplar (sapling)	*Populus x canadensis* (sapling)	R						
Italian alder	*Alnus cordata*	LO						
Norway maple	*Acer platanoides*				LD			
Norway maple (sapling)	*Acer platanoides* (sapling)				R			
Rose sp.	*Rosa sp.*						LO	
Silver birch	*Betula pendula*	LA		F			LF	
Silver birch (seedling)	*Betula pendula* (seedling)	O-LF						
Small-leaved lime	*Tilia cordata*				D			
Sycamore	*Acer pseudoplatanus*						O-F	
Sycamore (seedling)	*Acer pseudoplatanus* (seedling)		R					
White poplar	*Populus alba*			R				
White poplar (seedling)	*Populus alba* (seedling)	R-LO						
White willow	*Salix alba*	LO		R			R	
White willow (seedling)	*Salix alba* (seedling)	R						
Herbs, Grasses and Ferns								
Alsike clover	*Trifolium hybridum*	R						
Annual meadow-grass	*Poa annua*		O-LA					
Arrowhead	*Sagittaria sagittifolia*							R-LA
Bird's-foot trefoil	*Lotus corniculatus*	R			R			
Black medick	*Medicago lupulina*	A	O-LA			R		
Broad-leaved dock	*Rumex obtusifolius*	R	R		O	R		
Bush vetch	*Vicia sepium*	R			R			
Cat's ear	*Hypochaeris radicata*	R	R					
Cleavers	*Galium aparine*		R					
Cock's-foot	*Dactylis glomerata*	R						
Colt's-foot	*Tussilago farfara*	R-O			A			
Columbine	*Aquilegia vulgaris* (garden escape)	R						
Common couch	*Elytrigia repens*	R			F-A			
Common field-speedwell	*Veronica persica*	R						
Common knapweed	*Centaurea nigra*					R		
Common michaelmas-daisy	*Symphyotrichum x salignum*	F	LO-LF			F		
Common mouse-ear	*Cerastium fontanum*	R						
Common nettle	*Urtica dioica*				R			
Common ragwort	*Jacobaea vulgaris*	F	R		R	F		
Common vetch	*Vicia sativa*	R			O			
Crane's-bill species	*Geranium sp.*	R				R		
Creeping bent	*Agrostis stolonifera*	A	A			LF		
Creeping cinquefoil	*Potentilla reptans*	R			O			
Creeping thistle	*Cirsium arvense*	R			O			
Creeping-Jenny	*Lysimachia nummularia*					R		
Crested dog's-tail	*Cynosurus cristatus*	R						
Curled dock	*Rumex crispus*	R						
Cut-leaved crane's-bill	*Geranium dissectum*	R				R		
Daisy	*Bellis perennis*	R	R			F-A		
Dandelion	*Taraxacum officinale agg.*	O	R		F			
False oat-grass	*Arrhenatherum elatius*				O	O		
Fern species	*Dryopteris sp.*						LA	
Fern-grass	*Catapodium rigidum*	R-LF	R					
Field forget-me-not	*Myosotis arvensis*						LO	
Foxglove	*Digitalis purpurea*	R						
Great willowherb	*Epilobium hirsutum*	R			R	R		
Greater plantain	*Plantago major*	R-O	F-LA					
Hairy tare	*Ervilla hirsuta*	R						
Hairy tare	*Vicia hirsuta*				O-F			
Hard rush	*Juncus inflexus*	R	R					
Hedge mustard	*Sisymbrium officinale*	R	R					
Herb-Robert	*Geranium robertianum*	R				R		
Hop trefoil	*Trifolium campestre*	R-LA						
Horsetail species	*Equisetum arvensis*	R						
Ivy	*Hedera helix*						LD	
Knotgrass	*Polygonum aviculare*		R					
Lady's-mantle	*Alchemilla vulgaris* (garden escapee)	R						
Large-flowered evening primrose	*Oenothera glazioviana*	R	R-LF		R			
Lesser trefoil	*Trifolium dubium*	R				R		
Mayweed species	*Tripleurospermum sp.*	R						
Meadow buttercup	*Ranunculus acris*	R			R	R		
Meadow vetchling	*Lathyrus pratensis*	R			O			
Meadowsweet	*Filipendula ulmaria*					R		
Mouse-ear-hawkweed	*Pilosella officinarum*					R		
Mugwort	*Artemisia vulgaris*	R	R					
Nipplewort	*Lapsana communis*	R						
Oxeye daisy	*Leucanthemum vulgare*	O-LF			O	LA		

Common Name	Scientific Name	Open, Neutral Grassland - Unimproved, with Young Trees/Scrub	Ephemeral/ Short Perennial	Broadleaved Woodland - Semi-natural (TN2)	Broadleaved Woodland - Plantation	Neutral Grassland - Unimproved	Broadleaved Woodland - Semi-natural (TN5)	Standing Water - Canal
Pendulous sedge	*Carex pendula*	R						
Perennial rye-grass	*Lolium perenne*	R				R		
Perforate St. John's-wort	*Hypericum perforatum*	O				R		
Pineappleweed	*Matricaria discoidea*		LO					
Prickly sow-thistle	*Sonchus asper*	R						
Purple toadflax	*Linaria purpurea*	R						
Red clover	*Trifolium pratense*	F-LA	R					
Red fescue	*Festuca rubra*	LA	R- LF		A	A	F	
Ribbed melilot	*Melilotus officinalis*	O						
Ribwort plantain	*Plantago lanceolata*	O-LA	LO		F	A		
Rosebay willowherb	*Chamaenerion angustifolium*	R						
Rough hawk's-beard	*Crepis biennis*	R-LO	R					
Rough meadow-grass	*Poa trivialis*	R						
Selfheal	*Prunella vulgaris*	O	R-LO			A		
Smooth hawk's-beard	*Crepis capillaris*	R						
Smooth sow-thistle	*Sonchus oleraceus*		R					
Soft brome	*Bromus hordeaceus*	R						
Spear thistle	*Cirsium vulgare*	R	R			R		
Square stalked willowherb	*Epilobium tetragonum*	R	R					
Squirrel-tail fescue	*Vulpia bromoides*	O-LA	R-LA					
Thyme-leaved speedwell	*Veronica serpyllifolia*		R					
Traveller's joy	*Clematis vitalba*						R	
Tufted vetch	*Vicia cracca*	R			R	LF		
Wall cotoneaster	*Cotoneaster horizantalis*					R		
White clover	*Trifolium repens*	R						
White melilot	*Melilotus alba*	F-LA	O-LF					
Wild carrot	*Daucus carota*	R						
Yarrow	*Achillea millefolium*	R				LA		
Yellow bartsia	*Parentucellia viscosa*	R						
Yellow iris	*Iris pseudacorus*					R		
Yellow-wort	*Blackstonia perfoliata**	R						
Yorkshire fog	*Holcus lanatus*	F			A	O		
Mosses								
Pointed spear-moss	*Calliergonella cuspidata*	L-F						

KEY

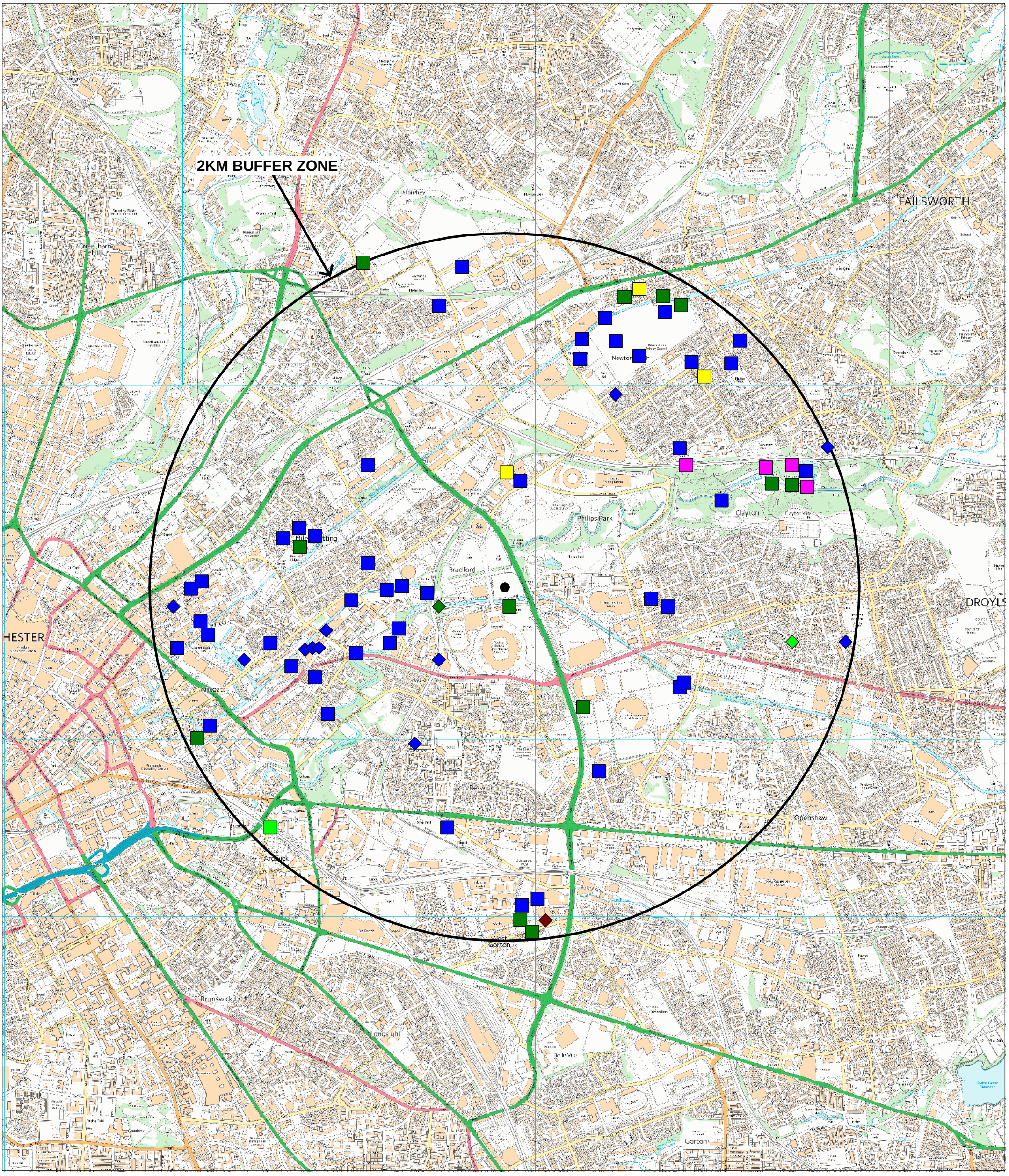
D - Dominant, A - Abundant, F - Frequent, O - Occasional, R - Rare, L - Locally

Species in blue are listed in the GMEU Sites of Biological Importance Selection Guidelines (for Grasslands)

* = BAP species

APPENDIX 3

Desk Study Results



KEY

BAT ROOSTS

- BAT SP
- BROWN LONG-EARED BAT
- COMMON PIPISTRELLE
- PIPISTRELLE SP

BATS OTHER SIGNS

- BAT SP
- COMMON PIPISTRELLE
- DAUBENTON'S BAT
- PIPISTRELLE SP
- SOPRANO PIPISTRELLE

GREATER MANCHESTER ECOLOGY UNIT
ECOLOGICAL SEARCH - SJ 86822 98860
SITE OFF ALAN TURING WAY - MAP 4

SCALE 1:20,000

BAT DATA COURTESY OF SOUTH LANCS BAT GROUP

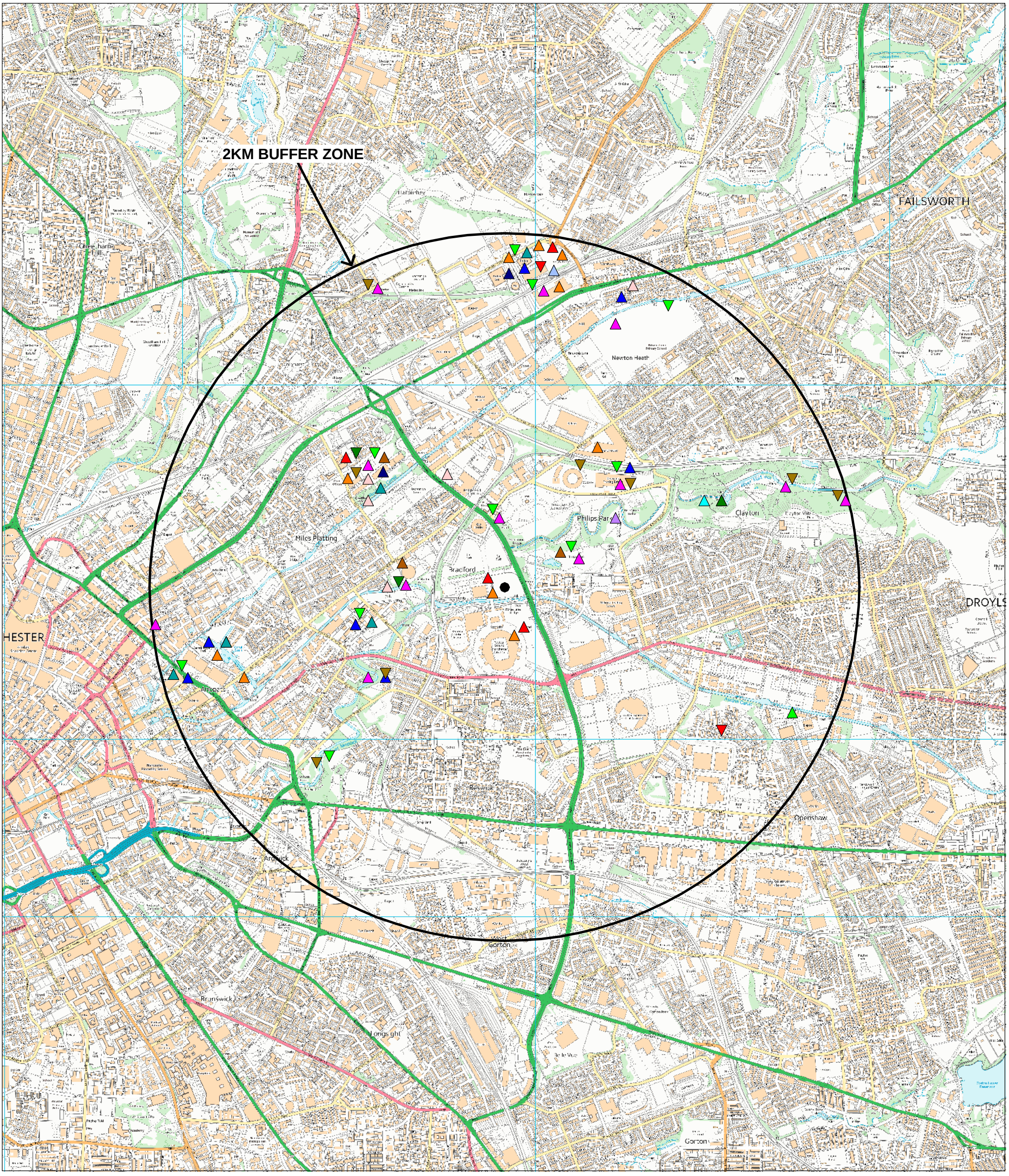
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TAMESIDE MBC LICENCE NO LA100022697, 2019

Greater Manchester Ecology Unit

Telephone 0161 342 4409
Email: gmeu@tameside.gov.uk

Date Produced: 27/06/2019



KEY

SECTION 41 SPECIES

- BULLFINCH
- COMMON TOAD
- CURLEW
- DUNNOCK
- GRS-WRK PONDWEED
- HERRING GULL
- HOUSE SPARROW
- LAPWING
- LINNET
- MUD SNAIL
- REDPOLL
- REED BUNTING
- S41 MOTH
- SKYLARK
- SONG THRUSH
- SPOTTED FLYCATCHER
- STARLING

GREATER MANCHESTER ECOLOGY UNIT
ECOLOGICAL SEARCH - SJ 86822 98860
SITE OFF ALAN TURING WAY - MAP 5

SCALE 1:20,000

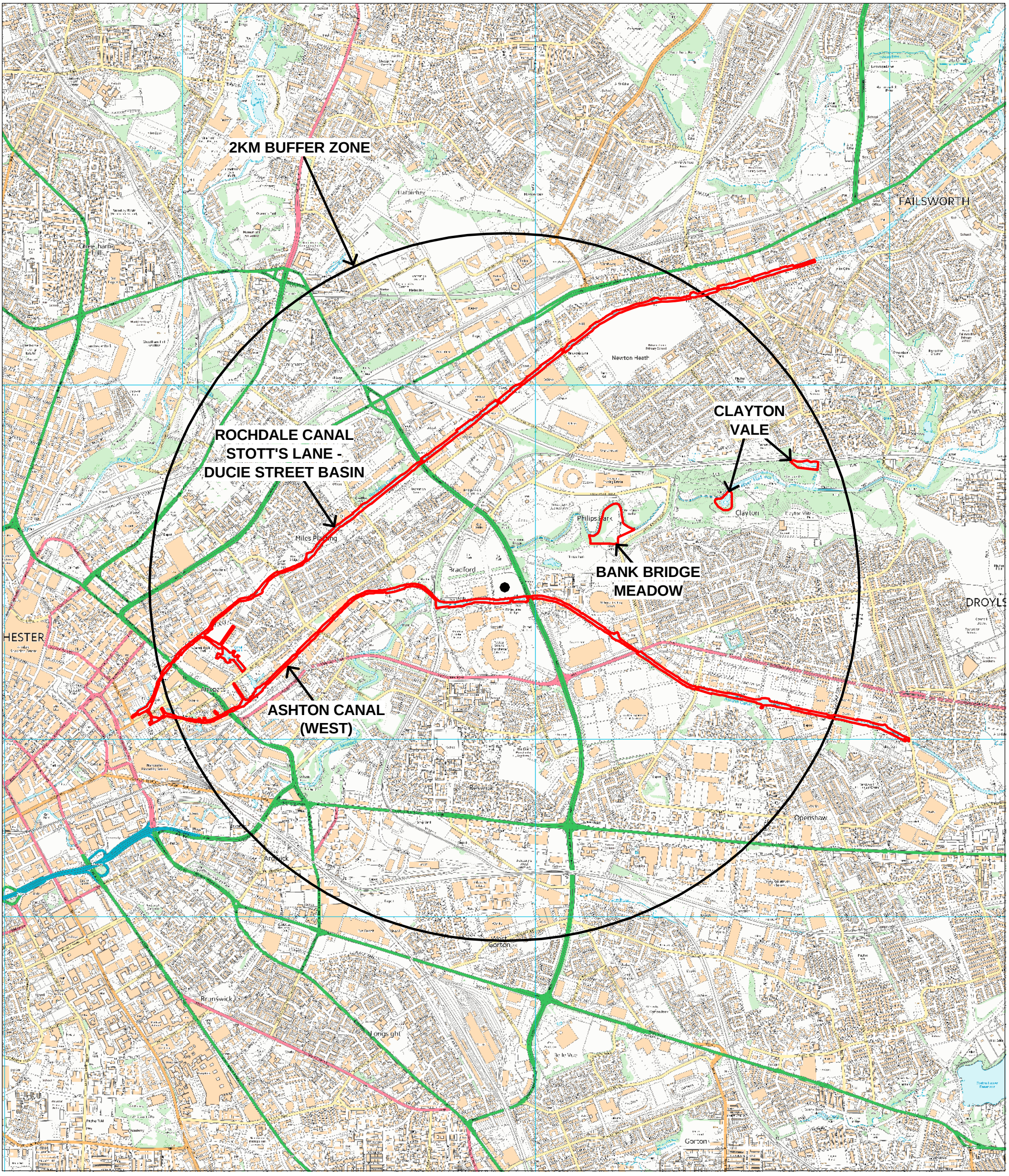
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KEY

SITE OF BIOLOGICAL IMPORTANCE

SBI BOUNDARY

GREATER MANCHESTER ECOLOGY UNIT
ECOLOGICAL SEARCH - SJ 86822 98860
SITE OFF ALAN TURING WAY - MAP 1

SCALE 1:20,000

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APPENDIX 4

Photographs



Photo 1 Tarmac road over canal bridge, accessing the site from the south



Photo 2 Site, looking west



Photo 3 Site, looking north-west



Photo 4 Site, looking north-east



Photo 5 Site, looking east



Photo 6 View looking north-west across open, unimproved neutral grassland towards ephemeral/short perennial vegetation, hard standing and neutral grassland with young trees/scrub in distance



Photo 7 Young trees/scrub within the unimproved neutral grassland along the southern edge of the site



Photo 8 Line of young trees/scrub across the middle of the site



Photo 9 Open, unimproved neutral grassland with scattered young trees/scrub & line of planted small-leaved lime trees in distance



Photo 10 Circular culvert within ephemeral/short perennial vegetation; young trees within the unimproved neutral grassland at north-east edge of site



Photo 11 Mats within the grassland offering potential refugia for amphibians/reptiles and yellow-wort plant



Photo 12 Bridge across the canal, looking west and unimproved neutral grassland verges



Photo 13 Bridge across the canal, looking east and unimproved neutral grassland verges



Photo 14 Norway maple planted in wooden containers along central reservation of the dual carriageway



Photo 15 Open, unimproved neutral grassland, with young trees/scrub along edge of site



Photo 16 Canal with small population of arrowhead plant, looking north towards edge of site and line of lime trees

Penny Anderson Associates Ltd

CONSULTANT ECOLOGISTS



Park Lea, 60 Park Road, Buxton, Derbyshire SK17 6SN

Registered Office as Above | Registered in England & Wales | Company No. 4223109 Directors: Mrs P Anderson Mr P Worrall Miss S Rogers

Appendix 5 TV, FM Radio and DAB Radio Reception Survey

TV/FM & DAB RECEPTION SURVEY REPORT

THIS PRE-CONSTRUCTION TV/FM & DAB RECEPTION SURVEY WAS CARRIED OUT BY:

SCS Technologies Ltd
Unit 4, Centre 21 Business Park
Bridge Lane
Woolston
Warrington
WA1 4AW
0800 3777 485
www.SCStechnologies.co.uk

DATE OF SURVEY: 6th September 2019
JOB NO: 157929

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EXECUTIVE SUMMARY

This study was undertaken in September 2019, to investigate whether the proposed development could cause interference to television and radio broadcast service reception. The report also details the baseline reception conditions for future reference.

A survey has been undertaken to determine the potential effects of the introduction of the proposed development at Alan Turing Way, Manchester. The development is to consist of a new development, with an elevation of approximately 35m. The majority of the proposed development's location has no existing buildings. Impacts to the reception of digital terrestrial television (Freeview) FM, DAB and digital satellite television services (SKY and Freesat) have all been assessed.

From the results of the desktop and field survey we have located an approximate area where digital terrestrial reception may be affected. However due to the height of most of the existing buildings in this zone, we do not envisage a major significant impact to the disruption to the digital terrestrial signal with the introduction of the proposed new building. Therefore, only minor mitigation may be required.

One area of note is a small area between Stuart and Gibbon street that is adjacent to Alan Turing Way, which also has a property called 'Lock House' as shown on the Potential impact zone map 2 on page 35

We have not indicated a potential impact zone for satellite television reception as the buildings directly to the north are a sufficient distance from the proposed development and as always, we recommend that funds are available to deal with the investigation of any reported interference and to enable subsequent mitigation requirements. We advise that the situation regarding television and satellite reception is monitored closely during the construction and any reports of interference are investigated promptly.

FM & DAB signals were recorded, and we anticipate these not to be affected

Please note if tower cranes are used on site these could cause interference on a greater scale than the completed development. This interference would be for the duration of time that the tower cranes are present.

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INTRODUCTION

Theory predicts, and practical evaluation has confirmed, that the introduction of new structures into an area can cause interference to television reception.

This Pre-Construction TV/FM/DAB Reception Survey has been undertaken to record the existing baseline conditions and assess if the introduction of the proposed new development has the potential to impact upon existing viewers' television reception in the surrounding area.

To enable us to make an assessment, an initial desktop study is conducted, followed by a comprehensive field survey.

The desktop study is carried out using plans of the proposed development for example the proposed buildings location and elevations, along with maps of the surrounding area and details of local television transmitter broadcast information.

The field survey is then carried out at a number of test point locations surrounding the proposed development. Television signal test results and relevant information are recorded at each of the test point locations.

This report includes the information collated during the desk top study and field survey along with an assessment of where, or if, the introduction of the proposed development has the potential to cause interference to existing viewers' television reception, and mitigation if required.

SCOPE

To carry out a desktop study and comprehensive field survey to record existing baseline television reception conditions in the surrounding area to the proposed development. To provide details of any potential impact zone and methods of mitigation if required, to conform to Local Planning Authority requirements
The results and information recorded during this field survey assist in assessing if, or where, the introduction of the proposed development has the potential to impact upon existing viewers' television reception.

DISCUSSIONS

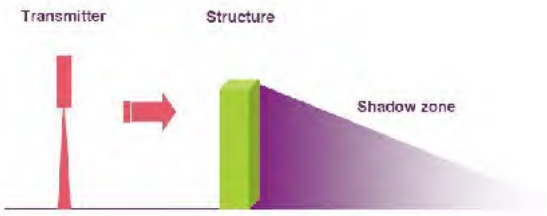
The introduction of a new building or structure into an area has the potential to cause interference to existing viewers' television and listeners radio reception.

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SIGNAL BLOCKING

Wireless signals, especially those using relatively high frequencies such as television, behave much like light. Therefore, it is desirable to have a clear line of sight path between the transmitter and a receiving aerial in order to achieve the most reliable reception. The presence of a tall structure between the transmitter and receiver will cause a 'shadow' to be cast behind the structure on the side opposite the transmitter. This effect is similar to the way that an obstruction between a lamp and an observer's eye blocks out the light.

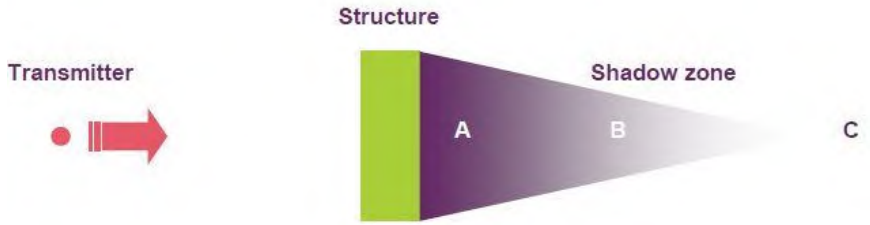


The shadow cast by a structure does not have hard edges though and does not usually extend indefinitely. While there would be a large reduction in signal levels immediately behind the structure, the blocking effect of the structure diminishes with distance because of diffraction. Diffraction is a process where signals appear to bend behind the structure and partially fill in the shadow.

Zone A - close behind the structure (typically a few tens of metres) there may be a large reduction in signal level with a possible complete loss of reception

Zone B - further away (typically a few hundred metres) the signal reduction is less severe, and the shadow will be smaller as diffraction effects partially fill in the shadow. Depending on the size of the structure, some locations could still lose reception completely

Zone C - some distance away (1-5km) the shadow will effectively have disappeared
The resulting shadow is therefore a triangular shape as shown in Figure 2.



It should be noted that the severity of the reduction and the actual size of the shadow will depend upon many factors including the construction of the structure and its height – the distances given above are for guidance only.

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FIELD SURVEY METHOD

Tests are carried out at a selection of locations in the area surrounding the proposed development.

Test results are recorded regarding television signal strength and quality: -
Strength is recorded in: dBµv
Quality is recorded in: VBER (Standard definition SD)
LBER (High definition HD)

Due to the rollout of the 4G Networks all results are recorded with a CAI approved benchmarked aerial with a balun and LTE filter

An alternative transmitter is tested for and where receivable, results are recorded.

All tests are carried out at a 10m height above ground level.

The direction and type of existing viewers' television aerials is noted.

A bearing and distance to the proposed development is recorded at each test point location, for comparison with the bearing and distance to the television transmitter serving the area.

Existing obstructions to television reception are noted.

FIELD SURVEY EQUIPMENT

The field survey is carried out using the following equipment: -

- Specialist vehicle complete with telescopic mast
- 360° Antenna rotator
- 14 Element CAI approved wideband UHF antenna with balun and LTE filter, one vertical and one horizontal polarisation
- FM Omni aerial
- DAB Omni aerial
- 20m x WF100 twin screened CAI approved coaxial cable
- Televes spectrum analyser/field strength meter
- Ordnance survey maps
- Garmin GPS receiver
- Compass
- Digital camera

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SERVICES LIKELY TO BE AFFECTED

TERRESTRIAL TELEVISION RECEPTION

There are two potential ways that the introduction of a new building or extension can cause interference to terrestrial television reception; these are obstruction and reflection.

Obstruction occurs when existing viewers are located in an area where their television aerial beam path (direction) to the television transmitter is either through, or within very close proximity to, the new building or structure. This can result in a reduction of television signal strength and quality and in some cases (if existing viewers are located within close proximity to the new building or structure); receiving terrestrial television signals can become problematic and may not be achievable.

Reflection occurs when the new building or extension reflects terrestrial television signals. These unwanted reflected signals are received on the existing viewer's television aerial along with the direct signals from the television transmitter, resulting in irregularities of television signal strength and quality. However, digital terrestrial television broadcasts are less prone to reflections than the previous analogue television broadcasts, but this must still be taken into account when assessing any potential impact.

SATELLITE TELEVISION RECEPTION

Satellite television reception requires a clear line of sight between the satellite antenna and the satellite it is aligned to. In most cases the angle of the satellite antenna to the satellite orbiting the earth is between 20- and 30-degrees elevation.

This elevation must be taken into account when assessing if the introduction of the new building or structure has the potential to obstruct existing viewers' satellite antenna beam path to the satellite.

Satellite reception is very rarely affected on a large scale and is mostly only relevant to existing viewers within close proximity to the new building or structure.

FM & DAB RECEPTION

There are two potential ways that the introduction of a new building or extension can cause interference to radio reception; these are obstruction and reflection.

Obstruction occurs when existing listeners are located in an area where their radio reception to the radio transmitter is either through, or within very close proximity to, the new building or structure. This can result in a reduction of radio signal strength and quality and in some cases (if existing listeners are located within close proximity to the new building or structure); receiving radio signals can become problematic and may not be achievable.

Reflection occurs when the new building or extension reflects radio signals

FM & DAB reception is very rarely affected on a large scale and is mostly only relevant to existing listeners within close proximity to the new building or structure

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THE PROPOSED DEVELOPMENT:
Project Bradford
near Etihad Stadium
Manchester

CARRIED OUT ON BEHALF OF:
ME- Engineers
57 Great Suffolk Street,
London.
SE1 0BB

OVERVIEW OF PROPOSED DEVELOPMENT
The proposed development is to consist of a new development.

DETAILS OF PROPOSED DEVELOPMENT

Development Type:	New development
Proposed Building Height:	The development is to have a maximum elevation of approximately 35m.

Please refer to;
Plan A which highlights the proposed development's location
Plan B the proposed site elevation

EXISTING BUILDINGS
A series of photographs has been taken to highlight the existing building/structure/area at the proposed development's location, and any existing buildings in the surrounding area.

Photograph A: - The proposed development's location
Photograph B: - View directly to the north of the proposed development.
Photograph C: - View directly to the east of the proposed development.
Photograph D: - View directly to the south of the proposed development.
Photograph E: - View directly to the west of the proposed development.

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COORDINATES

Prior to commencement of the survey, coordinates at the proposed development's location are entered into a GPS receiver, along with the coordinates for the television transmitter serving the area. This enables us to record a bearing and distance from each test point location to the proposed development, for comparison with the bearing and distance to the television transmitter. The coordinates used throughout the survey are listed below and shown on Plan A.

LOCATION	NATIONAL GRID REFERENCE
Proposed Development Position	SJ 86830 98873
Winter Hill Transmitter	SD 66000 14400
Holme Moss FM Transmitter	SE 09497 04077
Sunley Building (city tower) DAB Transmitter	SJ 84268 98194

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PLAN A: THE PROPOSED DEVELOPMENT'S LOCATION



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PHOTO A: The proposed developments location



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PHOTO B: View directly to the north of the proposed development



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PHOTO C: View directly to the east of the proposed development



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PHOTO D: View directly to the south of the proposed development



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PHOTO E: View directly to the west of the proposed development



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TERRESTRIAL TELEVISION SERVICES

Viewers in the surrounding area to the proposed development are receiving their terrestrial television services from the Winter Hill transmitter, located to the northwest of the building/structure, approx. 24 km away

The Winter Hill transmitter broadcasts 9 digital multiplexers providing the full range of standard definition and high definition digital terrestrial television services available on Freeview, with regional programming. Please refer to the transmitter details for further information

The test results recorded during the survey show that terrestrial television reception from the Winter Hill transmitter has good signal strengths and at the majority of test points the quality is good. Please note that the results are recorded at a 10mt aerial height, in accordance with TV reception survey specifications and that for existing television aerials sited at multi-storey height reception could be much improved.

During the survey, tests were carried out to receive an alternative transmitter to the Winter Hill transmitter. The result of these tests was that no alternative transmitter could be received at an acceptable quality or strength.

SATELLITE TELEVISION SERVICES

Both Sky TV and Freesat are broadcast from the same fleet of satellites located at an orbital position of 28.2º east of south, with a required satellite dish elevation of approximately 23º.

Sky TV is primarily a subscription-based service offering a number of packages of various television services at monthly subscription costs.

Freesat is a non-subscription-based service and offers a similar television service line up to Freeview and selectable regional programming.

FM RADIO SERVICES

Listeners in the surrounding area to the proposed development are receiving their radio services from the Holme Moss transmitter, located to the northwest of the building/structure, approx. 23 km away at a compass bearing of 76 degrees

DAB RADIO SERVICES

Listeners in the surrounding area to the proposed development are receiving their radio services from the Sunley Building, (now city tower) Piccadilly transmitter, located to the east of the building/structure, approx. 2.5km away at a compass bearing of 257 degrees

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FIELD SURVEY TEST RESULTS AND INFORMATION

TEST POINT 1

Location Etihad Car park H
NGR: SJ 86539 98955
Alt: 59 m
Mast Height: 10 m

LOCATION	BEARING	DISTANCE
Winter Hill Transmitter	307°	25.6 km
Proposed Development	101°	0.3 km

Visible Existing Aerial Arrays: none

Visible Existing Obstructions: Various buildings/Trees in the general direction of the Winter Hill Transmitter.

WINTER HILL UHF TRANSMITTER - REPORT

Channel	Frequency	MUX	Format	Level (dBµv)	CN dB	MER	VBER	LBER	Quality
31	554.0	COM7	HD	69	45	32		-6	Pass
37	602.0	COM8	SD	75	45	34		-6	Pass
49	698.0	ARQA	SD	75	45	33	-8		Pass
50	706.0	BBCA	SD	74	45	33	-8		Pass
54	737.8	BBCB	HD	75	45	32	-8		Pass
55	746.0	ARQB	HD	67	34	30	-8		Pass
56	754.0	LM	SD	59	29	27	-8		Pass
58	770.0	SDN	SD	73	39	35	-8		Pass
59	778.0	D3+4	SD	72	45	34	-8		Pass

FM/DAB TRANSMITTER – REPORT

Channel	Frequency FM	Level (dBµv) FM	CN Db FM	Frequency DAB	Level (dBµv) DAB	CN Db DAB
BBC 1	98.9	75	45	225.64(12B)	85	45
BBC 2	89.3	74	44	225.64(12B)	85	45
BBC 3	91.5	73	42	225.64(12B)	85	45
BBC 4	95.1	76	44	225.64(12B)	85	45

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TEST POINT 2

Location Etihad Car park G
NGR: SJ 86789 99023
Alt: 56 m
Mast Height: 10 m

LOCATION	BEARING	DISTANCE
Winter Hill Transmitter	306°	25.7 km
Proposed Development	175°	0.35 km

Visible Existing Aerial Arrays: none

Visible Existing Obstructions: Various buildings/Trees in the general direction of the Winter Hill Transmitter

WINTER HILL UHF TRANSMITTER - REPORT

Channel	Frequency	MUX	Format	Level (dBµv)	CN dB	MER	VBER	LBER	Quality
31	554.0	COM7	HD	74	45	32		-6	Pass
37	602.0	COM8	SD	79	45	34		-6	Pass
49	698.0	ARQA	SD	77	45	34		-8	Pass
50	706.0	BBCA	SD	78	45	34		-8	Pass
54	737.8	BBCB	HD	75	45	35		-6	Pass
55	746.0	ARQB	HD	70	32	31		-6	Pass
56	754.0	LM	SD	69	35	29		-8	Pass
58	770.0	SDN	SD	74	39	35		-8	Pass
59	778.0	D3+4	SD	72	45	34		-8	Pass

FM/DAB TRANSMITTER – REPORT

Channel	Frequency FM	Level (dBµv) FM	CN Db FM	Frequency DAB	Level (dBµv) DAB	CN Db DAB
BBC 1	98.9	70	35	225.64(12B)	80	45
BBC 2	89.3	69	35	225.64(12B)	80	45
BBC 3	91.5	66	33	225.64(12B)	80	45
BBC 4	95.1	65	28	225.64(12B)	80	45

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TEST POINT 3

Location Stuart Street
NGR: SJ 86970 98843
Alt: 62 m
Mast Height: 10 m

LOCATION	BEARING	DISTANCE
Winter Hill Transmitter	308°	25.9 km
Proposed Development	272°	0.10 km

Visible Existing Aerial Arrays: High gain aerial on 1m mast, mounted at rooftop height on 2 storey properties, directed towards the Winter Hill Transmitter

Visible Existing Obstructions: Various buildings/Trees in the general direction of the Winter Hill Transmitter

WINTER HILL UHF TRANSMITTER - REPORT

Channel	Frequency	MUX	Format	Level (dBµv)	CN dB	MER	VBER	LBER	Quality
31	554.0	COM7	HD	55	38	30	-5		Pass
37	602.0	COM8	SD	62	44	33		-6	Pass
49	698.0	ARQA	SD	57	38	32		-8	Pass
50	706.0	BBCA	SD	60	40	32		-8	Pass
54	737.8	BBCB	HD	60	43	31	-5		Pass
55	746.0	ARQB	HD	52	30	29	-4		Pass
56	754.0	LM	SD	46	27	26		-5	Pass
58	770.0	SDN	SD	57	37	34		-8	Pass
59	778.0	D3+4	SD	56	40	32		-8	Pass

FM/DAB TRANSMITTER – REPORT

Channel	Frequency FM	Level (dBµv) FM	CN Db FM	Frequency DAB	Level (dBµv) DAB	CN Db DAB
BBC 1	98.9	79	45	225.64(12B)	72	45
BBC 2	89.3	69	42	225.64(12B)	72	45
BBC 3	91.5	69	41	225.64(12B)	72	45
BBC 4	95.1	64	38	225.64(12B)	72	45

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VISIBLE TV AERIAL LOCATED IN THE AREA OF TEST POINT 3



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TEST POINT 4

Location Willdale Close
NGR: SJ 87062 98889
Alt: 63 m
Mast Height: 10 m

LOCATION	BEARING	DISTANCE
Winter Hill Transmitter	306°	26.1 km
Proposed Development	265°	0.2 km

Visible Existing Aerial Arrays: 18 element and high gain aerials on 1m masts, mounted at rooftop height on 2 storey properties, directed towards the Winter Hill Transmitter

Visible Existing Obstructions: Various buildings/Trees in the general direction of the Winter Hill Transmitter

WINTER HILL UHF TRANSMITTER - REPORT

Channel	Frequency	MUX	Format	Level (dBµv)	CN dB	MER	VBER	LBER	Quality
31	554.0	COM7	HD	61	44	30	-6		Pass
37	602.0	COM8	SD	66	44	33		-8	Pass
49	698.0	ARQA	SD	65	43	34		-8	Pass
50	706.0	BBCA	SD	64	42	33		-8	Pass
54	737.8	BBCB	HD	65	45	33	-6		Pass
55	746.0	ARQB	HD	58	33	28	-3		Pass
56	754.0	LM	SD	50	27	25		-5	Pass
58	770.0	SDN	SD	60	38	34		-8	Pass
59	778.0	D3+4	SD	61	43	34		-8	Pass

FM/DAB TRANSMITTER – REPORT

Channel	Frequency FM	Level (dBµv) FM	CN Db FM	Frequency DAB	Level (dBµv) DAB	CN Db DAB
BBC 1	98.9	64	38	225.65(12B)	70	44
BBC 2	89.3	60	40	225.64(12B)	70	44
BBC 3	91.5	62	42	225.64(12B)	70	44
BBC 4	95.1	59	35	225.64(12B)	70	44

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VISIBLE TV AERIAL LOCATED IN THE AREA OF TEST POINT 4



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TEST POINT 5

Location Ashton New Road
NGR: SJ 87419 98494
Alt: 66 m
Mast Height: 10 m

LOCATION	BEARING	DISTANCE
Winter Hill Transmitter	306°	26.6 km
Proposed Development	299°	0.7 km

Visible Existing Aerial Arrays: none

Visible Existing Obstructions: Various multi-storey buildings in the general direction of the Winter Hill Transmitter

WINTER HILL UHF TRANSMITTER - REPORT

Channel	Frequency	MUX	Format	Level (dBµv)	CN dB	MER	VBER	LBER	Quality
31	554.0	COM7	HD	61	44	30	-6		Pass
37	602.0	COM8	SD	66	44	33		-8	Pass
49	698.0	ARQA	SD	65	43	34		-8	Pass
50	706.0	BBCA	SD	64	42	33		-8	Pass
54	737.8	BBCB	HD	65	45	33	-6		Pass
55	746.0	ARQB	HD	58	33	28	-3		Pass
56	754.0	LM	SD	50	27	25		-5	Pass
58	770.0	SDN	SD	60	38	34		-8	Pass
59	778.0	D3+4	SD	61	43	34		-8	Pass

FM/DAB TRANSMITTER – REPORT

Channel	Frequency FM	Level (dBµv) FM	CN Db FM	Frequency DAB	Level (dBµv) DAB	CN Db DAB
BBC 1	98.9	66	39	225.65(12B)	71	42
BBC 2	89.3	62	42	225.64(12B)	71	42
BBC 3	91.5	68	40	225.64(12B)	71	42
BBC 4	95.1	61	33	225.64(12B)	71	42

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TEST POINT 6

Location Gibbon Street
NGR: SJ 86974 98687
Alt: 61 m
Mast Height: 10 m

LOCATION	BEARING	DISTANCE
Winter Hill Transmitter	307°	26.2 km
Proposed Development	324°	0.2 km

Visible Existing Aerial Arrays: none

Visible Existing Obstructions: Various multi-storey buildings in the general direction of the Winter Hill Transmitter

WINTER HILL UHF TRANSMITTER - REPORT

Channel	Frequency	MUX	Format	Level (dBµv)	CN dB	MER	VBER	LBER	Quality
31	554.0	COM7	HD	74	45	33	-6		Pass
37	602.0	COM8	SD	77	45	34		-8	Pass
49	698.0	ARQA	SD	76	45	34		-8	Pass
50	706.0	BBCA	SD	76	45	33		-8	Pass
54	737.8	BBCB	HD	74	45	32	-6		Pass
55	746.0	ARQB	HD	65	33	31	-6		Pass
56	754.0	LM	SD	62	31	27		-8	Pass
58	770.0	SDN	SD	68	38	35		-8	Pass
59	778.0	D3+4	SD	66	45	34		-8	Pass

FM/DAB TRANSMITTER – REPORT

Channel	Frequency FM	Level (dBµv) FM	CN Db FM	Frequency DAB	Level (dBµv) DAB	CN Db DAB
BBC 1	98.9	70	40	225.64(12B)	76	45
BBC 2	89.3	65	30	225.64(12B)	76	45
BBC 3	91.5	68	42	225.64(12B)	76	45
BBC 4	95.1	71	38	225.64(12B)	76	45

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TEST POINT 7

Location Asda Car Park
NGR: SJ 87146 98555
Alt: 63 m
Mast Height: 10 m

LOCATION	BEARING	DISTANCE
Winter Hill Transmitter	306°	26.4 km
Proposed Development	308°	0.4 km

Visible Existing Aerial Arrays: none

Visible Existing Obstructions: Various buildings/Trees in the general direction of the Winter Hill Transmitter

WINTER HILL UHF TRANSMITTER - REPORT

Channel	Frequency	MUX	Format	Level (dBµv)	CN dB	MER	VBER	LBER	Quality
31	554.0	COM7	HD	76	45	31	-6		Pass
37	602.0	COM8	SD	74	45	36		-8	Pass
49	698.0	ARQA	SD	77	45	32		-8	Pass
50	706.0	BBCA	SD	76	45	30		-8	Pass
54	737.8	BBCB	HD	72	45	33	-6		Pass
55	746.0	ARQB	HD	70	33	31	-6		Pass
56	754.0	LM	SD	63	30	26		-8	Pass
58	770.0	SDN	SD	71	35	38		-8	Pass
59	778.0	D3+4	SD	70	45	34		-8	Pass

FM/DAB TRANSMITTER – REPORT

Channel	Frequency FM	Level (dBµv) FM	CN Db FM	Frequency DAB	Level (dBµv) DAB	CN Db DAB
BBC 1	98.9	76	45	225.64(12B)	76	45
BBC 2	89.3	75	40	225.64(12B)	76	45
BBC 3	91.5	75	45	225.64(12B)	76	45
BBC 4	95.1	77	41	225.64(12B)	76	45

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TEST POINT 8

Location Waterfront Sport City
NGR: SJ 87184 98736
Alt: 63 m
Mast Height: 10 m

LOCATION	BEARING	DISTANCE
Winter Hill Transmitter	306°	26.3 km
Proposed Development	290°	0.4 km

Visible Existing Aerial Arrays: High Gain aerial at rooftop height on multi-storey buildings.

Visible Existing Obstructions: Various buildings/Trees in the general direction of the Winter Hill Transmitter

WINTER HILL UHF TRANSMITTER - REPORT

Channel	Frequency	MUX	Format	Level (dBµv)	CN dB	MER	VBER	LBER	Quality
31	554.0	COM7	HD	45	30	17	-2		Marginal
37	602.0	COM8	SD	47	27	21		-5	Pass
49	698.0	ARQA	SD	47	29	23		-6	Pass
50	706.0	BBCA	SD	48	34	20		-8	Pass
54	737.8	BBCB	HD	49	32	20	-6		Pass
55	746.0	ARQB	HD	42	26	16	-6		Pass
56	754.0	LM	SD	34	18	15		-5	Fail
58	770.0	SDN	SD	42	28	21		-5	Pass
59	778.0	D3+4	SD	43	28	21		-8	Pass

FM/DAB TRANSMITTER – REPORT

Channel	Frequency FM	Level (dBµv) FM	CN Db FM	Frequency DAB	Level (dBµv) DAB	CN Db DAB
BBC 1	98.9	73	45	225.64(12B)	80	45
BBC 2	89.3	72	45	225.64(12B)	80	45
BBC 3	91.5	71	45	225.64(12B)	80	45
BBC 4	95.1	73	43	225.64(12B)	80	45

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VISIBLE TV AERIAL LOCATED IN THE AREA OF TEST POINT 8



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TEST POINT 9

Location Howarth Close
NGR: SJ 87080 98262
Alt: 65 m
Mast Height: 10 m

LOCATION	BEARING	DISTANCE
Winter Hill Transmitter	307°	26.5 km
Proposed Development	336°	0.6 km

Visible Existing Aerial Arrays: High gain aerial on 1m mast, mounted at rooftop height on 2 storey properties, directed towards the Winter Hill Transmitter

Visible Existing Obstructions: Various buildings/Trees in the general direction of the Winter Hill Transmitter

WINTER HILL UHF TRANSMITTER - REPORT

Channel	Frequency	MUX	Format	Level (dBµv)	CN dB	MER	VBER	LBER	Quality
31	554.0	COM7	HD	61	44	30	-6		Pass
37	602.0	COM8	SD	66	44	33		-8	Pass
49	698.0	ARQA	SD	65	43	34		-8	Pass
50	706.0	BBCA	SD	64	42	33		-8	Pass
54	737.8	BBCB	HD	65	45	33	-6		Pass
55	746.0	ARQB	HD	58	33	28	-3		Pass
56	754.0	LM	SD	50	27	25		-5	Pass
58	770.0	SDN	SD	60	38	34		-8	Pass
59	778.0	D3+4	SD	61	43	34		-8	Pass

FM/DAB TRANSMITTER – REPORT

Channel	Frequency FM	Level (dBµv) FM	CN Db FM	Frequency DAB	Level (dBµv) DAB	CN Db DAB
BBC 1	98.9	76	45	225.64(12B)	76	45
BBC 2	89.3	75	45	225.64(12B)	76	45
BBC 3	91.5	75	45	225.64(12B)	76	45
BBC 4	95.1	77	45	225.64(12B)	76	45

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VISIBLE TV AERIAL LOCATED IN THE AREA OF TEST POINT 9



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TEST POINT 10

Location National Cycling Centre
NGR: SJ 87382 98646
Alt: 67 m
Mast Height: 10 m

LOCATION	BEARING	DISTANCE
Winter Hill Transmitter	306°	26.5 km
Proposed Development	289°	0.6 km

Visible Existing Aerial Arrays: none

Visible Existing Obstructions: Various buildings/Trees in the general direction of the Winter Hill Transmitter

WINTER HILL UHF TRANSMITTER - REPORT

Channel	Frequency	MUX	Format	Level (dBµv)	CN dB	MER	VBER	LBER	Quality
31	554.0	COM7	HD	52	34	24	-3		Pass
37	602.0	COM8	SD	62	41	35		-8	Pass
49	698.0	ARQA	SD	50	34	21		-7	Pass
50	706.0	BBCA	SD	56	37	31		-8	Pass
54	737.8	BBCB	HD	56	42	28	-6		Pass
55	746.0	ARQB	HD	50	33	26	-6		Pass
56	754.0	LM	SD	45	28	27		-4	Marginal
58	770.0	SDN	SD	47	30	22		-6	Pass
59	778.0	D3+4	SD	48	32	22		-7	Pass

FM/DAB TRANSMITTER – REPORT

Channel	Frequency FM	Level (dBµv) FM	CN Db FM	Frequency DAB	Level (dBµv) DAB	CN Db DAB
BBC 1	98.9	60	40	225.64(12B)	70	45
BBC 2	89.3	62	41	225.64(12B)	70	45
BBC 3	91.5	69	45	225.64(12B)	70	45
BBC 4	95.1	60	40	225.64(12B)	70	45

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CONCLUSIONS for Building development

The proposed development is to be located at Alan Turing Way, Manchester. The development is to consist of a new development, with a maximum elevation of approximately 35m. The majority of the proposed development's location has no existing buildings.

Subsequently, the proposed development will change the existing skyline which can result in an impact to existing viewers' television reception.

By taking into account the proposed development's location and elevation, the details collated during the desktop study, and the results and information recorded during the field survey, we are able to ascertain where, or if, the introduction of the proposed development has the potential to impact upon existing viewers' television reception.

In the case of the proposed development, we have highlighted a potential impact zone for terrestrial television reception shown on Map 1. We have not indicated a potential impact zone for satellite television reception as there are no visible satellite dishes directly to the north that would be affected.

Adjacent Buildings

The potential impact zone for terrestrial television reception covers an area to the southeast of the proposed development. Most of the potential impact zone covers a Car Park area where we do not envisage any issues. However, a portion of the potential impact zone covers a small area of Stuart street and Gibbon street where subsequently mitigation may be required.
One area of note is a small area between Stuart and Gibbon street that is adjacent to Alan Turing Way, which also has a property called 'Lock House' as shown on the Potential impact zone map 2 on page 35

Please note if tower cranes are used on site these could cause interference on a greater scale than the completed development. This interference would be for the duration of time that the tower cranes are present.

Please refer to the Mitigation section of this report for possible remedies to rectifying terrestrial television reception issues., For FM and DAB reception due to the signal being a lower frequency and as such is generally more 'robust' it is rarely affected and any deviation in signal levels would be only noticeable in very close proximity to the development.

We have not indicated a potential impact zone for satellite television reception as the buildings directly to the north are a sufficient distance from the proposed development. We advise that the situation regarding television and satellite reception is monitored closely during the construction and any reports of interference are investigated promptly.
Please note if tower cranes are used on site these could cause interference on a greater scale than the completed development. This interference would be for the duration of time that the tower cranes are present.

Please refer to the Mitigation section of this report for possible examples to rectifying terrestrial television reception issues if required.

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MITIGATION

Terrestrial Television Reception

Remedial Aerial Work
One or all the following may assist in rectifying interference being received to terrestrial television reception

Change of aerial type to one most suited to the type of interference being received.
Redirecting existing television aerial to an alternative transmitter that is not affected, in some cases the existing television aerial may not be suitable for redirecting and the installation of a suitable television aerial may be required
Re-siting of the television aerial to a position on the property where interference is reduced or not present.
Increase or decrease of aerial height
Installation of masthead amplification to improve television signal strengths being received

Remote Television Aerial
When a remote television aerial is positioned at a location with good quality television reception, (which can be a considerable distance from the affected area), and the signals are brought back via a cable network to the affected properties.

Utilising Satellite Reception
Should rectifying terrestrial television reception prove problematic, the installation of satellite systems utilising the Freesat platform can assist in rectifying reception issues.

To provide satellite television reception for individual affected dwellings or commercial units requires the installation of a satellite dish and set top box.

Satellite Television Reception

Remedial Satellite Work
One or all the following may assist in rectifying satellite television reception issues.

Re-siting of the satellite antenna to a position on the property where a clear line of sight can be achieved.
Increase in height of the satellite antenna to achieve a clear line of sight to the satellite.

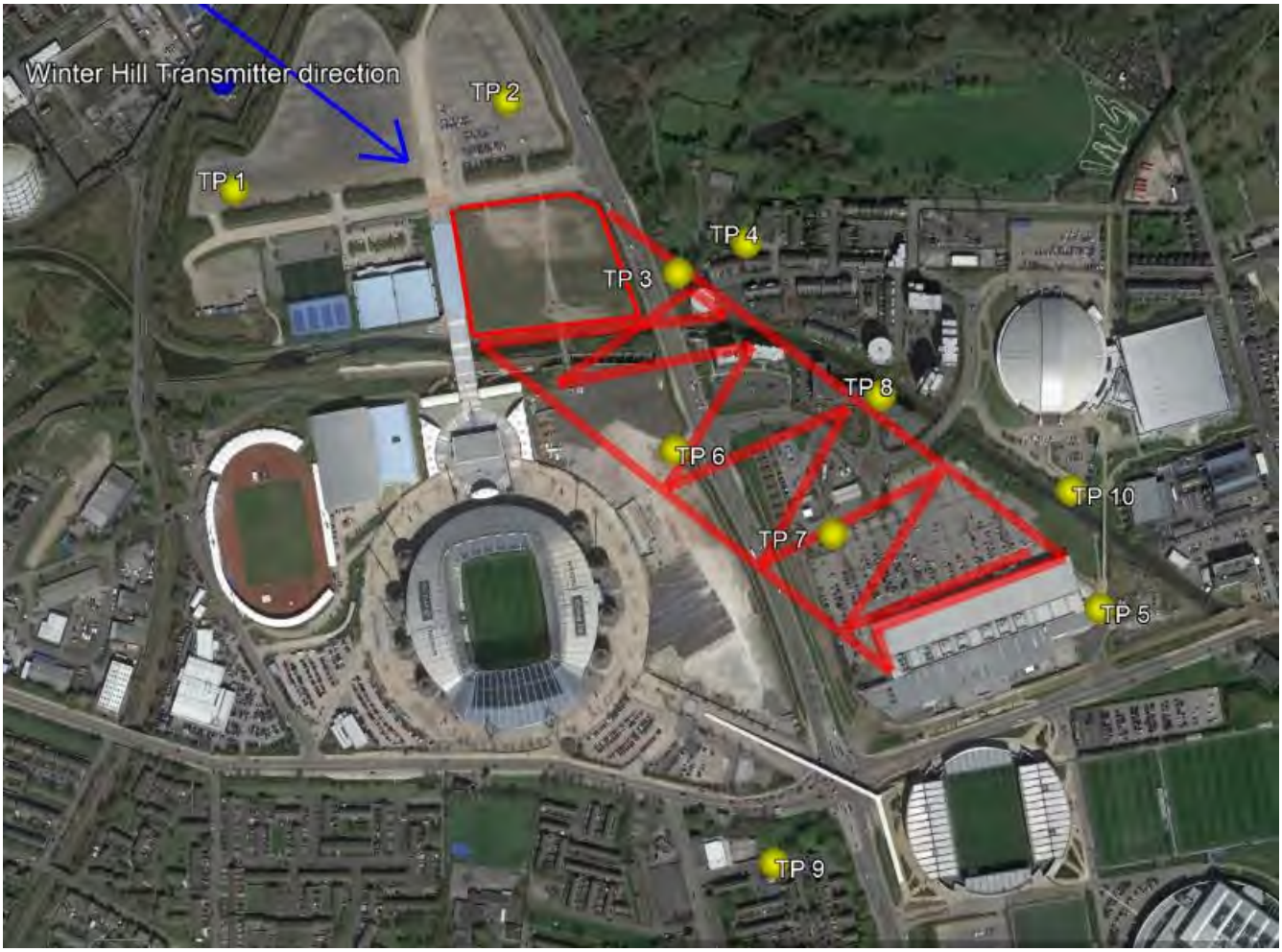
Remote Satellite Dish
When the receiving satellite dish is sited in a position where a clear line of sight can be achieved; this can sometimes be a considerable distance from the affected property. In some instances, the satellite dish may require siting on the offending property to achieve a clear line of sight, or on an adjoining property where permission will have to be sought. The signals are brought back to the affected property via a cable and amplifier network.

The need for such mitigation would need to be determined on a case by case basis.

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POTENTIAL IMPACT ZONE – MAP 1

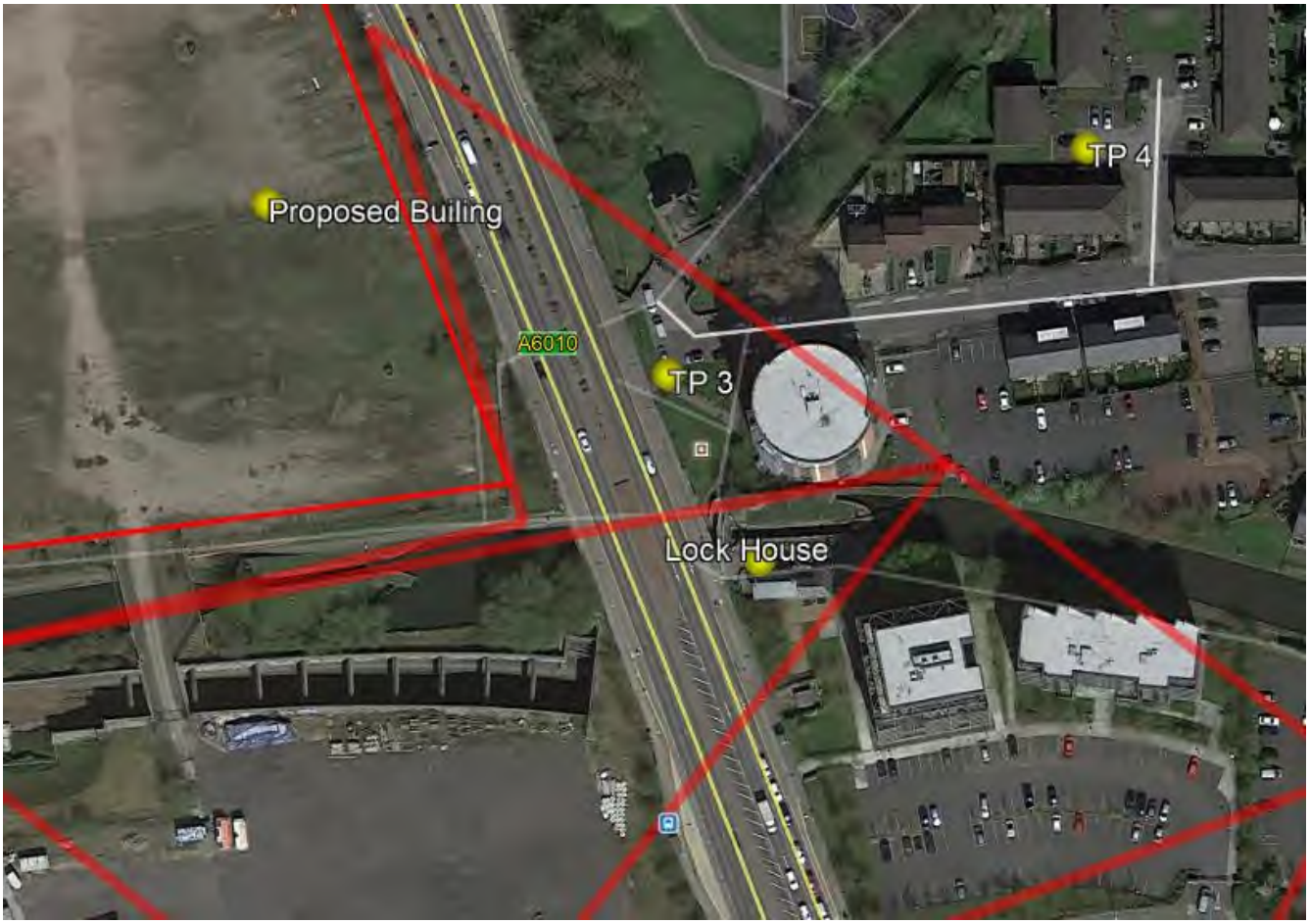


Red area indicates potential area for interference of Freeview

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POTENTIAL IMPACT ZONE – MAP 2 LOCK HOUSE



Red area indicates potential area for interference of Freeview

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REFERENCE OF TERMS

c.	Circa
CH	The UHF Channel allocation from the transmitter.
MUX	The digital multiplexer allocation/operator.
Tx	Transmitter.
dBµv	Carrier strength reading (decibel microvolt).
C/N	Carrier /Noise Ratio
VBER	Measurement for digital signal after error correction (BER after VITERBi)
LBER	BER after been applied the LDPC (low density parity check) error correction.
SD	SD Standard Definition
HD	HD High Definition
NGR	National Grid Reference
ALT	Altitude above sea level at the location.
BRG	Bearing from North.
GPS	Global Positioning System.

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Appendix 6 Baseline Lighting Condition Survey

me engineers

Project Bradford

Existing Lighting Condition Survey

BRA-MEEE-ZZ-XX-SU-EL-0001

30th September 2019

Bradford

Light Spill Survey

Issue and Revision Record

Rev/ Issue	Date	Description	Revision Details	Prepared	Checked
-	30/09/2019	For Information	-	A. Kalimeri	C.Parsons

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1 LIGHT SURVEY

1.1 Overview

A key requisite of any exterior lighting installation is to minimise consequent obtrusive spill light which might adversely affect local residential communities, vehicular traffic routes or surrounding environmental areas.

The proposed works to the project will involve a new exterior amenity lighting system for the public realm as well as façade illumination of the building. The installation of a media façade is also being proposed.

The primary purpose of this report is to record the existing lighting conditions to allow reference to be made during the planning process, however commentary is also made in areas that are considered key focal points in the success of the redevelopment works.

An ambient light level survey has been carried out at the site to ascertain the base-line spill light levels within the immediate surrounding area of the development. The results, are presented in this report.

1.1.1 Referred Units and Terminology

Where referred to in the report, the following units and terminology are used to define the associated lighting phenomena and/or illuminance plane

Candela:	unit used to define the intensity of a light source.
Lumen:	unit used to define luminous flux. 1 lumen is defined as the luminous flux passing through a 1-foot opening in the surface of a sphere with a radius of 1-foot and a 1-candela light source at its centre.
Lux:	unit used to define illumination. 1 lux is equal to 1-lumen falling on an area of 1-square meter.
Horizontal Light Level:	the illumination on a horizontal plane. Readings taken with the light meter in the horizontal position
Vertical Light Level:	the illumination on a vertical plane. Readings taken with the light meter in the vertical position.
Maximum Vertical Light Level:	the illumination measured on the vertical plane with the meter facing the brightest light source.
Line of Sight:	term used to express the condition in which a person's view is directly in line with a light source.
Spill Light:	for the purpose of this report spill light can be defined as the illumination that is produced by a light source or light sources at a point or surface on which the light is not intended or desirable.
Glare:	the discomfort or impairment of vision experienced when the image is excessively bright compared to the general surroundings.

1.2 Assessment Criteria

The light level study has been completed with reference to the following industry standard guidelines:

- CIE 150:2003 – Guide on the limitation of the effects of obtrusive light from outdoor lighting installations.
- ILP: Guidance Notes for the Reduction of Obtrusive Light GN01:2011

1.2.1 Preamble

Spill light is normally related to interruption of sleep but may also interfere with other light-sensitive areas. The effect of light is often determined by the contrast posed with the immediate background.

In defining the intensity of light, the terms maximum vertical and maximum horizontal are used. These terms relate to the orientation of the light meter measuring the light level. In the horizontal conditions, the meter is oriented horizontally aiming straight up. In the maximum vertical condition, the meter is pointed directly at the light source. The maximum vertical condition is considered the worst-case measure of light intensity.

1.2.2 Regulating Light Spill

The following tables are excerpts from the Guidance Notes for the Reduction of Obtrusive Light by the Institute of Lighting Engineers. The tables provide the limits of illuminance to minimise light spill, depending on different darkness zones and road classifications

Obtrusive Light Limitations for Exterior Lighting Installations – General Observers						
Environmental Zone	Sky Glow ULR [Max %]	Light Intrusion (into Windows) Ev [lux]		Luminaire Intensity I [candelas]		Building Luminance Pre-curfew
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Average, L [cd/m^2]
E0	0	0	0	0	0	0
E1	0	2	0 (1*)	2,500	0	0
E2	2.5	5	1	7,500	500	5
E3	5.0	10	2	10,000	1,000	10
E4	15	25	5	25,000	2,500	25

Environmental Zone:

E0 – Protected surrounding, dark lighting environment

E1 – Natural surroundings, intrinsically dark lighting environment

E2 – Rural surrounding, low district brightness lighting environment

E3 – Suburban surrounding, medium district brightness lighting environment

E4 – Urban surrounding, high district brightness lighting environment

Abbreviations:

ULR = Upward Light Ratio of the installation

Ev = Vertical illuminance in Lux

I = Light intensity in Candelas (cd)

L = Luminance in candelas per square metre (cd/m²)

Curfew = the time after which stricter requirements (for the control of obtrusive light) will apply.

* = Permitted only from only public road lighting installations

Table 1.2.2a – Guidance Notes for the Reduction of Obtrusive Light by the Institute of Lighting Engineers, table 2

Obtrusive Light Limitations for Exterior Lighting Installations – Road Users		
Road Classification [(1)]	Threshold Increment (TI)	Veiling Luminance (Lv)
No road lighting	15% based on adaption luminance of 0.1cd/m²	0.04
ME6 / ME5	15% based on adaption luminance of 1cd/m²	0.25
ME4 / ME3	15% based on adaption luminance of 2cd/m²	0.40
ME2 / ME1	15% based on adaption luminance of 5cd/m²	0.84

[(1)] Road Classification:

As defined in EN 13201-2(2015) road lighting performance requirements

Abbreviations:

TI = Threshold increment

Lv = Veiling luminance

Table 1.2.2b – Guidance Notes for the Reduction of Obtrusive Light by the Institute of Lighting Engineers, table 3

For the purpose of comparison with the collated baseline readings, the current environmental zone for the site is considered to be best represented by E3– Suburban surrounding, medium district brightness lighting environment.

Based upon the above, the two main criteria which need to limit obtrusive light for general observers are:

- Light trespass on the vertical plane of any adjacent building should be less than 10 lux and 2 lux during pre and post curfews respectively.
- Source Intensity of the luminaire should be less than 10,000cd and 1,000cd during pre and post curfews respectively.

It shall be noted that these figures are for guidance only and can be supplemented or replaced by the Local Planning Authorities own guidance on sky glow ULR, light intrusion, luminaire intensity and specific pre-curfew and post-curfew limitations defined within planning approval requirements.

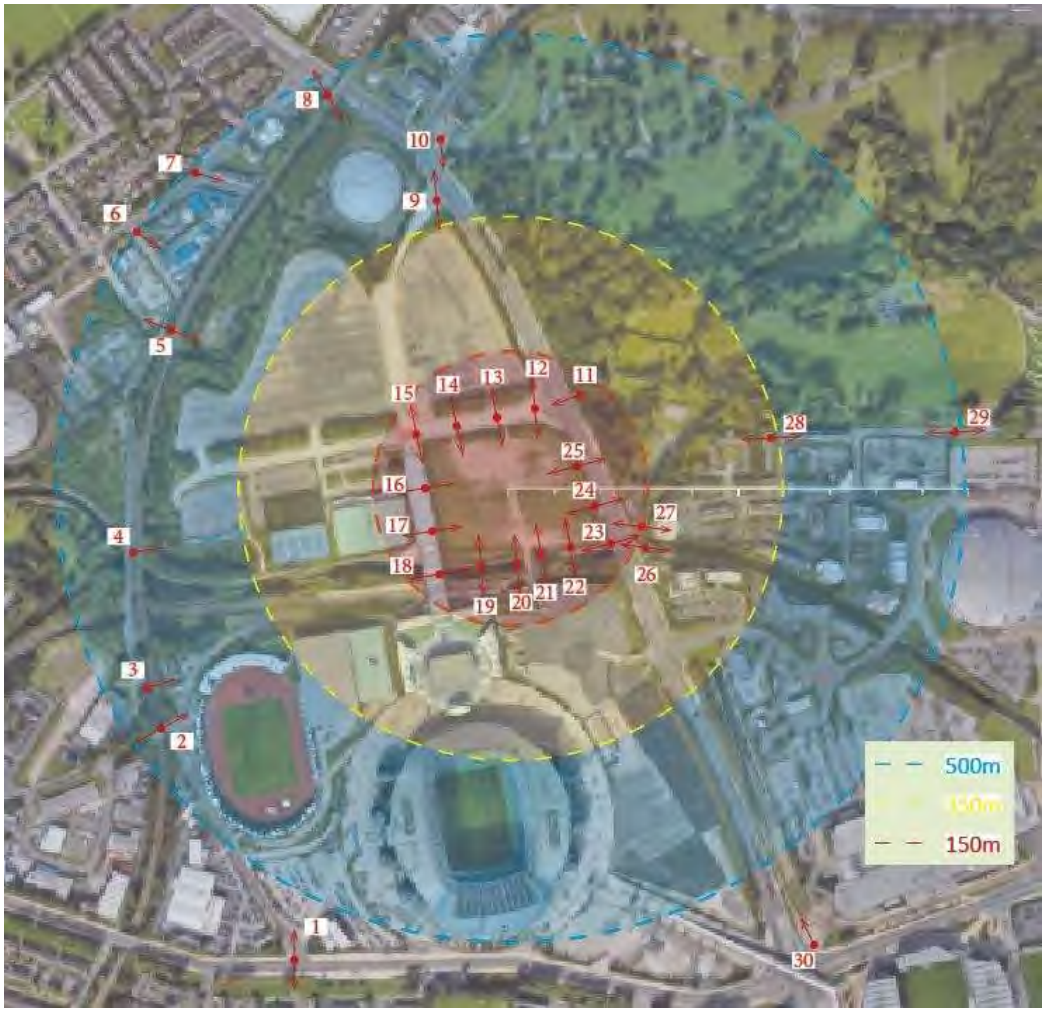
1.3 Survey

1.3.1 Methodology

At various points within the immediate surrounding of the development, a horizontal illuminance reading is presented which was taken at floor level with the light meter orientated so as aiming straight up. Additional vertical illuminance readings are taken with the light meter orientated directly towards the development and when deemed relevant away from it. These are taken at 2m above ground level.

The illuminance levels presented within the results is the measurement of a single point reading of lux at the relevant location.

Locations of measurement positions are as indicated in the map below, with the associated GPS coordinates and light level being imposed provided within section 1.3.3 of this report.



Measurements were taken at a distance up to 500m form the proposed development. Measurement points are set at circa 40 to 50m intervals in the immediate surrounding- 150m radius- of the site (points 11 to 25). Further measurements were taken at areas where residents are most likely to be affected within a 500m radius of the Stadium. This primarily focuses on the residential buildings North of Viaduct Road (points 5 to 8) and South of Philips Park (points 26 to 29) as indicated above.

Where measurement points are located local to residential properties, the readings are taken as close to the residential boundary as possible whilst keeping within the public realm.

1.3.2 Test Apparatus

Instrument: Konica Minolta illuminance meter

Model: T-10

Serial Number: 61731077-41721019

Calibration Certificated attached in Appendix B

1.3.3 Field Results

The following observations are made for the baseline spill light levels taken at key point areas around the site.

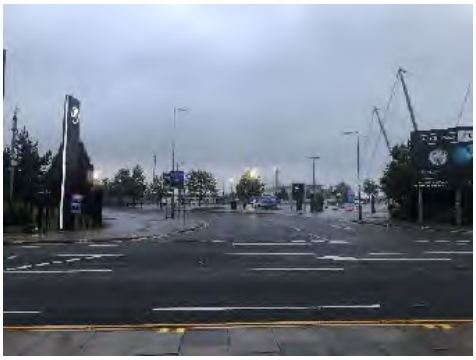
Readings are intended to establish existing conditions for future comparison and are not intended to be a random sampling that would be required in order to determine a statistical average for the given area and street.

It shall be noted that the survey carried out is an initial study to obtain the base-line spill lighting conditions within immediate surrounding of the development. Consequently, any light generated by other external sources e.g. floodlighting during a match day, should also be considered when assessing the contribution of spill lighting by the new development.

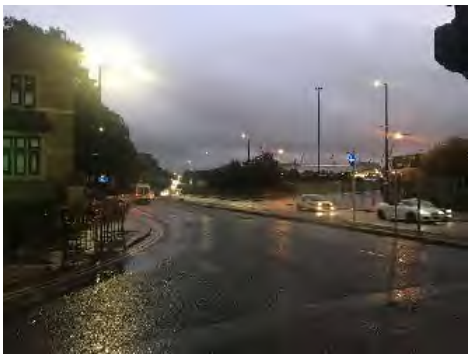
To obtain the base-line spill lighting conditions within the immediate surrounding of the proposed works area, a survey was carried out on 12th of September 2019. The survey was carried out during low-light hours (21.30-12.00).

Point	GPS Coordinates	Illuminance		
		Horizontal	Vertical	
			Towards the Site	Away from the Site
1	53°28'54"N 2°12'12"W	30.12	11.71	5.06
2	53°29'02"N 2°12'20"W	4.50	0.32	2.37
3	53°29'04"N 2°12'21"W	14.61	1.61	-
4	53°29'08"N 2°12'22"W	10.43	0.33	-
5	53°29'18"N 2°12'18"W	4.52	7.92	0.31
6	53°29'20"N 2°12'21"W	4.43	6.06	-
7	53°29'22"N 2°12'18"W	4.05	26.05	-
8	53°29'25"N 2°12'11"W	13.72	10.63	6.56
9	53°29'21"N 2°12'03"W	30.21	10.56	11.01
10	53°29'23"N 2°12'03"W	10.08	6.41	-
11	53°29'14"N 2°11'55"W	17.93	3.66	-
12	53°29'13"N 2°11'57"W	2.34	0.38	2.22
13	53°29'13"N 2°12'00"W	12.58	0.51	8.79
14	53°29'13"N 2°12'02"W	36.53	1.21	22.02
15	53°29'12"N 2°12'05"W	51.35	0.90	21.51
16	53°29'11"N 2°12'05"W	12.24	0.32	2.93
17	53°29'10"N 2°12'04"W	32.62	0.85	8.45
18	53°29'08"N 2°12'04"W	11.99	3.42	4.47
19	53°29'08"N 2°12'01"W	4.02	1.00	0.22
20	53°29'08"N 2°11'58"W	4.32	0.98	0.54
21	53°29'08"N 2°11'58"W	9.01	25.41	0.28
22	53°29'08"N 2°11'55"W	3.43	7.23	0.67
23	53°29'09"N 2°11'53"W	5.36	2.51	2.45
24	53°29'11"N 2°11'54"W	1.23	1.61	0.19
25	53°29'12"N 2°11'55"W	2.42	0.07	1.6
26	53°29'09"N 2°11'51"W	3.92	0.26	2.65
27	53°29'09"N 2°11'51"W	3.43	1.17	0.23
28	53°29'13"N 2°11'43"W	10.81	0.28	0.15
29	53°29'13"N 2°11'30"W	11.80	16.04	6.67
30	53°28'54"N 2°11'41"W	13.57	2.73	8.35

2 APPENDIX A: SURVEY PHOTOS

	**Calculation Point: 1 (View towards the site)** **Subject: Etihad Stadium and Manchester Regional arena** High illuminance levels due to the street lighting. Additional flood lighting during match days
	**Calculation Point: 1 (View away from the site)** **Subject: Properties South of Ashton New Road** The Etihad Campus obstructs direct view of the site from these properties
	**Calculation Point: 4** **Subject: View up New Viaduct Street** Subsidiary road lit by LED lighting columns. Foliage next to the rail lines
	**Calculation Point: 5** **Subject: View down New Viaduct Street** Subsidiary road lit by LED lighting columns. Foliage next to the rail lines obstructs direct view of the site

	**Calculation Point: 3** **Subject: View up New Viaduct Street** Subsidiary road lit by LED lighting columns. Foliage next to the rail lines obstructs direct view of the site
	**Calculation Point: 6** **Subject: View up Barking Street** Subsidiary road lit by LED lighting columns
	**Calculation Point: 7** **Subject: View down Broxton Street** Residential road lit by LED lighting columns. Road at lower level that the site. Properties subjected to no light spill or glare from the site as they sit at lower level. Also, the rail bridge provides an obstruction
	**Calculation Point: 8** **Subject: View up Alan Turing Way** Highway illuminated by LED lighting columns

	**Calculation Point: 8** **Subject: View down Alan Turing Way** Highway illuminated by LED lighting columns
	**Calculation Point: 10** **Subject: View down Alan Turing Way** Highway illuminated by LED lighting columns
	**Calculation Point: 15** **Subject: View down Joe Mercer Way** Street illuminated by LED lighting columns
	**Calculation Point: 15** **Subject: View from Joe Mercer Way to the site** Highway illuminated by LED lighting columns

	**Calculation Point: 18** **Subject: View east on the canal** Canal path illuminated by LED lighting columns
	**Calculation Point: 23** **Subject: View west on the canal** Canal path illuminated by LED lighting columns
	**Calculation Point: 24** **Subject: View southeast to residential building** Highway illuminated by LED lighting columns. Building has direct line of sight to the site
	**Calculation Point: 23** **Subject: View southeast to residential building** Highway illuminated by LED lighting columns. Building has direct line of sight to the site

	**Calculation Point: 25** **Subject: View down Alan Turing Way** Highway illuminated by LED lighting columns
	**Calculation Point: 25** **Subject: View up Alan Turing Way** Highway illuminated by LED lighting columns
	**Calculation Point: 26** **Subject: View east to the canal** Canal illuminated by bollards. Illuminance contribution from Alan Turing Street lighting
	**Calculation Point: 28** **Subject: View down Wesham Road** Street illuminated by LED lighting columns

	**Calculation Point: 28** **Subject: View up Wesham Road to the park** Street illuminated by LED lighting columns
	**Calculation Point: 30** **Subject: View up Alan Turing Way** The Etihad Campus obstructs direct view to the site

3 APPENDIX B: COMMENTARY

3.1 Comments

The proposed site is surrounded by areas that could be sensitive to light such as residential blocks, parks and the canal.

The Etihad Campus on the south of the site obstructs direct view from the residencies located south of Ashton New Road and potential light spill to them (points 1 and 2).

Areas within 500m west of the New Viaduct Street are not subject to glare or ambient light spill from the site as they are obstructed by the foliage of trees next to the trainline (points 3 to 7). Also, they are at lower level than the site. The road is lit by street lighting and it slopes down towards the north where views to the site are obstructed by a rail bridge (point 8).

On the west the main contribution of ambient illumination is by the street lights illuminating Alan Turing Way (points 9 to 11, 23 to 25 and 30). The light levels are quite high as this is a traffic route for motorized vehicles of medium to high driving speeds with conflict areas e.g. intersections and pedestrian passages.

The residential area south of Philips park is at lower level than the site. There is a direct line of sight from the buildings adjacent to Alan Turing Way (points 26 and 27) but not from other location in this area. The horizontal light levels next to the park are quite high (points 28 and 29). These streets are well lit by post top luminaires.

In a radius within 150m of the ground the only sensitive area is the canal which is currently lit by LED lighting columns (points 18 to 23 and 26). The vertical light levels are high due to the contribution of light from the street columns. During the site survey we recorded bats flying above the canal.

The part of the canal which is east of Alan Turing Way is lit mainly by bollards.

Areas further than 500m from the site are very unlikely to suffer from light spill (due to distance) or direct glare from a façade installation.

3.2 Summary

Exterior illumination of the building and the façade might have an impact on the surrounding areas.

The areas most likely to be affected by the new development are the buildings adjacent to Alan Turing Way as well as the canal.

The residential buildings have a direct line of sight to the site. If of a media façade is installed on the southeast elevation it would create high contrast with the night time sky and would be visible from all floors of these buildings.

Because the canal is a bat corridor light levels should be kept to a minimum. A new installation of exterior lighting might add to the existing light levels. Although the design could aim to minimise any light spill in the area, it is also possible to alter the current lighting design across the canal keep the illuminance at low levels.

In conclusion the new development could affect some surrounding residencies as well as the bat corridor. Therefore, the design should take into account the lines of direct sight and try to minimize light spill on the canal.

Appendix 7 Townscape and Visual Impact Viewpoints

REFERENCE
2318

PROJECT
PROJECT BRADFORD

DOCUMENT
BASELINE VIEWPOINT SELECTION

CLIENT	STATUS	DATE
OVG EUROPE LLC	DRAFT	09/10/19

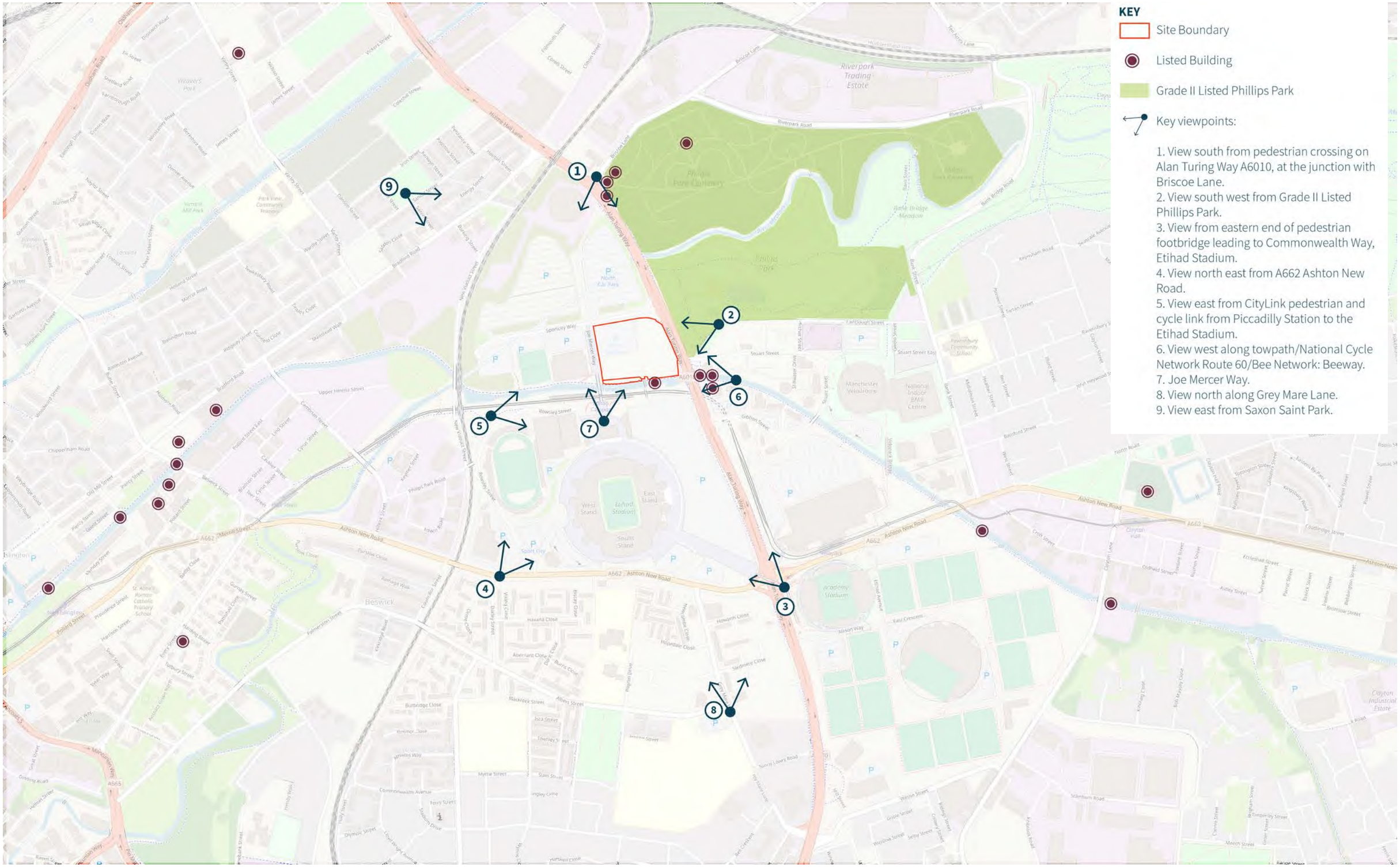
DOCUMENT CONTROL

FILE NAME
2318-ID-001-02-PROJECT BRADFORD TVIA VIEWPOINTS

PREPARED BY (INITIALS) **GW**	
CHECKED BY (INITIALS) **JW**	
PLANNING **03**	



1.1: GOOGLE VIEWSHED



1.2: KEY VIEWPOINTS

Viewpoint 1: Alan Turing Way A6010 - Photography



Viewpoint 2: Philips Park



Viewpoint 3: Pedestrian footbridge to Commonwealth Way, Etihad Stadium



Viewpoint 4: A662 Ashton New Road



Viewpoint 5: Citylink Pedestrian/Cycle link from City Centre/Piccadilly Station



Viewpoint 6: National Cycle Network Route 60/Bee Network - Beeway.



Viewpoint 7: Joe Mercer Way.



Viewpoint 8: Grey Mare Lane.



Viewpoint 9: Saxon Saint Park



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