



# **Great Jones Street, Manchester**

## **Phase 1 Geo-Environmental Investigation**

For: Oslady Homes Ltd

Geo-Environmental Engineering Services

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## REVISIONS

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## 1.0 INTRODUCTION

This Phase 1 Geo-Environmental Investigation report has been prepared at the request of Oslady Homes Ltd. Instructions to proceed were received in July 2023. Phase 1 desk study work was undertaken between 28<sup>th</sup> July and 17<sup>th</sup> August 2023.

### 1.1 Site Location and Description

This report pertains to a c. 0.02 Ha site located to the north of Great Jones Street, Manchester, c. 3.6km southeast of Manchester City Centre, at the approximate post code M12 5PA. The National Ordnance Survey Grid Reference for the centre of the site is 387394E, 396598N.

The site currently comprises an open parcel of land. The site is bound by residential properties to the north and the west, Milne Close to the east and Great Jones Street to the south. Access to the site is off Great Jones Street. An aerial photo of the site is included below:



*Figure 1: Aerial image of the site dated May 2019.*

A site location plan is contained in Appendix 2.

### Proposed Development

This Phase 1 Geo-Environmental Investigation is to be used for submission to the Local Authority as part of a planning application. It is the Client's intention to develop the site into a low-rise 2-storey residential development comprising 4 No. terraced dwellings with associated private gardens, as shown by the below extract.

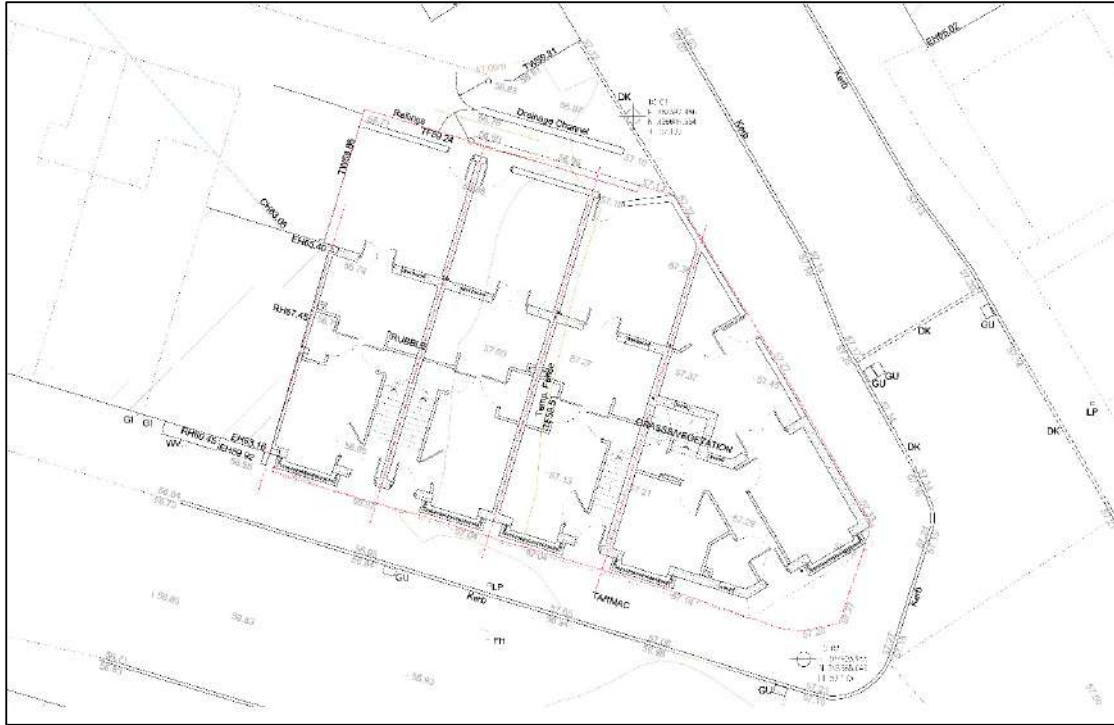


Figure 2: Extract from the proposed development plan.

A proposed development plan is contained in Appendix 2.

## 1.2 Brief

The brief was to carry out a Phase 1 Geo-Environmental Investigation for the site based upon the proposed development outlined in Section 1.0. The site area is shown on the site location plan contained in Appendix 2.

The investigation was to include the following:

- a) Assess the probable ground conditions and contaminated land conditions on and below the site based on existing and historical site uses and relevant off-site activities, this is to include a site walkover.
- b) Identify probable contaminants / sources of contamination that may be present at the site using current contaminated land guidance and develop a conceptual site model for potential human health, ground gas and controlled waters receptors.
- c) Undertake a Preliminary Risk Assessment – which will determine the requirement for further environmental (contaminated land) investigation and assessment.
- d) Design, on the basis of the anticipated ground conditions, appropriate ground investigation works and discuss potential development issues (i.e. sub-surface features – obstructions, infilling, compressible ground, faulting, mineral extraction, mining and land instability).

A summary of the information / data sources is detailed in Section 2.2. A report was to be provided to summarise findings and to provide recommendations.

The limitations of this investigation work and report are included in Appendix 1.

### **1.3 Third Parties**

This report has been prepared for the sole use of Oslady Homes Ltd. It must not be copied or passed onto any third party or used for any purpose other than which it was prepared without the permission of the author. This report is copyright.

## **2.0 SCOPE OF INVESTIGATION WORKS**

### **2.1 Walkover Survey**

The site was visited on 26<sup>th</sup> July 2023 in overcast weather conditions and the objectives of the site walkover were, where applicable:

- to identify and assess visual and olfactory evidence of contamination (e.g. staining of concrete / soils, odours, presence of gas protection measures etc.);
- to identify locations of potential sources of contamination and assess their conditions (i.e. tank location, presence / condition of secondary containment / bunds, location of fill points, process areas);
- to identify surrounding land uses and any potentially contaminating activities;
- to identify / verify the presence of potential receptors (on- and off-site) which may be affected by identified sources;
- to obtain information on activities / procedures and standards of housekeeping etc.;
- to assess site access and potential investigation locations and constraints; and
- to assess any visual subsurface geotechnical features / anomalies (e.g. foundations, Made Ground, subsidence etc.).

Photographs were taken of the site during the walkover survey and these photographs, together with a plan indicating their location and direction, are contained in Appendix 3.

### **2.2 Documentation**

A combined Enviro + Geo Insight report (REF GS-K1E-MYS-ZF2-ERZ) was obtained from Groundsure, an environmental database company, which provides a list of recorded past and present activities at or adjacent to the site which could have an impact on the levels of contamination in the soils and groundwater at the site. As part of the desk study works, the below documents were obtained and examined. Unless otherwise stated, the documents are contained within the Groundsure Enviro + Geo Insight Report in Appendix 5:

a) Groundsure maps, all dated 2023 as follows:

- Historical Land Use map;
- Environmental Permits, Incidents and Registers map;
- Landfill and other Waste Sites map;
- Current Land Use map;
- Hydrogeology and Hydrology maps;
- Environment Agency / Natural Resources Wales flood maps;
- Designated Environmentally Sensitive Sites map;
- Geological maps and Ground Working map;
- Mining, Extraction & Natural Cavities map;
- Natural Ground Subsidence maps;
- Borehole Records map; and
- Railways and Tunnels map.

b) Aerial photographs of the site dated April 2019, June 2015, June 2009, and June 2000.

c) Historical Ordnance Survey maps dated between 1848 and 2023, at scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

d) The following sources were obtained and examined from the British Geological survey. All items were copied under licence; [C18/01] British Geological Survey ©UKRI. All rights reserved:

- The British Geological Survey (BGS) 1:50,000 superficial geological map (Sheet ref 85 dated 2011).
- The British Geological Survey (BGS) 1:50,000 bedrock geological map (Sheet ref 85 dated 2010).
- The British Geological Survey 1:10,560 solid and drift geological maps (Sheet ref SJ89NE dated 1976 and 2004)
- The British Geological Survey (BGS) Mineral Resources Map for Greater Manchester.

- e) A Greater Manchester Joint Minerals Plan was obtained and examined.
- f) A Zetica UXO Risk Map was obtained and examined and is included within appendix 8.
- g) A Brimstone Preliminary UXO Risk Assessment was obtained and examined and is included in Appendix 8.
- h) A Phase 1 desk study prepared by Peter Brett Associates LLP was obtained from the Planning Portal and examined.
- i) Britain From Above, a historical aerial image database, was examined but no useful information was sourced.

## 3.0 FINDINGS

### 3.1 Walkover Survey

The walkover survey was carried out on 26<sup>th</sup> July 2023 during overcast weather conditions. During the walkover survey the following features were noted.

The site currently comprises a small, vacant parcel of land. The ground underfoot was noted to be semi-grassed Made Ground across the site. The site is bound by a residential property to the west, an alleyway to the north, Milne Close to the east and Great Jones Street to the south.



Figure 3: Photographs of the western site section (left) and eastern site section (right).

The topography across the site remains relatively consistent with levels in the north western site section at 56.76m AOD and levels in the southeastern corner at 57.14m AOD.



Figure 4: Photographs showing the southern boundary along Great Jones Street looking east (left) and west (right).



*Figure 5: Photographs showing the northwestern corner of the site (left) and the site access looking north towards Milne Close (right).*

No evidence of overhead or underground services were noted on site. However, services were noted running beneath the pavements which bound the site. For example, water services are known to run parallel to the northern boundary, while electricity and gas services are known to run parallel to the southern boundary.

Two open holes were also noted on site. One adjacent to the southern boundary and the other in the western site section, both suspected former trial pits.



*Figure 6: Photographs showing open holes along the southern boundary (left) and in the western site section (right).*

### Contamination

No evidence of contamination (i.e. spillages or leakages) or contaminative sources were identified. However, evidence of fly tipping was noted in the northeastern site section. The material primarily contained household waste.



Figure 2: Photograph showing the fly tipping in the northeastern site section.

## 3.2 Site History

The site development history has been researched by reference to historical maps, street plans and aerial photographs. The historical maps are included in Appendix 4 to this report and the principal observations, which are divided into on-site history and off-site history, are summarised below:

### On-Site History

| Date        | Site Feature                                                                                                                                                          |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1848 - 1890 | On the earliest historical map, the site is recorded as an open field, with a possible pond in the southern site section. This is absent by 1890, suspected infilled. |
| 1890 - 1908 | From 1890 until 1908 the site remains as an open parcel of land.                                                                                                      |

|             |                                                                                                                   |
|-------------|-------------------------------------------------------------------------------------------------------------------|
| 1908 - 1993 | By 1908, 4 No. terraced houses are built on site with associated back gardens in the northern site section.       |
| 1993 -2023  | In 1903 the 4 No. terraced houses have been demolished leaving the site as a vacant parcel of land until present. |

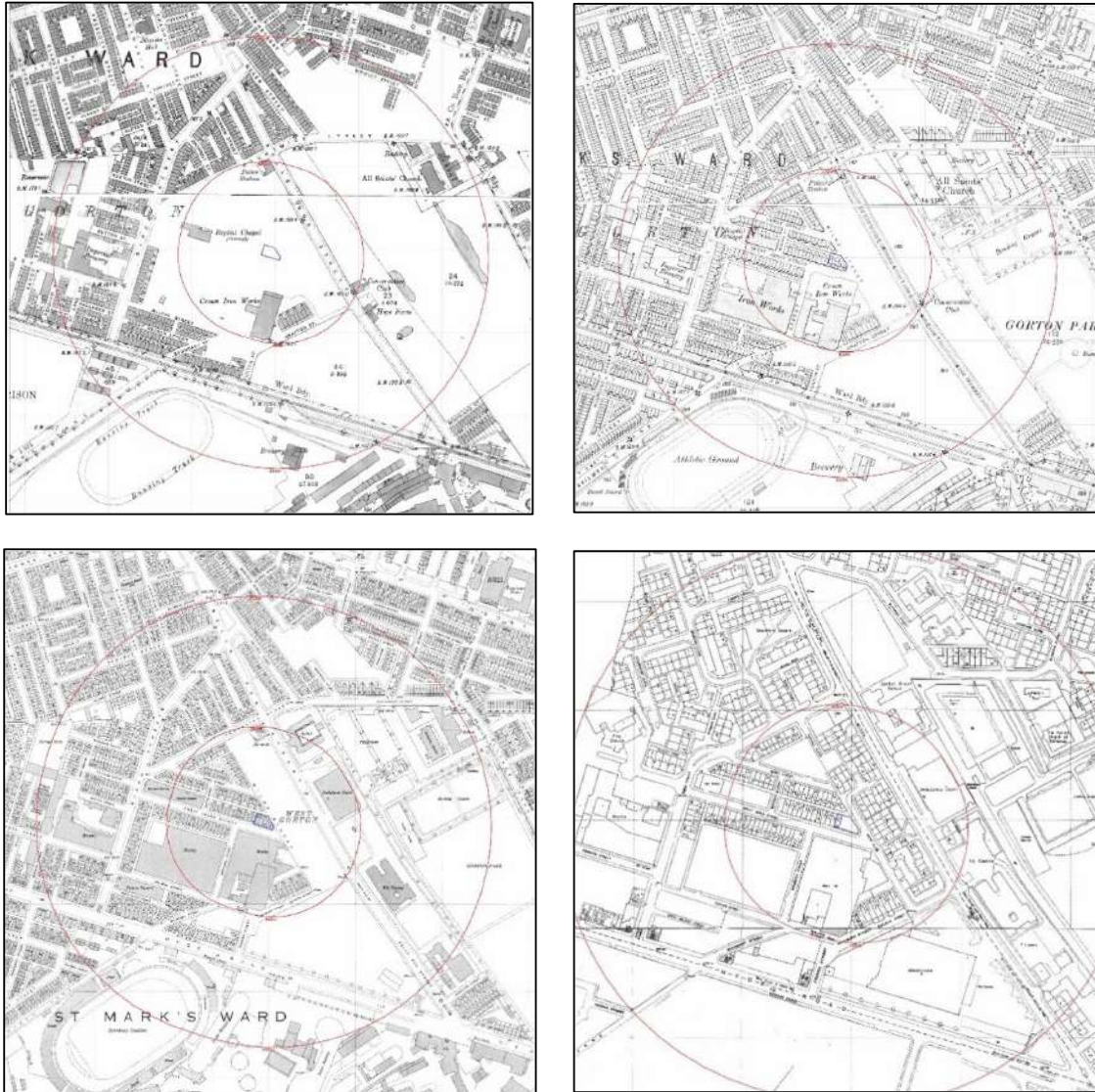


Figure 3: Extracts of the OS historical maps dated 1893 (top left), 1908 (top right), 1964 (bottom left) and 1993 (bottom right)

## Off Site History

| Date        | Site Feature                                                                                                                                                                                                                                                                 | Distance (m) | Direction |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------|
| 1848 - 1890 | On the earliest historical OS maps, 4 No. ponds which appear to flow into one another are recorded 5m south of the site. Multiple other ponds are recorded <500m from the site in all directions. All are absent on OS maps by 1890 and are suspected to have been infilled. | 5            | S         |
| 1890 - 2023 | Crown Iron Works is present 45m south of the site in 1890. This became Belle Vue Engineering Works in 1933 and later a warehouse by 1992 which has remained until present.                                                                                                   | 45           | S         |
| 1908 - 1989 | In 1908 an Iron Works is present 45m southwest of the site. This became an Engineering Works in 1922, and a Car Auction Room by 1989.                                                                                                                                        | 45           | SW        |
| 1991 - 2023 | From 1991 until present, an unspecified warehouse is recorded 105m southeast of the site.                                                                                                                                                                                    | 105          | SE        |
| 1848 - 1890 | Hope Farm is recorded 150m southeast of the site from 1848 until 1890.                                                                                                                                                                                                       | 150          | SE        |
| 1893 - 1993 | An Imperial Brewery is present from 1893 until 1982, 160m west of the site. This then became a warehouse and then an unspecified works from 1992 until 1993.                                                                                                                 | 160          | W         |
| 1871 - 2022 | Railway sidings are noted 173m south of the site in 1905 until 1949.                                                                                                                                                                                                         | 173          | S         |
| 1893 - 1933 | From 1893 until 1933, a brewery is recorded 240m south of the site.                                                                                                                                                                                                          | 240          | S         |
| 1949 - 1992 | An electricity substation is present 270m south of the site from 1949 until 1992.                                                                                                                                                                                            | 270          | S         |
| 1956 - 1977 | An unspecified tank is recorded 277m south of the site from 1956 until 1977.                                                                                                                                                                                                 | 277          | S         |

Given the industrial nature of the area, numerous other iron works, engineering works, unspecified works, warehouses, railway siding, unspecified tanks, chemical works and motor works are located between 200m and 500m from the site however have not been summarised above.

## 3.3 Geology

### 3.3.1 BGS Geological Map

The BGS 1:50,000 Bedrock and Superficial Geological Maps of the area (Sheet No: 85, dated 2010 and 2011 respectively) indicate that the site is underlain by superficial deposits comprising **Glacial Till** which typically comprises a heterogenous mixture of clays, sands and gravels. The superficial deposits are underlain by bedrock of the

**Halesowen Formation** which typically comprises grey-green, micaceous sandstone, and grey-green mudstone, with thin coals and limestone beds.

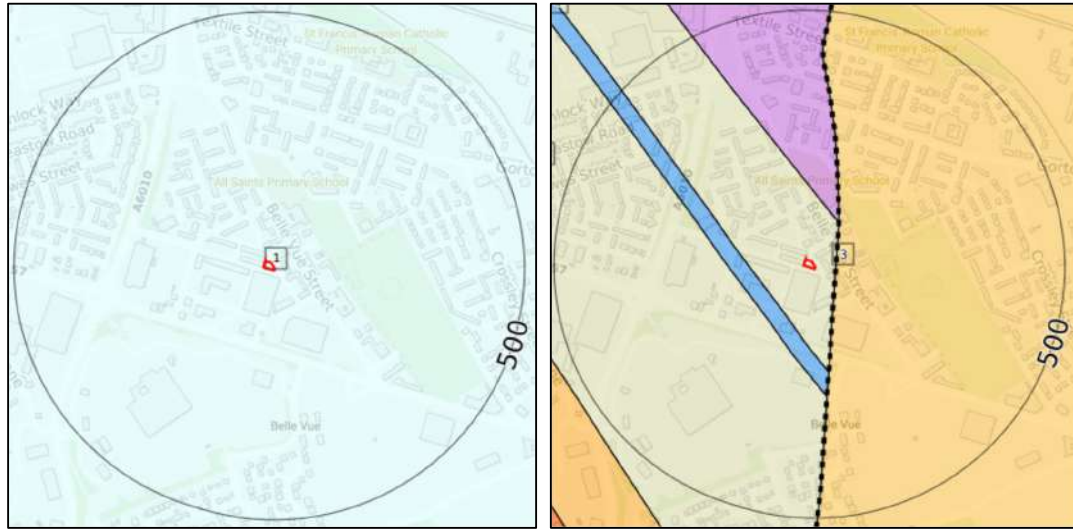


Figure 9: Extracts of the BGS 1:50,000 Superficial (left) and Bedrock (right) Geological Maps. Light blue = Glacial Till, Grey = Halesowen Formation, Orange = Chester Formation, Purple = Etruria Formation, Blue = Great Mine Limestone.

No faults exist on site, however the solid geological map indicates that a fault is recorded 41m east of the site. Based on younging direction, the bedrock is anticipated to be dipping to the southwest. Also, the 1:10,560 solid geological map records a bedrock dip of 16 degrees to the southwest for the Openshaw Coal Formation which underlies the Etruria Formation and the Halesowen Formation.

### 3.3.2 BGS Borehole Logs

There were no available BGS boreholes on-site. There were 2 No. BGS boreholes available in close proximity to the site within a comparable geological setting. The pertinent information from the borehole logs is outlined below:

#### BGS Borehole Reference: SJ89NE647

This borehole is located approximately c. 120m southwest of the site and was excavated to a depth of 10.00m bgl in 1989. The logs recorded the following pertinent information:

- **Made Ground** comprising ash and brick rubble to a depth of 1.50m bgl, underlain by;

- **Glacial Till** comprising stiff, brown, slightly gravelly, slightly silty clay to a depth of 10.00m bgl.

No groundwater was encountered during the drilling of the borehole.

#### BGS Borehole Reference: SJ89NE647

This borehole is located approximately c. 140m south of the site and was excavated to a depth of 10.00m bgl in 1989. The logs recorded the following pertinent information:

- **Made Ground** comprising reinforced concrete and quarry waste to a depth of 0.30m bgl, underlain by;
- **Glacial Till** comprising very stiff, brown, slightly gravelly, slightly silty clay with occasional wet sand bands to a depth of 10.00m bgl.

No groundwater was encountered during the drilling of the borehole.

### 3.3.3 BGS Geohazards

| Data Type             | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ground Stability Data | <ul style="list-style-type: none"> <li>➤ The Potential for Shrinking or Swelling Clay Ground Stability Hazards is regarded as very low.</li> <li>➤ The Potential for Running Sand Ground Stability Hazards is regarded as very low.</li> <li>➤ The Potential for Compressible Ground Stability Hazards is regarded as negligible.</li> <li>➤ The Potential for Collapsible Ground Stability Hazards is regarded as very low.</li> <li>➤ The Potential for Landslide Ground Stability Hazards is regarded as very low.</li> <li>➤ The Potential for Dissolution Ground Stability Hazards is regarded as negligible.</li> </ul> |

### 3.3.4 BGS Estimated Soil Chemistry

The BGS have estimated that the superficial deposits across the site to naturally comprise of the following determinands:

- Arsenic – 15mg/kg - 25mg/kg
- Cadmium – 1.8mg/kg
- Chromium – 60mg/kg – 90mg/kg
- Nickel – 30mg/kg – 45mg/kg
- Lead – 100mg/kg - 200 mg/kg
- Bioaccessible Lead – No data

### 3.4 Mining

#### 3.4.1 Coal Mining

The site does not lie within a development high risk area, neither are there any mine entries or coal outcrops recorded on site. However, the site lies within a Coal Authority Coal Mining Reporting Area as well as a Surface Coal Resource Area. Known underground coal workings are also recorded on site. The seam level is recorded as c. 345 – 349m bgl. The nearest mine entry is located c. 630m north of the site.

#### 3.4.2 Non-Coal Mining

The Groundsure Enviro + Geo Insight report indicates that no non-coal mining has occurred on site. The nearest recorded non-coal mining is located 93m northeast of the site and pertains to the mining of a mineral vein. Groundsure states that *Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.*

#### 3.4.3 Salt Mining / Brine Extraction

The site lies outside the Cheshire Brine Subsidence Compensation Board Compensation District.

#### 3.4.4 Historical Surface Excavations

There is one possible historical surface excavation recorded on site, pertaining to the historical pond located in the southern site section from 1848 until 1890. 3 No. other historical ponds are recorded immediately south of the site during the same time period and appear to flow into one another.

#### 3.4.5 Mineral Safeguarding

Where mineral resources are present the mineral planning authority may designate areas as Mineral Safeguarding Areas (MSA) and Mineral Consultation Areas (MCA). These are aimed to safeguard mineral resource areas from unnecessary sterilization by non-mineral development. The BGS Mineral Resources maps designate the areas of potential mineral resources and where active / lapsed planning permission was granted for mineral extraction.

The BGS Mineral Resources Map for Manchester indicates that the site does not lie within an area designated as containing mineral resources. The Greater Manchester Joint Minerals Plan indicates that the site lies outside of any mineral safeguarding zones.

### 3.5 Hydrology and Hydrogeology

Environmental data relevant to the site and its immediately surrounding area has been obtained from sources available in the public domain. In addition, an environmental report was obtained from Groundsure. The Enviro + Geo Insight report and associated maps that have been inspected are presented in Appendix 5 and the principal observations in relation to waters and flooding can be summarised as follows:

| Data Type                   | Details                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Flooding                    | <ul style="list-style-type: none"> <li>➤ With respect to rivers and seas, the site lies within Flood Zone 1.</li> <li>➤ With respect to surface water flooding, the site is recorded as being at negligible risk.</li> <li>➤ With respect to groundwater, the site is recorded as being at moderate to high risk.</li> </ul>                                                                                                                         |
| Surface Water Features      | <ul style="list-style-type: none"> <li>➤ No surface water features are located on site. The closest feature relates to Corn Brook located 495m north of the site.</li> </ul>                                                                                                                                                                                                                                                                         |
| Surface Water Abstractions  | <ul style="list-style-type: none"> <li>➤ There are no licensed surface water abstractions located on-site.</li> <li>➤ There are 26 No. licensed surface water abstractions located within 2km of the site, all are historical. The nearest license was located 1807m north of the site and pertains to the abstraction of water from Ashton Canal for general cooling.</li> </ul>                                                                    |
| Superficial Aquifer         | <ul style="list-style-type: none"> <li>➤ The site is underlain by superficial deposits classified as a Secondary Undifferentiated Aquifer – <i>Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.</i></li> </ul>                               |
| Bedrock Aquifer             | <ul style="list-style-type: none"> <li>➤ The underlying bedrock is classified as a Secondary A Aquifer - <i>Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.</i></li> </ul>                                                                                                                                                       |
| Groundwater Abstractions    | <ul style="list-style-type: none"> <li>➤ There are no recorded groundwater abstraction licenses located on-site.</li> <li>➤ There are 28 No. groundwater abstraction licenses located within 2km of the site, the majority are historical. The nearest active groundwater abstraction is located 1456m north of the site and pertains to the abstraction of groundwater from a borehole at Manchester City Football Club for general use.</li> </ul> |
| Source Protection Zones     | <ul style="list-style-type: none"> <li>➤ There are no recorded Source Protection Zones recorded on-site or within 500m of the site.</li> </ul>                                                                                                                                                                                                                                                                                                       |
| Nitrate Vulnerable Zones    | <ul style="list-style-type: none"> <li>➤ There are no Nitrate Vulnerable Zones recorded on-site or within 500m of the site.</li> </ul>                                                                                                                                                                                                                                                                                                               |
| Licensed Discharge Consents | <ul style="list-style-type: none"> <li>➤ There are no recorded licensed discharge consents to controlled waters located on-site.</li> <li>➤ However, there is 1 No. recorded within 500m of the site, located 442m northeast of the site at Gorton Lane. The consent relates to sewage discharges into Corn Brook.</li> </ul>                                                                                                                        |

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pollution Incidents to Controlled Waters | <ul style="list-style-type: none"> <li>➤ There are no recorded pollution incidents to controlled waters located on-site.</li> <li>➤ There has been 1 No. pollution incident recorded within 500m of the site. The incident was located 297m north of the site in December 2002, involving a diesel spill. The incident was recorded as a category 3 (minor) impact to waters and category 4 (no impact) to land and air.</li> </ul> |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 3.6 Hazardous Installations, Landfill and Waste

The following information relating to hazardous installations, landfill and waste obtained from the Groundsure Enviro + Geo Insight report, published information and the walkover survey can be summarised as follows:

| Data Type                                                                                           | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environment Agency Recorded Active Landfill Sites                                                   | <ul style="list-style-type: none"> <li>➤ There are no Environment Agency recorded landfill sites located on-site or within 500m of the site.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Environment Agency Recorded Historic Landfill Sites                                                 | <ul style="list-style-type: none"> <li>➤ There are no Environment Agency recorded historical landfill sites located on-site or within 500m of the site.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| BGS Recorded Historic Landfill Sites                                                                | <ul style="list-style-type: none"> <li>➤ There are no BGS recorded landfill sites located on-site or within 500m of the site.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Local Authority Recorded Landfill Sites                                                             | <ul style="list-style-type: none"> <li>➤ There are no Local Authority recorded landfill sites located on-site or within 500m of the site.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Local Authority Pollution Prevention and Control (Part A(2) and Part B Activities and Enforcements) | <ul style="list-style-type: none"> <li>➤ There are no Local Authority Part A2 or Part B Activities or Enforcements located on-site.</li> <li>➤ There are 2 No. Local Authority Part A2 or Part B Activities located within 500m of the site. Both pertain to historical Part B permits. One involves the unloading of petrol into storage at service stations, located 148m southwest, whereas the other involves the respraying of road vehicles located 232m south west.</li> </ul>                                                                                                                                                                                                                                                                      |
| Registered Radioactive Substances                                                                   | <ul style="list-style-type: none"> <li>➤ There are no Registered Radioactive Substances recorded on-site or within 500m of the site.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Registered Waste Treatment, Transfer or Disposal Sites                                              | <ul style="list-style-type: none"> <li>➤ There are no waste exemptions recorded on-site.</li> <li>➤ There are 4 No. waste exemptions recorded within 500m of the site, the nearest is located 282m southeast and pertains to the treatment of waste wood and plant matter by chipping, shredding, cutting or pulverising.</li> <li>➤ There are no licensed waste sites on site. The nearest is located 496m north, relating to an ELV facility on Birch Lane.</li> </ul>                                                                                                                                                                                                                                                                                   |
| Industrial Land Use                                                                                 | <ul style="list-style-type: none"> <li>➤ There are no current industrial land uses recorded on-site.</li> <li>➤ There are 10 No. recent industrial uses recorded within 250m of the site, the nearest is located 28m south relates to Belle Vue Works, involving electrical motors and generators.</li> <li>➤ There is a single petrol / fuel station recorded within 500m of the site, located 164m southwest.</li> <li>➤ There are no historic industrial site uses recorded on-site. There are 100 No. historic industrial land uses recorded within 500m of the site pertaining to iron works, engineering works, unspecified works, railway sidings, unspecified tanks, breweries, warehouses, unspecified mills, chemical works and more.</li> </ul> |
| Dangerous Substances                                                                                | <ul style="list-style-type: none"> <li>➤ There are no recorded discharges of dangerous substances on-site or within 500m of the site.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

|                              |                                                                                                               |
|------------------------------|---------------------------------------------------------------------------------------------------------------|
| Hazardous Building Materials | ➤ Possible risk of Asbestos Containing Materials (ACM) if demolition waste is present within the Made Ground. |
|------------------------------|---------------------------------------------------------------------------------------------------------------|

### 3.7 Radon

A site-specific radon map included in the Groundsure Enviro + Geo Insight report finds that the site lies within an area where less than 1% of homes are above the Action Level. Consequently, no radon protection measures are required, in line with BR211 (2023).

### 3.8 Previous Site Investigations

No known previous ground investigations have been undertaken on-site.

However, a previous Phase 1 desk study was undertaken in 2014 by Peter Brett Associates LLP for a site c. 60m to the east. The factual findings are broadly the same as those presented here so have not been summarised.

### 3.9 Services

No overhead services were noted crossing the site and no evidence of underground services were recorded on site. However, it is recommended that full service plans should be obtained prior to any intrusive works.

### 3.10 Unexploded Ordnance (UXO)

The Zetica UXO risk map, contained in Appendix 7, indicates that the site lies within an area of Moderate risk. Subsequently a Preliminary UXO Risk Report has been undertaken for the site, also contained in Appendix 7. The findings of the report concluded that a detailed stage 2 risk assessment is not deemed necessary due to the risk of unexploded UXO present on site being unlikely. However, this cannot be completely ruled out due to 3 No. HE bombs being recorded within 200m of the site. Therefore, it is recommended that a UXO Safety Awareness Briefing is conducted to all personnel conducting ground works on site.

### **3.11 Animal Burial Sites**

The Animal Health and Veterinary Laboratories Agency (AHVLA) no longer routinely respond to consultations relating to records of animal burial sites. Based upon a review of the site history it is considered unlikely that the site has been subject to recorded animal burials.

### **3.12 Archaeology**

We do not anticipate that the site will be affected by archaeological issues, however consultation with the county archaeologist is recommended.

## 4.0 CONCLUSIONS

### 4.1 General

The site comprises a small parcel of land that is brownfield in nature. Historically, the site was an open field with a possible pond present in the southern site section until 1905 when 4 terraced houses occupied the site. These were demolished by 1995 and the site has remained relatively unchanged until present. The topography, in general, remains level across the site and no evidence of over head or underground services are noted.

### 4.2 Ground Conditions

The anticipated typical ground conditions across the site are as follows:

- **Made Ground** of unknown composition, possibly deep if basements were historically present and in the location of the infilled pond, (likely in excess of 1.50mbgl), underlain by:
- **Glacial Till** comprising firm to stiff, slightly gravelly, slightly sandy CLAY with rare thin to thick bands of brown, fine to coarse sand to a depth of at least 10.00m bgl, (likely 17.00m – 24.00m bgl) underlain by:
- **Halesowen Formation** typically comprising grey-green micaceous SANDSTONE with thin coals and limestone beds.

\*Drift thickness is based on a BGS Digital Terrain Model divided into 1km grid squares.

#### 4.2.1 Geotechnical Hazard Identification

Potential geotechnical hazards based on the expected ground conditions that may require further consideration at the site are outlined below:

| Factors            | Remarks                                                                                                                                               | Considerations                                                                                                                                                                                                                                                                                   | Hazard          |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Made Ground</b> | Made Ground is anticipated to be widespread and possibly deep in the location of the historical pond and if the former terraced houses had basements. | Made Ground may settle variably, have highly inconsistent bearing capacity and may suffer significant movements that may be problematic for foundations, externals and infrastructure elements without treatment. The presence of Made Ground may be problematic for foundations as there may be | <b>Moderate</b> |

|                                          |                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                                          |                                                                                                                                                                                          | loose / soft spots within the Made Ground and it may not be suitable to utilise traditional foundations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| <b>Aggressive Ground and Groundwater</b> | While the risk posed from the natural strata is anticipated to be very low, given the presence of Made Ground there is potential for aggressive ground conditions to be present on-site. | Acidic ground / groundwater and sulfate may attack the concrete and steel used in foundations and react with aggregates. The oxidation of pyrite and other sulfides can also occur due to geotechnical activities. This can lead to the generation of high concentrations of sulfate and low pH that attacks construction materials and may lead to the precipitation of gypsum resulting in the heave of foundations and floor slabs. Pyrite oxidation can also be triggered by mixing susceptible materials with lime or cement resulting in high pH that can lead to the expansion of some sulfates that cause heave of stabilised soils. | <b>Moderate</b>        |
| <b>Former Basements</b>                  | There is a possibility that the former terraces on site had basements. The depth of these is unknown.                                                                                    | This may cause issues with obstructions if internal walls or basement floor slabs have remained in situ. These will have to be taken into consideration and possibly removed with regards to foundation design.                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Low to Moderate</b> |
| <b>Soft spots</b>                        | There is a possibility that soft spots exist within the vicinity of the possible former pond.                                                                                            | Soft spots may cause differential settlement of foundations therefore there will be a requirement for localised deepening of foundations where soft spots are present.                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Low to Moderate</b> |
| <b>Fault (41m east)</b>                  | A fault is located 41m east of the site.                                                                                                                                                 | The presence of a fault could have implications on foundations if the fault zone is substantial and the bedrock highly fractured i.e. reinforced foundations may be required in the vicinity of the fault. However given the presence of thick superficial deposits, this is unlikely to have an affect on future foundations.                                                                                                                                                                                                                                                                                                               | <b>Low</b>             |

It should be noted that the western boundary of the site are existing buildings, therefore consideration is required for the impact of the proposed development on third party walls.

#### 4.3 Sources of Contamination and Probable Contaminants

Based on the desk study information the following potentially contaminative on-site sources have been identified:

| Potentially Contaminative Source | Associated Determinands                                                                                                                  | Remarks                                                                                                                                                                                                                                      | Hazard                 |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| <b>On-Site Made Ground</b>       | Unknown, anticipated to be metals, semi-metals, PAHs, TPH, asbestos.<br><br>Ground Gas – carbon dioxide, methane, hydrogen sulfide, VOCs | Widespread Made Ground of unknown composition is anticipated across the entire site. If basements and an infilled pond were present beneath the former buildings, then it is anticipated that Made Ground will be deeper in these locations. | <b>Low to Moderate</b> |

|                                                                |                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |
|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| <b>On-Site Historical Terraced Houses</b>                      | Unknown, possible asbestos.                                                                                  | It is anticipated that demolition waste is present on site from the former historical terraces. Due to the age of the building it is likely that uncontrolled demolition occurred without an asbestos survey and subsequent removal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Low to Moderate</b> |
| <b>Possible On-Site Pond</b>                                   | Ground Gas – carbon dioxide, methane, hydrogen sulfide, VOCs                                                 | On the earliest historical OS map, a pond appears to be present in the southern section of the site. This is then absent by 1890 and is suspected to have been infilled. This presents a possible ground gas risk in relation to buried organics and possible Made Ground fill. However, mapping inaccuracies must be considered when determining whether this pond was in fact located on site, and therefore its associated risk.                                                                                                                                                                                                                                                                                  | <b>Low</b>             |
| <b>Known Underground Coal Workings</b>                         | Mine Gas – methane, carbon dioxide                                                                           | Coal workings are known to underly the site. This presents a possible mine gas risk. However, given the depth of the worked seam (c. 345-349m bgl) underlying the Etruria Formation, the Halesowen Formation and c. 17-24m of impermeable glacial Till, pathways for vertical mine gas migration are negligible. Furthermore, no mine entries are located in the close vicinity which could provide a viable pathway for mine gas migration.                                                                                                                                                                                                                                                                         | <b>Low</b>             |
| <b>Historical Off-Site Industrial Activities (1897 - 2003)</b> | Unknown, possible wide range of determinants including metals, semi-metals, PAHs, hydrocarbons and asbestos. | Historically, the site has been situated next to a range of industrial activities, especially south of the site. These include: Iron Works, Engineering Works, Unspecified Works, Breweries, Railway Sidings, Electricity Substations and Unspecified Tanks. These activities were recorded 45 – 277m from the site.<br><br>These historical activities could have produced a wide range of contaminants, including hydrocarbons and asbestos. Due to some of these sources being located less than 50m away, there is a possibility of potential contaminants migrating on site. However, given the time since the majority of the activities took place, any contamination should have been significantly diluted. | <b>Low</b>             |

It should be noted that potentially contaminative unrecorded historical activities may have occurred (e.g. the use or deposition of Made Ground from off-site during historical on-site developments) and in this event, further contaminative sources may be present.

#### 4.3.1 Unknowns

Following the desk study, the areas of uncertainty are summarised as follows:

- Depth, extent and composition of Made Ground
- Depth, extent and composition of Superficial Deposits
- Depth to bedrock
- Presence and extent of possible historical pond

- Presence and extent of possible former basements
- Depth, extent and dimensions of third party foundations along the western boundary.

#### **4.4 Pathways for Contamination**

##### **4.4.1 Human Health**

The pathways along which contamination could potentially reach the receptors on-site during use and after completion of development works are detailed in 'Updated Technical Background to the CLEA Model' (Environment Agency 2009) but can be summarised as follows:

End Users (Residential Land Use Scenario with home-grown produce):

- Ingestion of soil directly and indoor dust\* including on home-grown produce;
- Inhalation of soil dust (indoor and outdoor);
- Dermal contact with soil (indoor and outdoor);
- Inhalation of soil vapours (indoor and outdoor);
- Oral background; and
- Inhalation background.

*\* Treated as one pathway*

##### **4.4.2 Controlled Waters**

The pathways along which contamination could potentially reach the controlled waters receptors during use and after completion of development works are as follows:

- Vertical migration along possible current and future foundations and pooling at base / beneath foundations;
- Vertical migration through possible granular Made Ground and granular lenses in natural cohesive deposits;
- Lateral migration along low permeability natural deposits and pooling at relative low points;
- Negligible infiltration through low-permeability natural cohesive deposits;
- Migration through porous sandstone bedrock;

- Migration along groundwater flow; and
- Overland flow.

#### 4.4.3 Ground Gas Pathways

The pathways along which ground gas could potentially reach the receptors on-site during use and after completion of the development works are as follows:

- Migration through fractures and fissures in bedrock;
- Preferential migration along foundations, service ducts / trenches;
- Migration within groundwater;
- Ingress through wall cavities and floors and accumulation; and
- Inhalation of ground gas and vapours.

#### 4.5 **Receptors of Contamination**

Human Health receptors for these pathways include the following:

- End Users (residential land use scenario);
- Construction workers; and
- The general public and adjacent site users.

Controlled waters receptors for these pathways include the following:

- Groundwater contained within the underlying Secondary Undifferentiated Aquifer and Secondary A Aquifer; and
- Surface Water - Offsite Corn Brook 495m north.

Other receptors for these pathways include the following:

- Subsurface plastic (e.g. potable plastic water pipe); and
- Building fabric (e.g. concrete foundations, et

## 4.6 Conceptual Model

| Source              | Pathway                                                                   | Receptor                                                   | Hazard (severity)                   | Likelihood                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Risk     |
|---------------------|---------------------------------------------------------------------------|------------------------------------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| On-Site Made Ground | Ingestion of soil and dust (indoor and outdoor)                           | End-user<br>General public                                 | Effect on human health<br>(Medium)  | <b>High Likelihood:</b> Made Ground is anticipated to be present across the entirety of the site at variable thicknesses. If basements were present beneath the former terraced houses, then Made Ground is likely to be of significant thickness (0.00 – 3.00m). The composition of Made Ground on site is unknown, therefore a wide range of possible contaminants could be present. However, given the site history, the Made Ground is likely to constitute demolition waste and rubble from the former terraced houses, meaning high level contamination is unlikely. Although, given the age of the former buildings, the risk of asbestos must not be discounted.                                                                                                                                                                                                                                          | Moderate |
|                     | Dermal contact with contaminated soil (indoor and outdoor)                |                                                            |                                     | Ground gas generation is possible in areas where Made Ground is of significant thickness, such as beneath possible former on-site basements. However due to the type of Made Ground expected (demolition waste and rubble), ground gas generation is anticipated to be low.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |
|                     | Inhalation of dust (indoor and outdoor), airborne fibres and soil vapours | Construction workers                                       | Effect on human health<br>(Medium)  | <b>High Likelihood:</b> Construction workers are at the highest risk due to acute interaction with soils. Although Made ground is anticipated to be widespread and possibly deep in certain area, high level contamination is not likely. Additionally, appropriate PPE and health and safety measures are anticipated to significantly reduce the risk.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Moderate |
|                     | Inhalation of ground gas                                                  |                                                            |                                     | <b>Unlikely:</b> Given Made ground is expected to constitute inert, non-degradable material, TOC values and subsequent ground gas generation is likely to be low, reducing the risk posed by ground gas build up beneath buildings and structures.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                     | Migration through ground vertically into aquifer groundwater              | Secondary Undifferentiated Aquifer and Secondary A Aquifer | Effects to controlled waters (Mild) | <b>Unlikely:</b> Given that on site Made Ground is anticipated to be widespread and possibly deep in places, it is possible that a wide range of contaminants are present. However, anticipated contaminants of concern given the site history are likely to be metals and PAHs associated with ash material. These contaminants have low solubility and mobility, reducing the likelihood of vertical migration. If vertical migration does occur, it is likely to be negated by the low permeability Glacial Till which is present to a depth of at least 17m – 24m bgl. reducing the risk posed to the underlying Secondary Undifferentiated aquifer and Secondary A aquifer. Additionally, following development hardstanding will be present across the majority of the site which will significantly reduce infiltration of water into soil and subsequent vertical migration into the underlying aquifers. | Low      |
|                     | Migration through ground laterally into surface water<br>Overland flow    | Corn Brook (495m N)                                        | Effects to controlled waters (Mild) | <b>Unlikely:</b> Corn Brook is located 495m north of the site. It is highly unlikely that any on site contaminants could migrate into this surface water receptor given the distance it is from the site and therefore the amount of drainage present between the two.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Very Low |

|                                                                                         |                                                                                                                                                                                                    |                            |                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Possible On-Site Pond (1848 – 1893)<br>And 3 No. off-site ponds (5m south, 1848 – 1893) | Inhalation of ground gas                                                                                                                                                                           | End-user<br>General public | Effect on human health<br>(Medium) | <b>Low Likelihood:</b> Historical OS maps indicated that there was a possible pond present in the southern site section from 1848 until 1893. Its absence after this date suggests that it was infilled. Due to the possibility of buried organics and Made Ground fill, a potential ground gas risk arises. However, given the pond was infilled before the 1930's and is less than 15m in diameter, the gas risk associated with this source is very low as stated by figure 6 of BS857 (2013). ground gas. Also, mapping inaccuracies must be considered when determining whether this pond was in fact located on site, and therefore its associated risk. Many other historical ponds were located in the surrounding area during the same time period, three of which were located less than 5m south of the site. However, given that all were a similar size to the one on site and all were absent before the 1930s, their gas risk remains very low. | Very Low |
|                                                                                         |                                                                                                                                                                                                    | Construction workers       | Effect on human health<br>(Medium) | <b>Low Likelihood:</b> Construction workers are at the highest risk due to acute interaction with soils, however with appropriate PPE and health and safety measures it is anticipated to significantly reduce the risk.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Very low |
| Off-Site Historical Industrial Activities (1890-1993)                                   | Ingestion of soil and dust (indoor and outdoor)<br><br>Dermal contact with contaminated soil (indoor and outdoor)<br><br>Inhalation of dust (indoor and outdoor), airborne fibres and soil vapours | End-user                   | Effect on human health<br>(Mild)   | <b>Unlikely:</b> Various industrial activities have occurred within 300m of the site from 1890 until 1993, such as two separate Iron Works (45m south), an Engineering Works (45m south), an Imperial Brewery (160m west), railway sidings (173m south), an electricity substation (270m south), an unspecified tank (277m south) and multiple unspecified warehouses. These historical activities may have produced a wide range of contaminants as well as possible high level contamination hotspots in close proximity to the site. However, the potential for on site migration is low given the time since these activities were recorded (30 years), meaning any possible contamination should have been significantly diluted.                                                                                                                                                                                                                         | Low      |
|                                                                                         |                                                                                                                                                                                                    | Construction workers       | Effect on human health<br>(Mild)   | <b>Unlikely:</b> Construction workers are at the highest risk due to acute interaction with soils, however given that significant contamination is unlikely and with appropriate PPE and health and safety measures it is anticipated to significantly reduce the risk.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Low      |

#### 4.7 Mine Gas Risk Assessment

Although a known underground coal working exists beneath the site, it is recorded at a depth of c. 345 - 349m bgl. Therefore, it underlies the Etruria Formation, Halesowen Formation and c. 17 - 24m of cohesive Glacial Till. Also, no mine entries are recorded in close proximity to the worked seam or near the site itself. As a result, pathways of vertical mine gas migration are deemed negligible and the risk associated is considered very low.

#### 4.7 Preliminary Risk Assessment Summary

##### Human Health

Based on the human health conceptual model the risk to human health is deemed low to moderate to end users and construction workers. It is anticipated that Made Ground will be widespread and in some areas of significant thickness. Therefore, elevated levels of contamination of unknown determinands are likely to be present. Although high level contamination is unlikely given the site history, feasible contaminative linkages still exist putting construction workers at the greatest risk due to their acute interaction with soils. However, it is envisaged that with appropriate PPE and site management, risks to construction workers can be significantly mitigated and therefore the risk can be reduced.

##### Ground Gas

Possible ground gas sources have been identified on site. These are limited to a possible on site historical pond and areas of potentially deep Made Ground. However, because the nature of the Made Ground is likely to comprise demolition rubble, which is expected to be inert and ashy, and due to the small size of the site, the associated ground gas risk can be reduced to low to moderate. As a result, a qualitative ground gas risk assessment in line with CL:AIRE RB17 (2013) is envisaged to sufficiently evaluate the ground gas risk instead of undertaking ground gas monitoring.

If any organic rich Made Ground deposits are identified or if previously unrecorded potential ground gas sources are recorded during the ground investigation works, then ground gas monitoring may be required. The length and frequency of the ground

gas monitoring regime and the sampling method, initial results and alterations to the conceptual model are subject to the findings of the ground investigation works and development constraints (i.e. development timescales and liaison with the local authority).

#### Controlled Waters

Although sensitive groundwater receptors have been identified on-site (Secondary Undifferentiated and Secondary A Aquifers) no significant contaminative linkages exist. Likewise, off-site surface water receptors have been identified (Corn Brook 495m north). However, due to the distance this is from the site, it is highly unlikely that a contaminative linkage exists. Therefore, the risk to controlled waters is deemed low.

If unrecorded contaminative sources are noted, the above conceptual models may require re-assessment / re-appraisal.

### **4.8 Scope of Phase 2 Intrusive Geo-Environmental Ground Investigation**

As a result of the preliminary risk assessment, a Phase 2 intrusive geo-environmental ground investigation should be carried out to quantify the identified risks. This intrusive ground investigation works should include the collection of appropriate samples – solid and / or liquid, if deemed necessary, across the site for appropriate chemical testing as detailed above.

Furthermore, to determine the geotechnical and geological properties of the underlying ground conditions, appropriate intrusive works and associated testing should be undertaken. The rationale and aims for these Phase 2 environmental, geotechnical and geological investigative works are detailed below.

In order to provide adequate assessment in terms of both environmental and geotechnical site parameters, ground investigation works will be required on a spatial basis.

The proposed initial ground investigation works should comprise the following:

- Dynamic sampling boreholes; and
- Mechanically excavated foundation inspection pits

The rationale for the exploratory holes is discussed below:

- To allow the collection of samples from the Made Ground and natural deposits for chemical laboratory testing (solid samples) for an appropriate suite of determinands and to determine the suitable concrete classification in associated with relevant guidance e.g. BRE Special Digest 1.
- To determine the extent, composition and depth of Made Ground deposits.
- To determine the nature, thickness and extent of superficial deposits.
- Enable geotechnical testing, including density testing (SPTs), hand shear vane (HSV) testing and undrained shear strengths of the underlying Made Ground and natural deposits for the purposes of sub-structure design;
- To allow a qualitative ground gas risk assessment to be carried out based on CL:AIRE RB17 (2013) given the nature of the site and the development.
- To determine the size, extent and dimensions of third party foundations along the western boundary as well as possible historical basements.

Based on the findings of the initial ground investigation works, further works may be required for detail design including:

- Cable Percussive boreholes (or similar) if piled design information is required.

## 5.0 RECOMMENDATIONS

- 5.1 As a result of the information gathered and the risks identified in this report, there is a low to moderate risk to human health on the basis that feasible contaminative linkages have been identified for end users and construction workers. The risk to controlled waters is deemed low given the lack of significant contaminative linkages.
- 5.2 A low to moderate ground gas risk has been identified based on possible ground gas sources being identified on site, so a qualitative ground gas risk assessment in line with CL:AIRE RB17 (2013) is recommended . On the basis that the site lies within an area where between less than 1% of homes are above the action level no radon protection measures are necessary.
- 5.3 Due to geotechnical requirements, ground investigation works should be undertaken in order to determine the ground conditions with a greater degree of certainty and allow design of the proposed development, drainage, services and immediate external areas to be undertaken. It is therefore recommended that exploratory holes are constructed where access is permitted across the site. The use of soakaways is unlikely to be suitable given the presence of low-permeability shallow Glacial Till across the site.
- 5.4 From the results of the Phase 2 ground investigation work – if this report identifies a potential risk and / or a requirement for further detailed site-specific assessment, a Phase 3 environmental investigation report and / or a Remedial Strategy (informing on potential remediation solutions) may be required.
- 5.5 The nature and extent of the proposed targeted chemical and environmental testing should be confirmed, if time / commercial constraints allow, with the relevant Local Authority Environmental Health Officer and the Environment Agency prior to undertaking works on-site. Proceeding without agreement between regulatory authorities may result in further assessment being required.

- 5.6 It should be noted that, if any visual or olfactory evidence of contamination is encountered during remediation or construction work, then the Local Authority Environmental Health Officer and Environment Agency should be contacted immediately in order to agree any necessary remediation measures.
- 5.7 Given the possibility of services on-site, full service plans should be obtained prior to any intrusive ground investigation works.

## **APPENDIX 1**

### **LIMITATIONS OF INVESTIGATION WORK AND REPORT AND CONTAMINATED LAND LEGISLATIVE FRAMEWORK**

## **LIMITATIONS OF REPORT**

This consultancy report was compiled and carried out by IGE Consulting Limited ('IGE') for the client, as defined in the main report (the 'client'), on the basis of a defined programme and scope of works and the terms of a contract between IGE and the client. IGE undertook this with all reasonable skill and care, taking into account the limits of the scope of works required by the client, the prevailing site conditions, the time scale involved and the resources, including financial and manpower resources, agreed between IGE and the client. IGE cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered outwith the agreed scope of works.

Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices. This report may not be relied upon, or transferred to, by any other party without the written agreement of its author. If a third party relies on this report, it does so wholly at its own and sole risk and IGE disclaims any liability to such parties.

It is IGE's understanding that this report is to be used for the purpose described in the 'Brief' section of this report. That purpose was a significant factor in determining the scope and the services to be provided. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without IGE's review and advice shall be at the client's sole and own risk.

The information contained in this report is protected by disclosure under Part 3 of the Environmental Information Regulations 2004 pursuant to the provisions of Regulation 12(5) without the consent in writing of a Director of IGE.

This report is a function of the date it was written and should be read in light of any subsequent changes in legislation, statutory requirements and industry practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of IGE. In the absence of such written advice of IGE, reliance on the report in the future shall be at the client's own and sole risk. Should IGE be requested to review the report in the future, IGE shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between IGE and the client.

The observations and conclusions described in this report are based solely upon the scope of works agreed between the client and IGE. IGE has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report. IGE is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the agreed scope of works. For the avoidance of doubt, this report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species (e.g. Japanese Knotweed). It is recommended that the client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the suspected presence asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace full and proper surveys.

Throughout the report the term 'geotechnical' is used to describe aspects relating to the physical nature of the site (such as foundation requirements) and the term 'geo-environmental' is used to describe aspects relating to ground-related environmental issues (such as potential contamination). However, it should be appreciated that this is an integrated investigation and these two main aspects are inter-related. The geo-environmental sections are written in broad agreement with BS 10175:2011+A2 2017.

## **LIMITATIONS OF INVESTIGATION WORK**

### **Desk Study References**

This report is based upon IGE's observations of existing physical conditions at the site gained from a walkover survey of the site together with IGE's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. Reliance has been placed on this publicly available data obtained from the sources identified in the main report. When using the information, it has been assumed that it is correct. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst IGE have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified. No responsibility can be accepted for errors within third party items presented in this report. IGE did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services. IGE is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to IGE and including the doing of any independent investigation of the information provided to IGE except when otherwise provided in the terms of the contract between the client and IGE.

### **Historical Mapping**

Historical Ordnance Survey maps do not provide a comprehensive description of a site history. They provide details of the site from a date prior to the publication of the map (i.e. a snapshot in time). The period between map editions can be substantial (i.e. several decades). Not all map series are available for every date range in many areas of the UK and therefore there will be gaps in this mapped record for some sites. Potentially contaminative land uses could have been present and removed during such periods and may therefore not form a part of this particular record. In addition, there will be potentially contaminative land uses which are not identified on the map records such as small scale storage / use of hazardous materials, illegal / unlicensed waste disposal activities etc. Different map series identify different features utilising different symbols which can result in features that remain on-site being removed from maps. Some features are also not mapped for security reasons (e.g. airfields and other military installations). These areas are mostly shown as blank areas on historical maps.

### **Site Walkover**

During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.

### **Flooding**

Flooding in this report is defined as flooding caused by the sea, ditches, rivers, streams, ponds, lakes, reservoirs and the like. It does not extend to flooding caused by surcharged piped drainage systems and investigations into flooding of this nature are excluded from this report.

### **Extent of Contamination Studies**

Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

The conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the reporting in full. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

### **Intrusive Investigation**

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations, the potential exists for ground conditions to be encountered which are different to those considered in this report. The explored extent of the site area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters, based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

### **Exploratory Holes**

Where exploratory holes have been carried out as part of this investigation, the spacing has been determined to provide a reasonable indication of the general ground conditions across the site, but the number has ultimately been limited by commercial constraints. The findings of the exploratory holes relate specifically to the exploratory hole locations and are no absolute guarantee of the ground conditions between such locations. Due allowance should be made for the possibility of variation in conditions between exploratory hole locations.

### **Extent of Contamination Testing**

The extent of contaminated land testing carried out on samples obtained from the site has been determined in accordance with the latest legal guidance issued by the government to provide, with reasonable certainty, the probable general levels of contamination present on site that could pose a significant hazard to human health or waters. The extent of site investigation works including chemical testing has also been limited by reasonable commercial constraints. Although extensive testing of samples has been carried out, the volume of samples taken for testing are a minute fraction of the total volume of soils and groundwater present on site. Therefore, there is a residual risk that undetected pockets of contamination may be present on site, situated between testing locations.

When investigating or developing potentially contaminated land it is important to recognise that sub-surface conditions may vary spatially and temporally. The absence of certain ground, ground gas, contamination or groundwater conditions at the positions tested is not a guarantee that such conditions do not exist anywhere across the site. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

### **Extent of Geo-Environmental Studies**

This report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species e.g. Japanese Knotweed. It is recommended that the Client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the identification asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace a full and proper survey. If an Unexploded Ordnance (UXO) report has been obtained within the report, it has been so on the basis of Health and Safety concerns and no assessment has been made other than transcribing the recommendations of the sub-contractor contained within the report. In terms of a potential contaminative source, unless ordnance has been manufactured / stored on site, UXOs will only be determined as a contaminative source following a positive identification on site.

### **PLANNING CONTEXT**

The National Planning Policy Framework (NPPF, 2021) states that the purpose of the planning system is to contribute to the achievement of sustainable development. In order to do this the planning system has three overarching objectives, one of which directly relates to the potential for pollution and contaminated land:

- ***environmental objective*** - *to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy*'.

In accordance with this environmental objective, Paragraph 118 clarifies that 'making effective use of land' includes to:

- *'give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land*'.

In accordance with this environmental objective, Paragraph 170 clarifies that 'conserving and enhancing the natural environment includes:

- *'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability*'; and
- *'remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate*'.

Paragraph 178 of the NPPF states that planning policies and decisions for developments should also ensure that:

- *'a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation)*'; and,
- *'after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990*'; and
- *'adequate site investigation information, prepared by a competent person, is available to inform these assessments*'.

This report has been prepared and authorised by staff that are competent as defined in the NPPF.

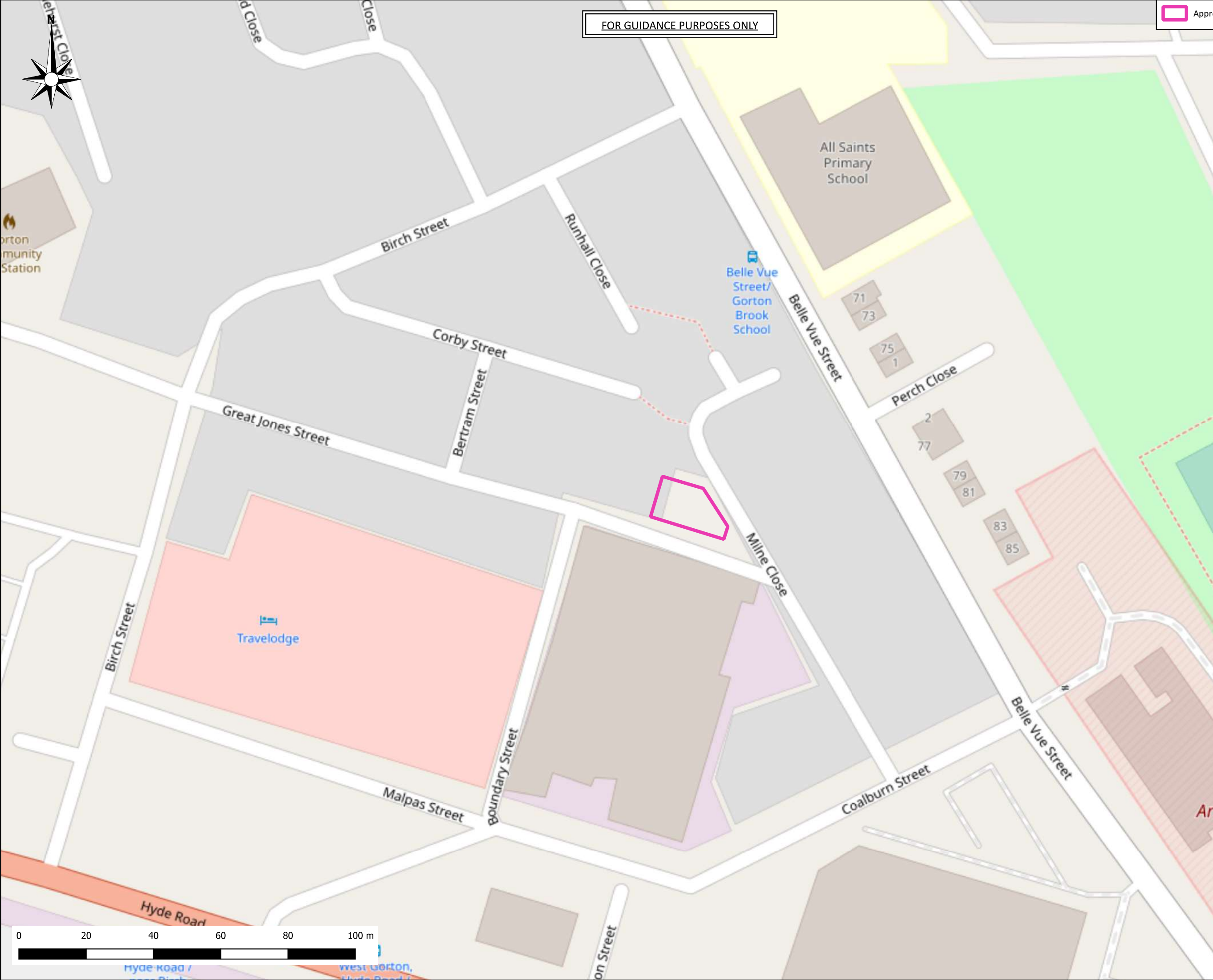
**APPENDIX 2**

**FIGURES AND DRAWINGS**



| Rev | Description: |
|-----|--------------|
|     |              |

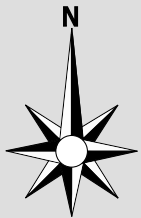
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View Associates Ltd  
Greystone House, Moss Lane  
Littleborough, M25 0UM



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Approximate Site Boundary

|                                                                                                                                                                                                                                       |       |                        |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------|-------------|
|                                                                                                                                                                                                                                       |       |                        |             |
| Rev                                                                                                                                                                                                                                   | Drawn | Date                   | Description |
| Drawing Status:<br>Information                                                                                                                                                                                                        |       |                        |             |
| Contract:<br><br>Great Jones Street<br>For: Oslady Homes Ltd                                                                                                                                                                          |       |                        |             |
| Drawing Title:<br><br>Site Location Plan                                                                                                                                                                                              |       |                        |             |
| <div>IGE<br/>consulting</div>                                                                                                                                                                                                         |       |                        |             |
| Office 16, Bartle House, Manchester, M2 3WQ<br>Email: <a href="mailto:contact@igeconsulting.co.uk">contact@igeconsulting.co.uk</a><br>Web: <a href="http://www.igeconsulting.co.uk">www.igeconsulting.co.uk</a><br>Tel: 0161 914 9170 |       |                        |             |
| Scale: 1:1000 @A3                                                                                                                                                                                                                     |       | Date: Aug 2023         |             |
| Drawn: TP                                                                                                                                                                                                                             |       | Checked: AE            |             |
| Contract No.<br><br>4015                                                                                                                                                                                                              |       | Drawing No.<br>SI - 01 | P1          |



FOR GUIDANCE PURPOSES ONLY

-  Approximate Site Boundary
-  Historical Terraced Houses (1908 - 1993)
-  Possible Historical Ponds (1848 - 1890)

Possible Historical Outhouse (1908 - 1993)

Historical Terraced Houses (1908 - 1993)

Possible Historical Pond (1848 - 1890)

Possible Historical Pond (1848 - 1890)

Milne Close

Possible Historical Pond (1848 - 1890)



|                                                                                                                                                                                                                                       |       |                        |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------|-------------|
|                                                                                                                                                                                                                                       |       |                        |             |
| Rev                                                                                                                                                                                                                                   | Drawn | Date                   | Description |
| Drawing Status:<br>Information                                                                                                                                                                                                        |       |                        |             |
| Contract:<br><br>Great Jones Street<br><br>For: Oslady Homes Ltd                                                                                                                                                                      |       |                        |             |
| Drawing Title:<br><br>Site Features Plan                                                                                                                                                                                              |       |                        |             |
|                                                                                                                                                  |       |                        |             |
| Office 16, Bartle House, Manchester, M2 3WQ<br>Email: <a href="mailto:contact@igeconsulting.co.uk">contact@igeconsulting.co.uk</a><br>Web: <a href="http://www.igeconsulting.co.uk">www.igeconsulting.co.uk</a><br>Tel: 0161 914 9170 |       |                        |             |
| Scale: 1:250 @A3                                                                                                                                                                                                                      |       | Date: Aug 2023         |             |
| Drawn: TP                                                                                                                                                                                                                             |       | Checked: AE            |             |
| Contract No.<br><br>4015                                                                                                                                                                                                              |       | Drawing No.<br>SI - 02 | P1          |

Notes

- 1
- This drawings is indicative and not to scale.
- 2
- This drawing is to be read in conjunction with all relevant Architects and Service Engineers drawings.

SOURCES

PATHWAYS

RECEPTORS

Sources

1. On-Site Made Ground
2. Possible On-Site Infilled Historical Pond (1848 - 1893)
3. Possible Off-Site Infilled Historical Ponds (5m S, 1848 - 1893)
4. Off-Site Historical Industrial Activities (45 - 277m, 1890 - 1993)

Secondary Sources

5. Pooling Beneath Current and Future Foundations
6. Pooling in Relative Low Points Above Low Permeability Deposits
7. Pooling In Granular Bands In Low Permeability Deposits

Ground Gas Sources

1. On-Site Made Ground
2. Possible On-Site Infilled Historical Pond (1848 - 1893)
3. Possible Off-Site Infilled Historical Ponds (5m S, 1848 - 1893)

Pathways To Human Health

1. Dermal Contact
2. Inhalation of Soil Dust and Vapours
3. Ingestion of Soil Directly

Pathways To Controlled Waters

1. Vertical Migration Along Current and Future Foundations
2. Vertical Migration Through Granular Made Ground, Granular Natural Deposits and Granular Lenses Within Natural Cohesive Deposits
3. Negligible Infiltration Through Low Permeability deposits.
4. Lateral Migration Along Low-Permeability Natural Deposits
5. Migration Through Fractures and Fissures in Bedrock
6. Migration Along Groundwater Flow
7. Overland Flow

Ground Gas Pathways

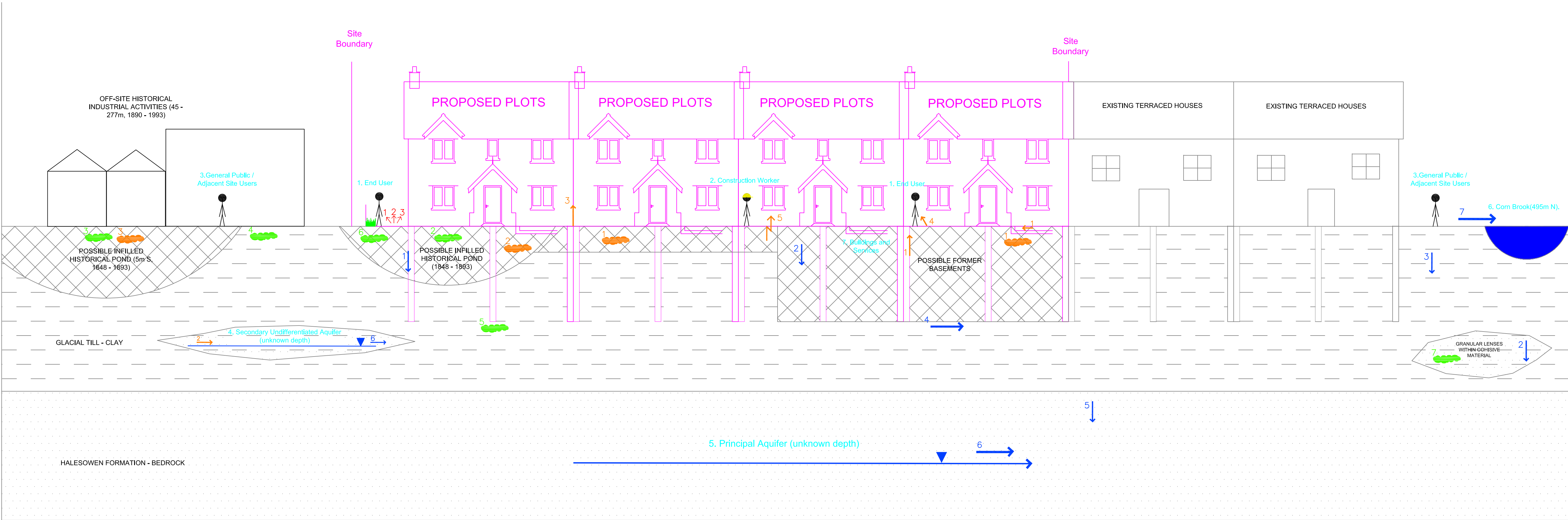
1. Preferential Migration Beneath Hardstanding, Along Foundations, Service Ducts and Trenches
2. Dissolved Gases Within Groundwater
3. Ingress Through Wall Cavities / Floors and Subsequent Accumulation
4. Inhalation of Ground Gas and Vapours
5. Vertical Migration Through Granular Deposits

Receptors

1. End User
2. Construction Workers
3. General Public / Adjacent Site Users
4. Secondary Undifferentiated Aquifer within Superficial Deposist (Unknown depth)
5. Secondary A Aquifer within bedrock (Unknown depth)
6. Corn Brook (495m N)
7. Buildings and Services

Key

- Made Ground
- Glacial Till – Clay
- Granualr Lenses Within Cohesive Material
- Halesowen Formation – Bedrock



|                                                                                                                                |       |             |             |
|--------------------------------------------------------------------------------------------------------------------------------|-------|-------------|-------------|
|                                                                                                                                |       |             |             |
| Rev                                                                                                                            | Drawn | Date        | Description |
| Drawing Status INFORMATION                                                                                                     |       |             |             |
| Contract GREAT JONES STREET, MANCHESTER FOR: OSLADY HOMES LTD                                                                  |       |             |             |
| Drawing Title PHASE 1 CONCEPTUAL SITE MODEL                                                                                    |       |             |             |
| IGE consulting                                                                                                                 |       |             |             |
| Office 16, Bartle House, Manchester, M2 3WQ email: contact@igeconsulting.co.uk web: www.igeconsulting.co.uk tel: 0161 914 9170 |       |             |             |
| Scale                                                                                                                          | NTS   | Date        | AUG 2023    |
| Drawn                                                                                                                          | TP    | Checked     | AE          |
| Contract No.                                                                                                                   | 4015  | Drawing No. | SI-03 P1    |

## **APPENDIX 3**

### **WALKOVER SURVEY PHOTOGRAPHS AND WALKOVER LOCATION PLAN**

 Walkover Locations

SITE WALKOVER PHOTOGRAPHS – 26<sup>th</sup> July 2023



Figure 1 – Looking west at the western site section.



Figure 2 – Looking east at the eastern site section.



Figure 3 – Looking east along the southern boundary with Great Jones Street.



Figure 4 – Looking northwest at the western boundary with residential properties.

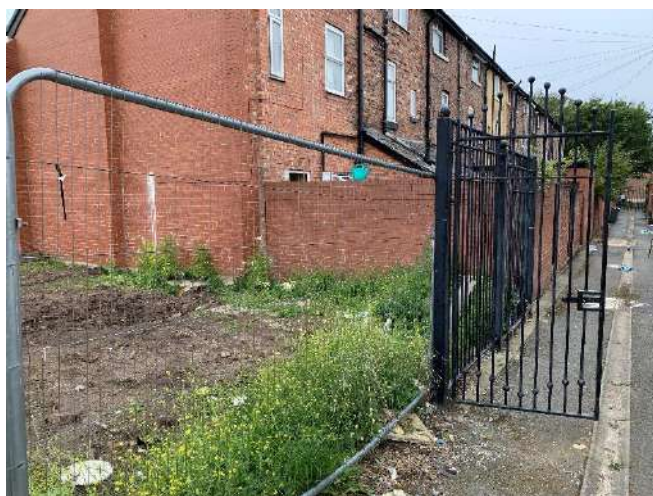


Figure 5 – Looking west at the northwestern corner of the site and the alley way that runs parallel to the northern boundary.



Figure 6 – Looking north at the site access off of Milne Close

SITE WALKOVER PHOTOGRAPHS – 26<sup>th</sup> July 2023



Figure 7 – Looking south east, showing the fly tipping on site.



Figure 8 – Showing the hieght of the third party walls along the western boundary.



Figure 9 – Looking north west across the site.



Figure 10 – Looking east along the southern site section withy Great Jones Street.



Figure 11 – Open hole running along the southern boundary.



Figure 12 – Open hole in the western site section.

## **APPENDIX 4**

### **HISTORICAL ORDNANCE SURVEY MAPS**

#### Site Details:

GREAT JONES STREET,  
MANCHESTER, M12 5PA

**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** County Series Town Plan

**Map date:** 1891

**Scale:** 1:500

**Printed at:** 1:1,000



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Edition N/A  
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Edition N/A  
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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** County Series

**Map date:** 1893

**Scale:** 1:2,500

**Printed at:** 1:2,500



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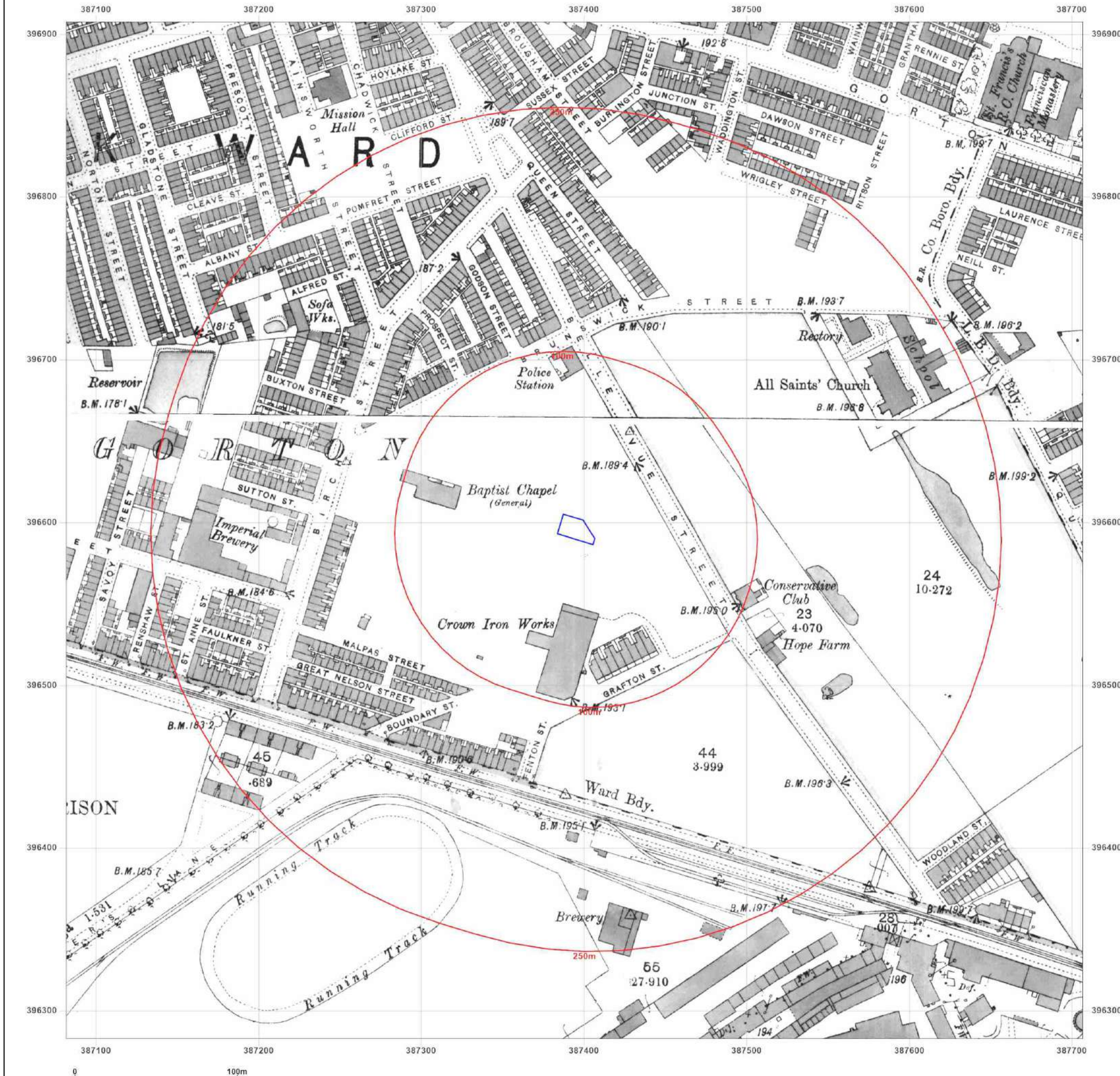


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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** County Series

**Map date:** 1908

**Scale:** 1:2,500

**Printed at:** 1:2,500



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**Grid Ref:** 387394, 396595

**Map Name:** County Series

**Map date:** 1922

**Scale:** 1:2,500

**Printed at:** 1:2,500



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Edition 1922  
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Levelled 1915

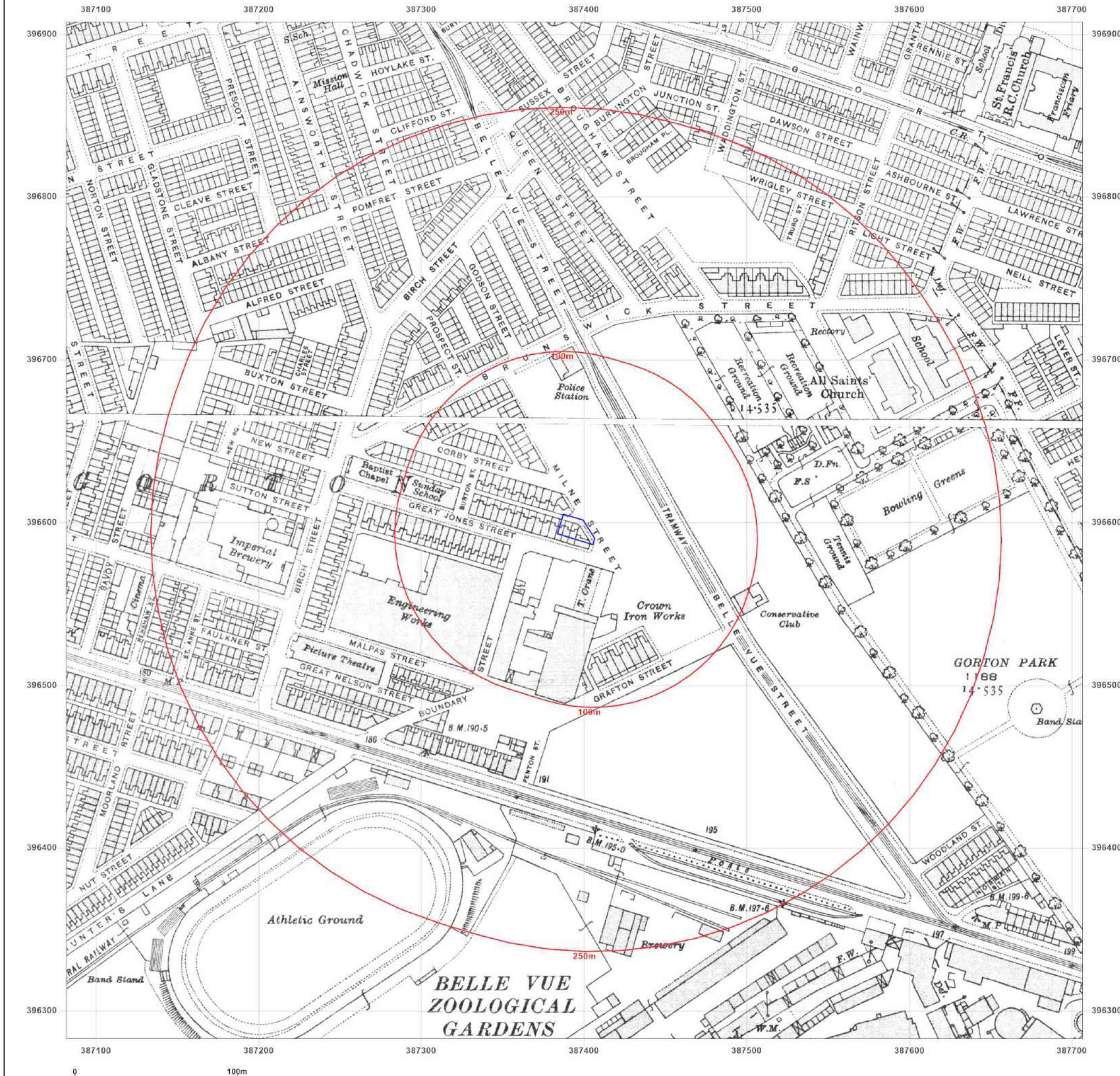


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#### Site Details:

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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** County Series

**Map date:** 1933

**Scale:** 1:2,500

**Printed at:** 1:2,500



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Surveyed 1873  
Revised 1933  
Edition N/A  
Copyright N/A  
Levelled 1927

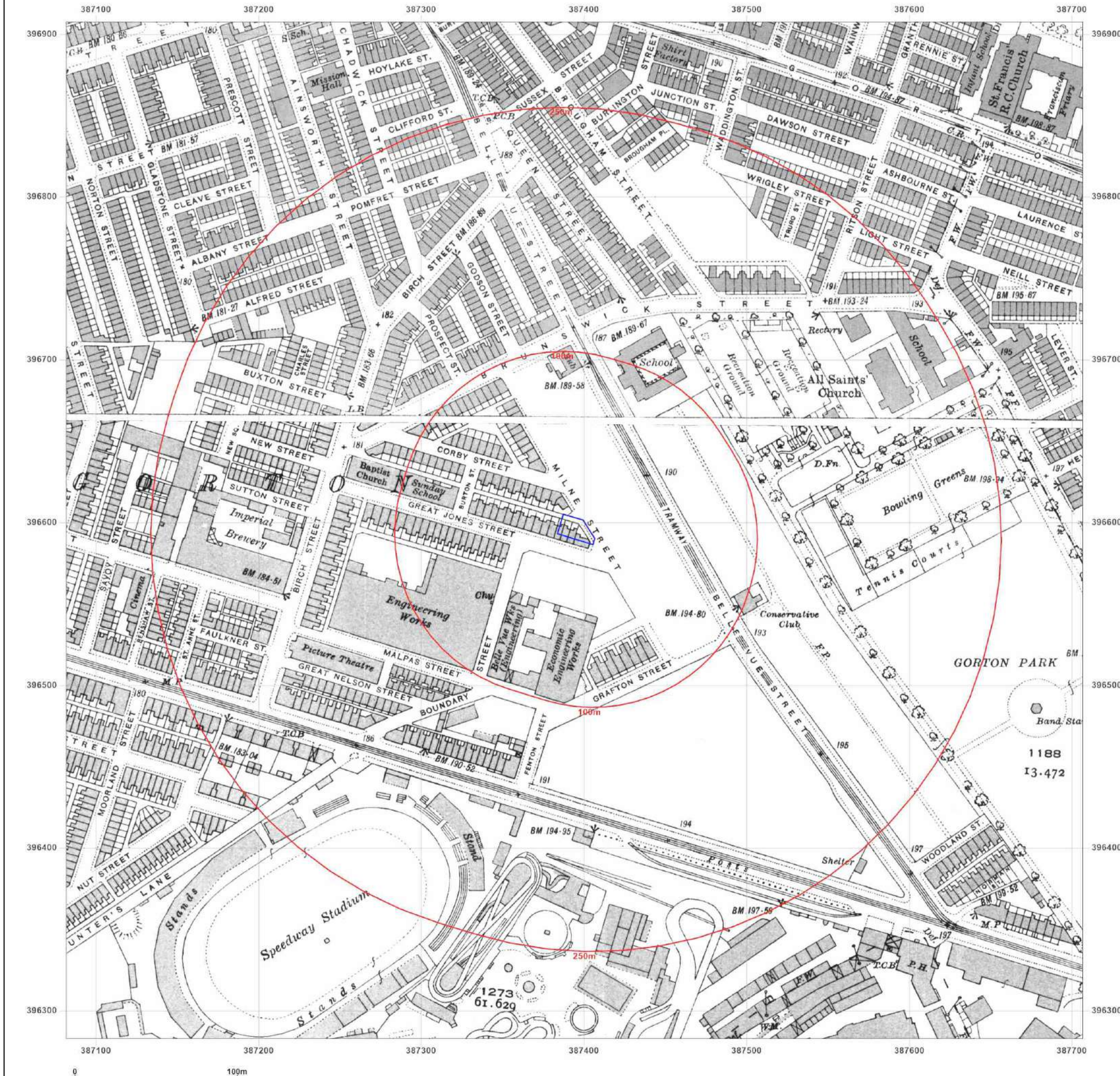


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#### Site Details:

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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** National Grid

**Map date:** 1949

**Scale:** 1:1,250

**Printed at:** 1:2,000



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Revised 1949  
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Client Ref: 4015  
Report Ref: GS-L44-AOE-YZC-WS9  
Grid Ref: 387394, 396595

Map Name: National Grid

Map date: 1950

Scale: 1:1,250

Printed at: 1:2,000



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**Client Ref:** 4015  
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**Map Name:** National Grid

**Map date:** 1951

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**Printed at:** 1:2,500



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Edition N/A  
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Levelled N/A

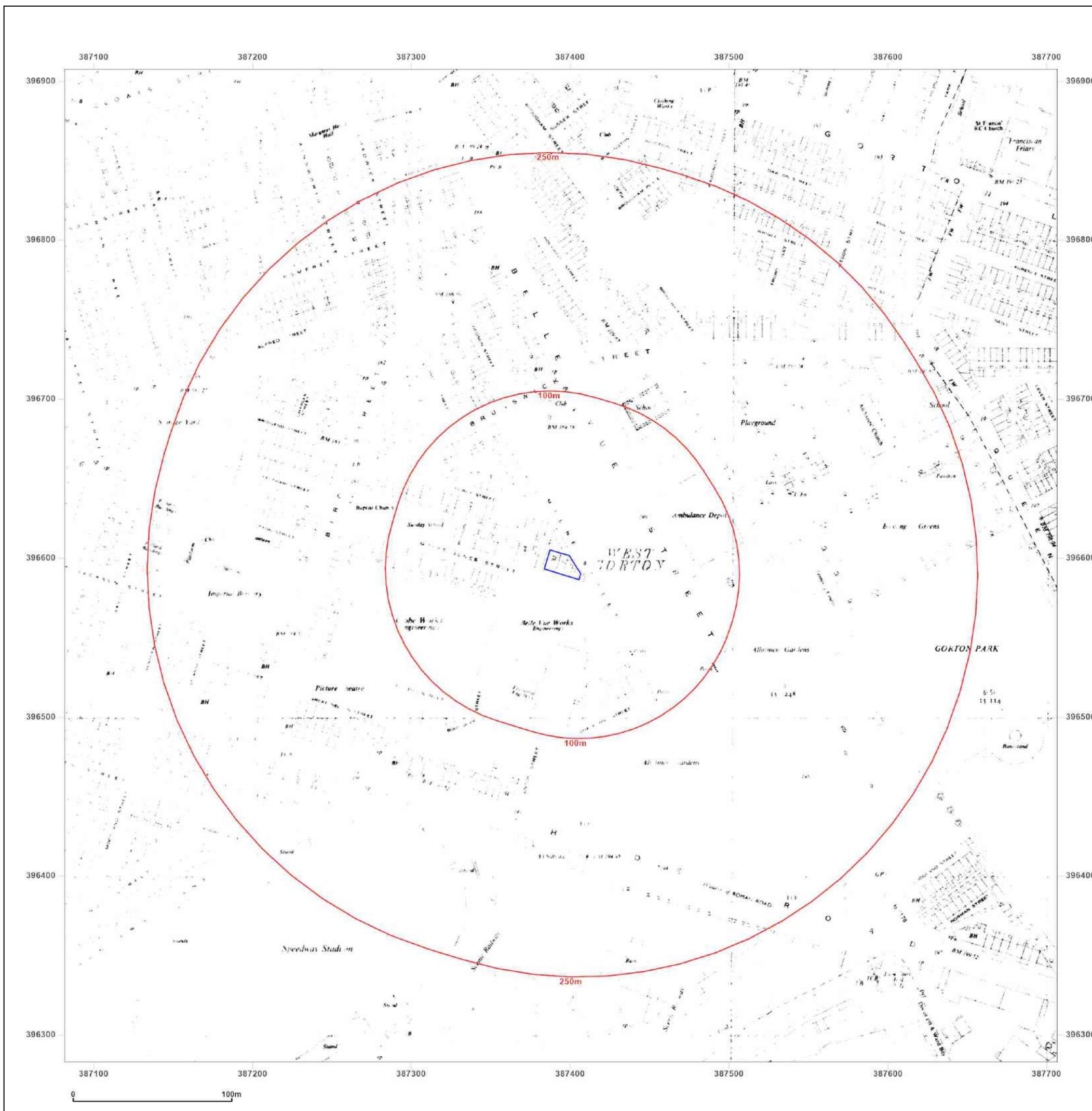


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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** National Grid

**Map date:** 1960-1961

**Scale:** 1:1,250

**Printed at:** 1:2,000



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Edition N/A  
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Revised 1960  
Edition N/A  
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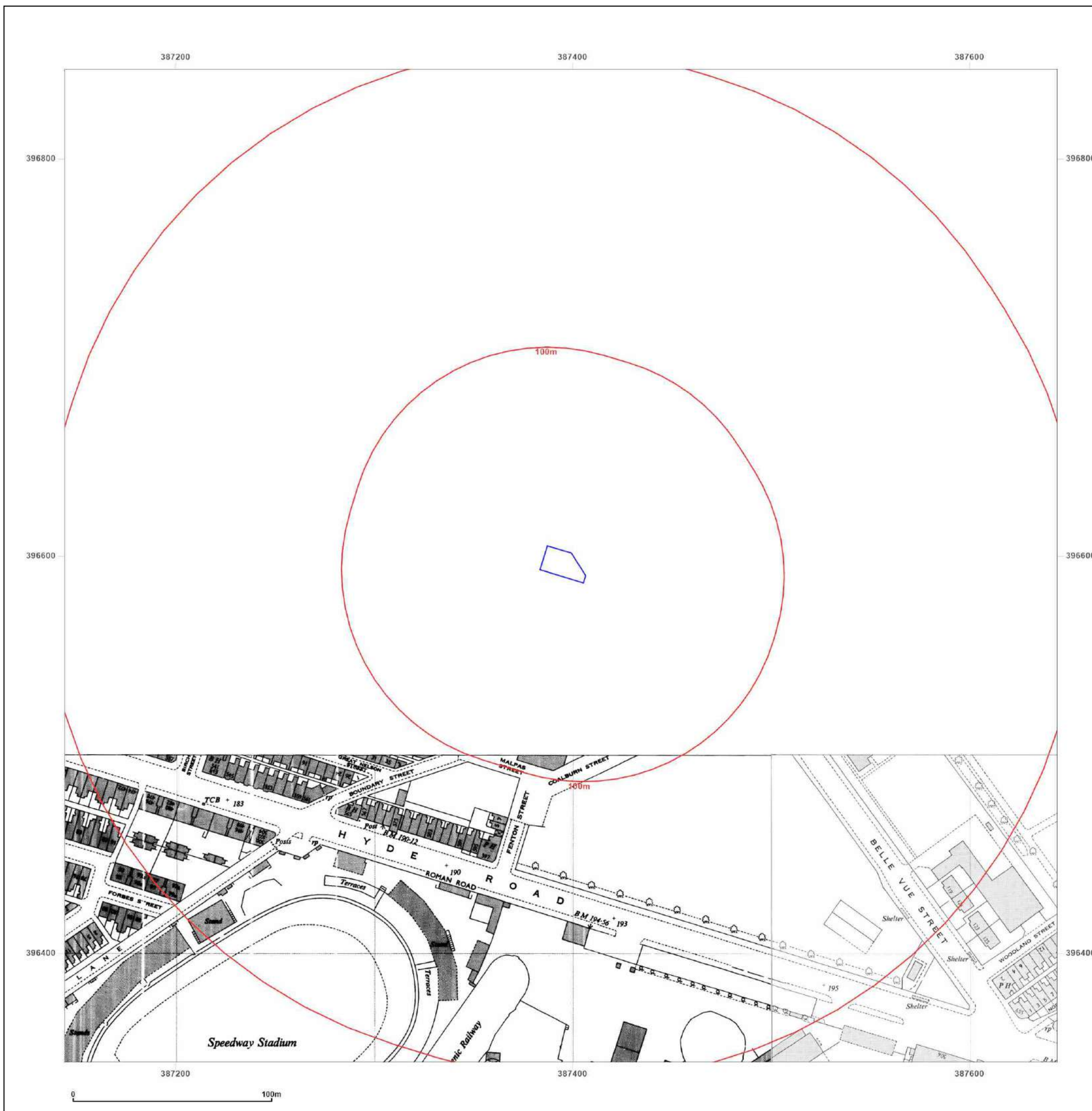


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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** National Grid

**Map date:** 1961

**Scale:** 1:1,250

**Printed at:** 1:2,000



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Revised 1960  
Edition N/A  
Copyright 1961  
Levelled 1959

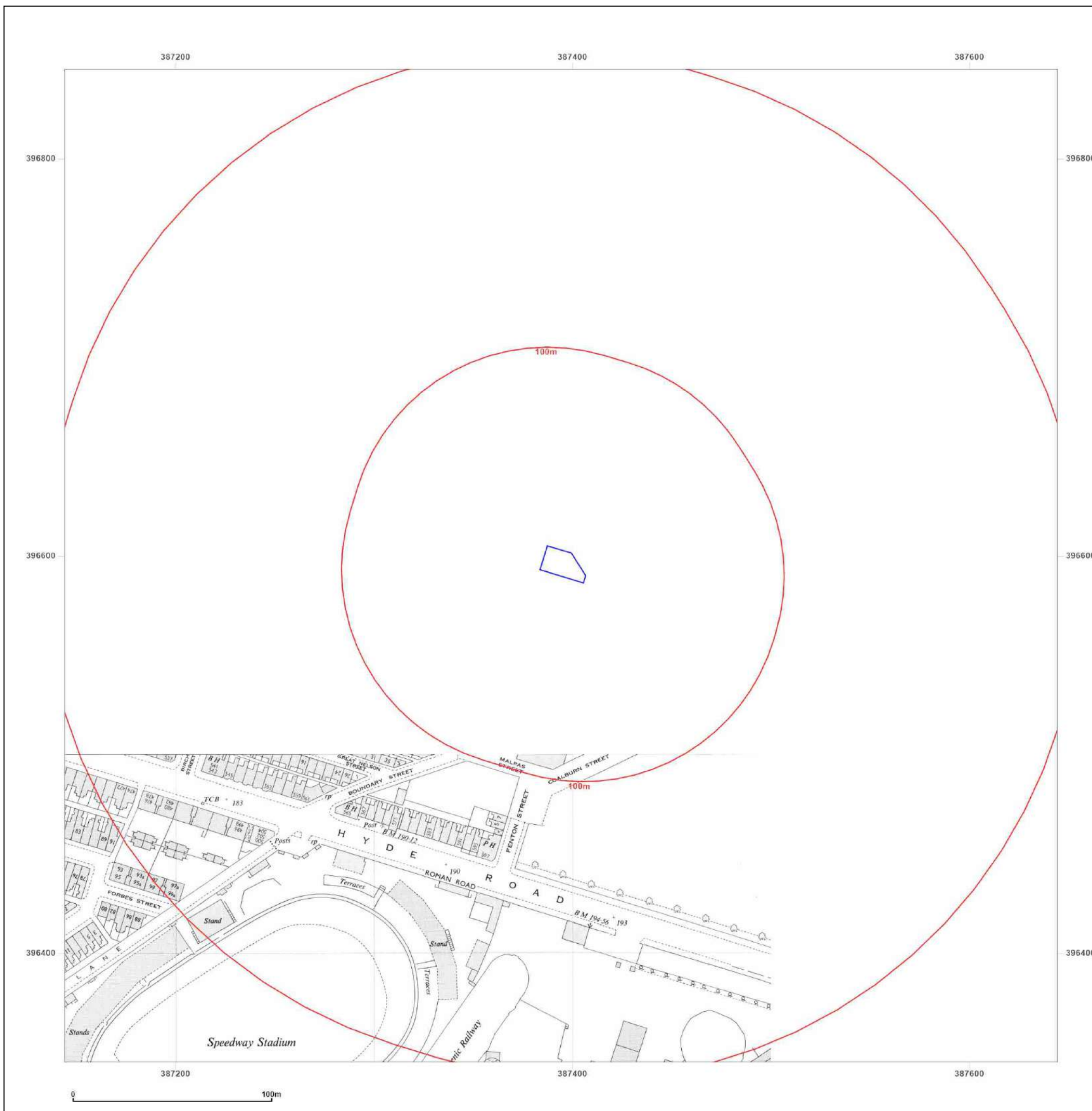


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**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** National Grid

**Map date:** 1964

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**Printed at:** 1:2,500



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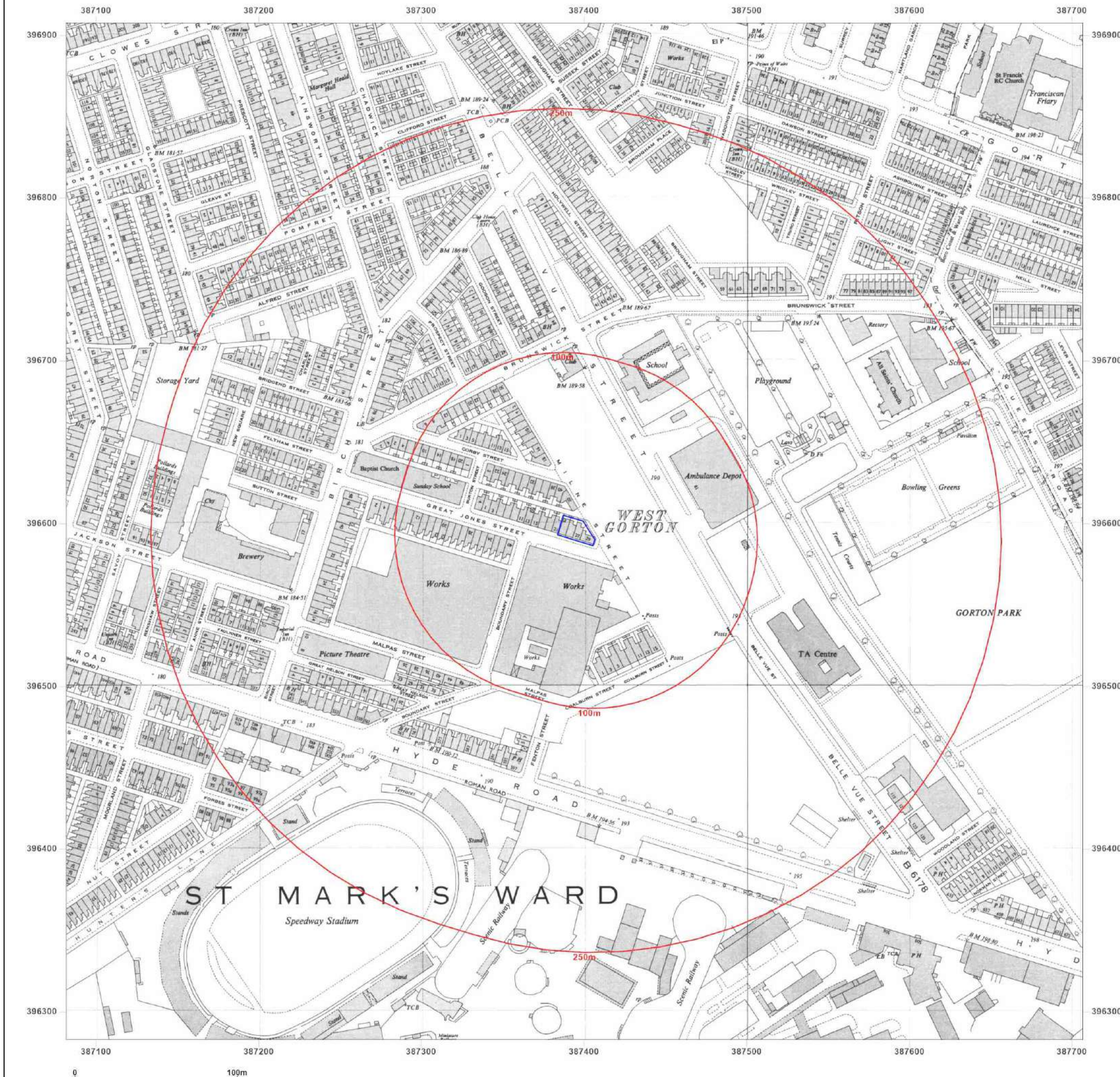


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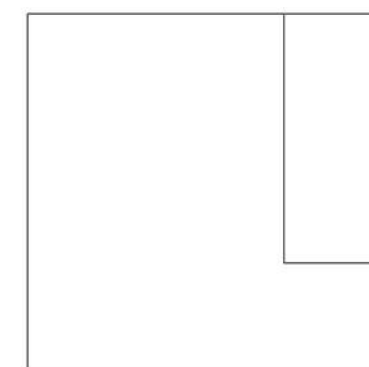
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**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** National Grid

**Map date:** 1968

**Scale:** 1:1,250

**Printed at:** 1:2,000



Surveyed 1949  
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Client Ref: 4015  
Report Ref: GS-L44-AOE-YZC-WS9  
Grid Ref: 387394, 396595

Map Name: National Grid

Map date: 1976-1977

Scale: 1:1,250

Printed at: 1:2,000



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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** National Grid

**Map date:** 1977-1982

**Scale:** 1:1,250

**Printed at:** 1:2,000



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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** National Grid

**Map date:** 1979-1983

**Scale:** 1:1,250

**Printed at:** 1:2,000



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Revised 1978  
Edition N/A  
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Levelled 1964

Surveyed 1964  
Revised 1983  
Edition N/A  
Copyright 1983  
Levelled 1964

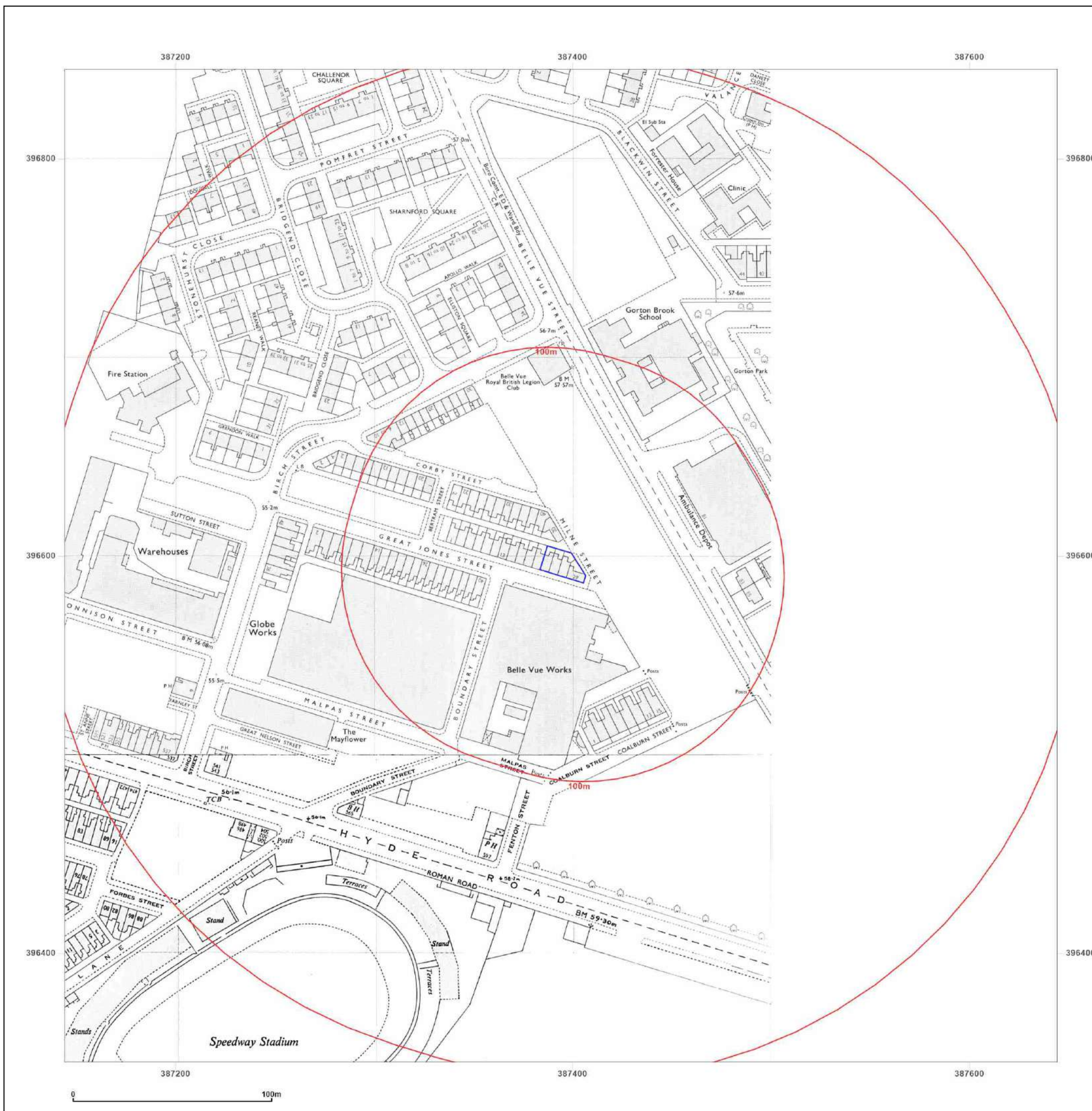


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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** National Grid

**Map date:** 1984-1989

**Scale:** 1:1,250

**Printed at:** 1:2,000



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Revised 1986  
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Surveyed 1964  
Revised 1984  
Edition N/A  
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Surveyed 1964  
Revised 1989  
Edition N/A  
Copyright 1989  
Levelled 1964

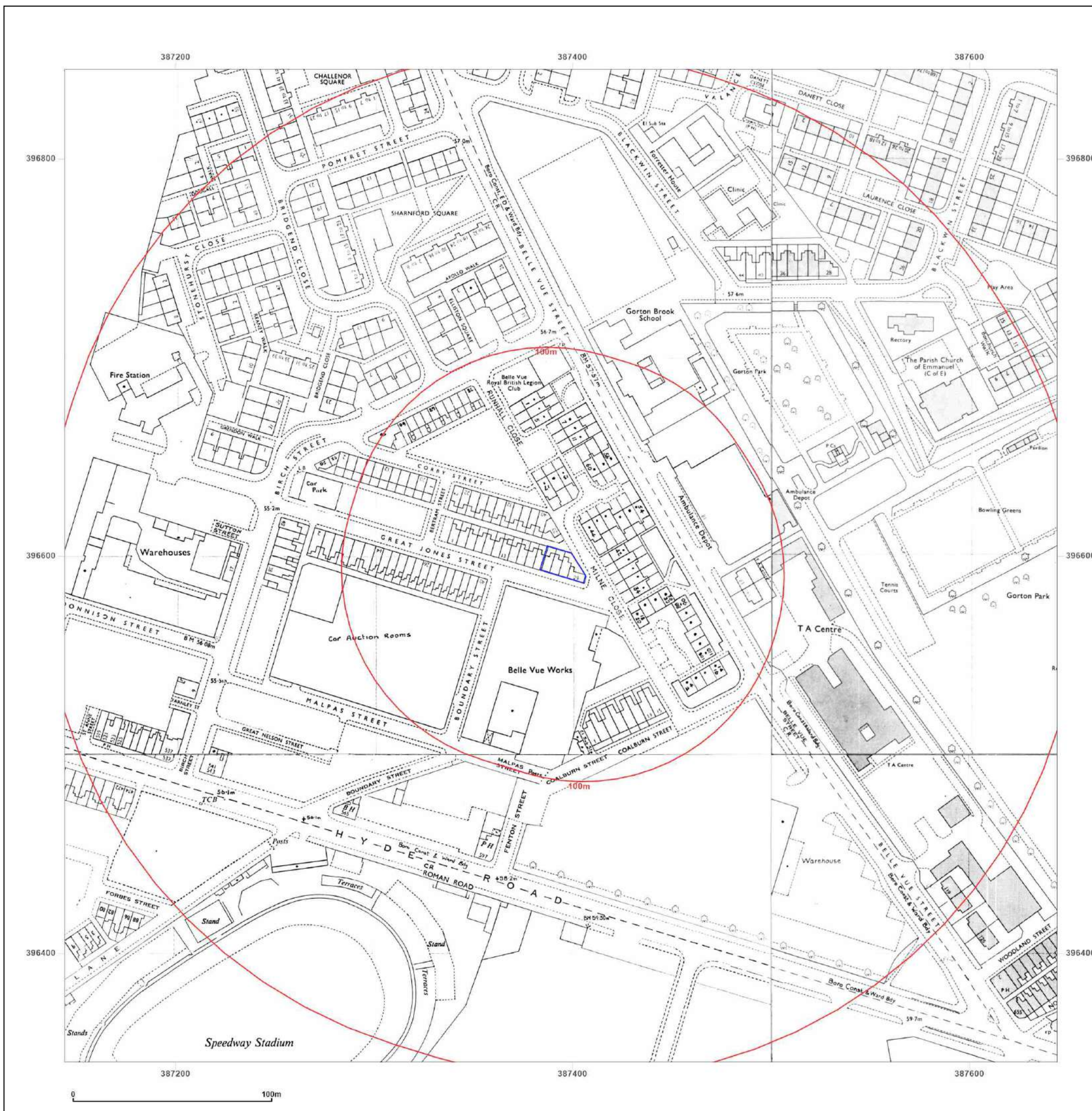


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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** National Grid

**Map date:** 1986-1991

**Scale:** 1:1,250

**Printed at:** 1:2,000



|                                                                                 |                                                                                |
|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Surveyed 1964<br>Revised 1991<br>Edition N/A<br>Copyright 1991<br>Levelled 1964 |                                                                                |
| Surveyed 1964<br>Revised 1986<br>Edition N/A<br>Copyright 1986<br>Levelled 1964 | Surveyed 1949<br>Revised 1981<br>Edition N/A<br>Copyright 1990<br>Levelled N/A |

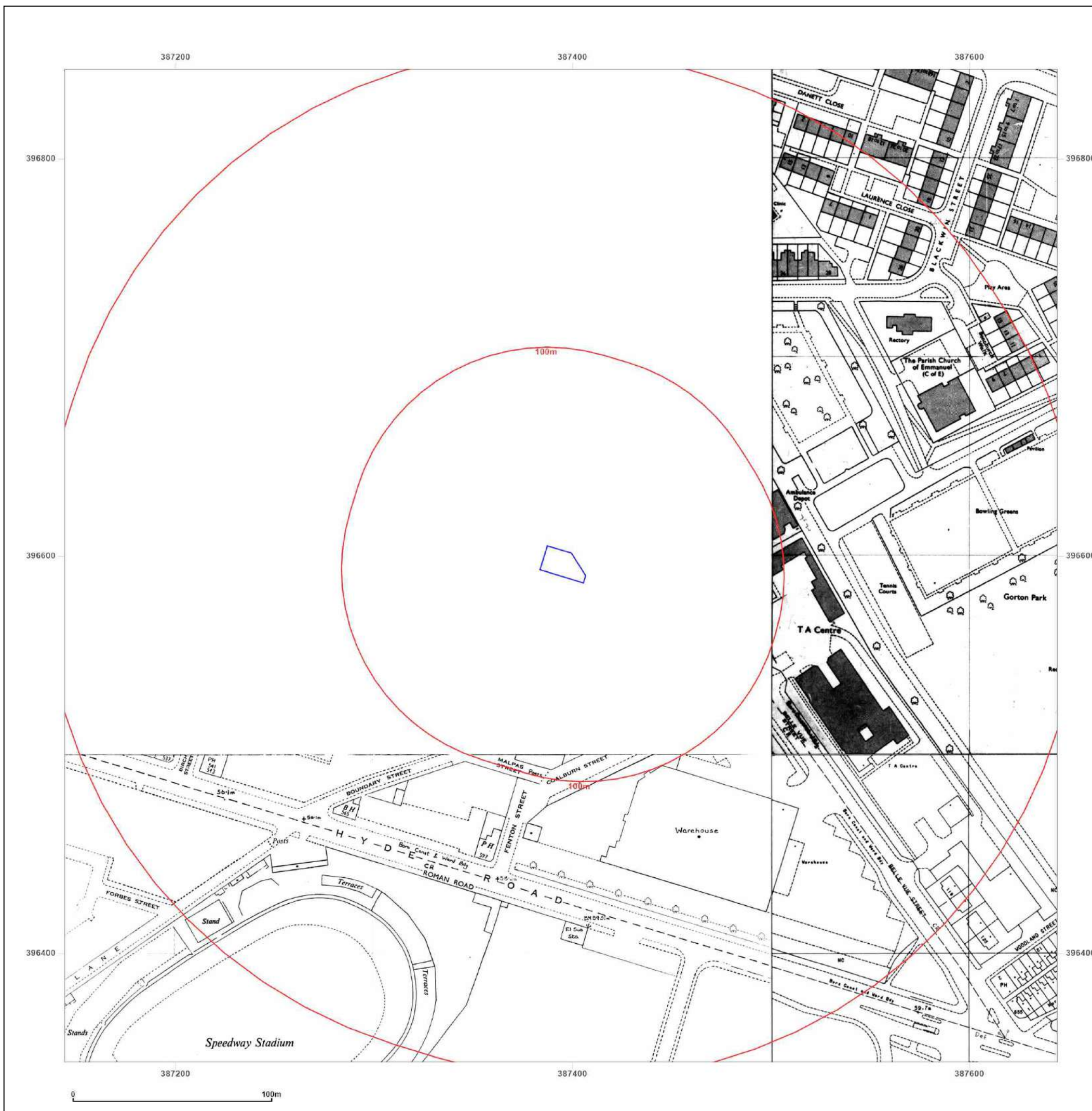


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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** National Grid

**Map date:** 1989-1992

**Scale:** 1:1,250

**Printed at:** 1:2,000



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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** National Grid

**Map date:** 1992

**Scale:** 1:1,250

**Printed at:** 1:2,000



Surveyed 1992  
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Edition N/A  
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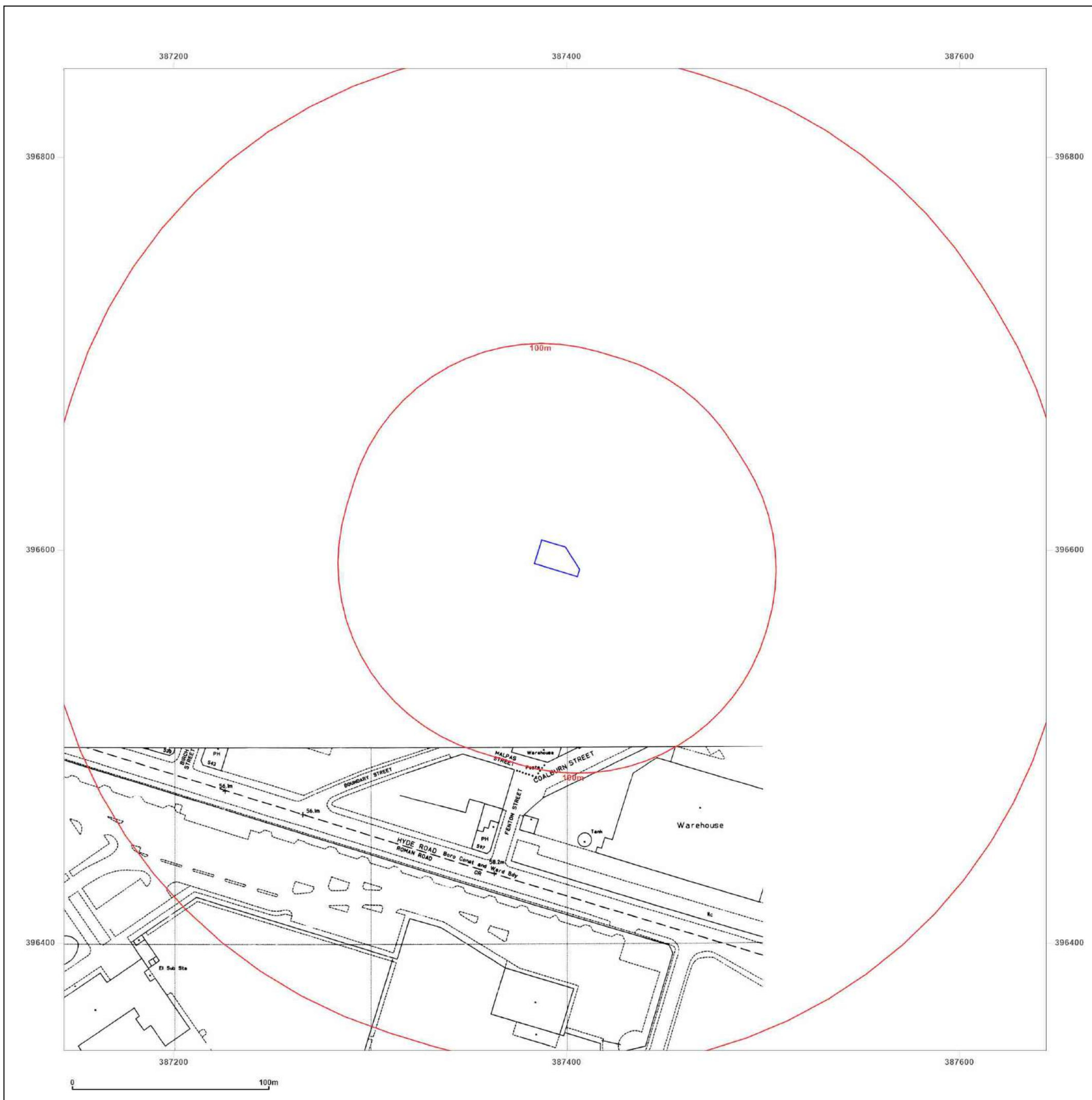


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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** National Grid

**Map date:** 1990-1993

**Scale:** 1:1,250

**Printed at:** 1:2,000



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Edition N/A  
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Surveyed 1949  
Revised 1989  
Edition N/A  
Copyright 1990  
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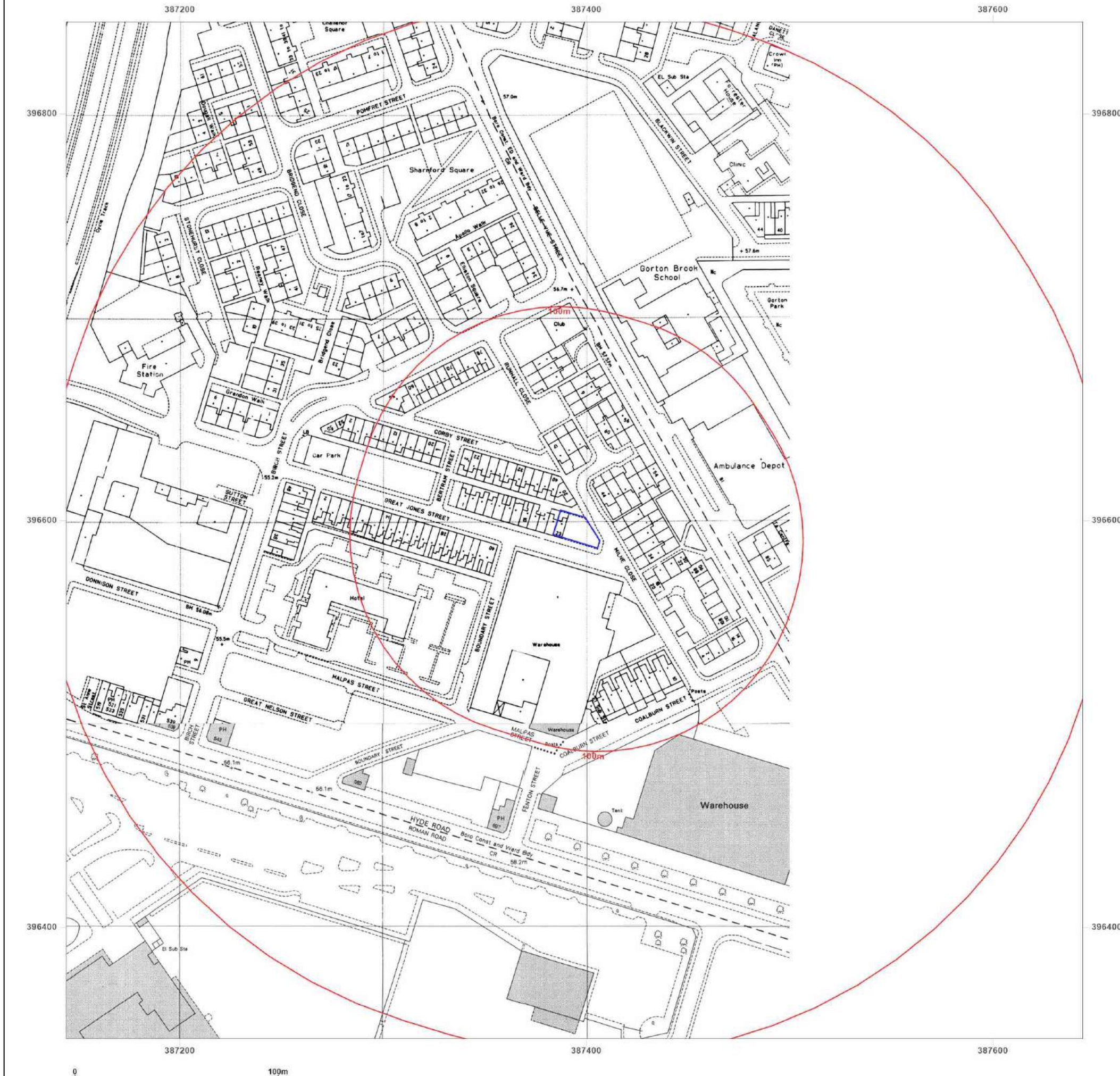


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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** National Grid

**Map date:** 1991-1993

**Scale:** 1:1,250

**Printed at:** 1:2,000



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Surveyed 1949  
Revised 1989  
Edition N/A  
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Levelled N/A

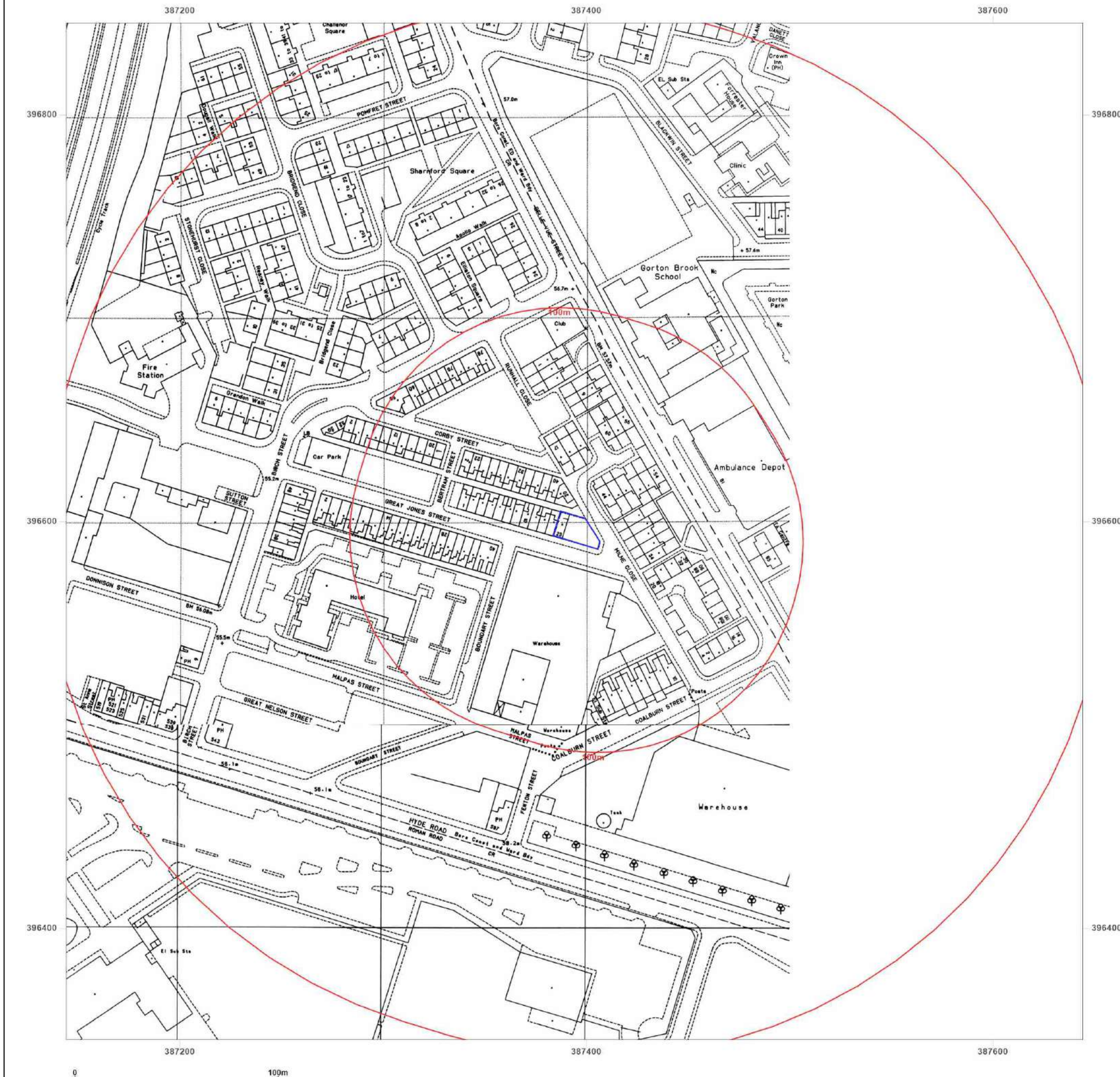


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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** LandLine

**Map date:** 2003

**Scale:** 1:1,250

**Printed at:** 1:1,250



2003

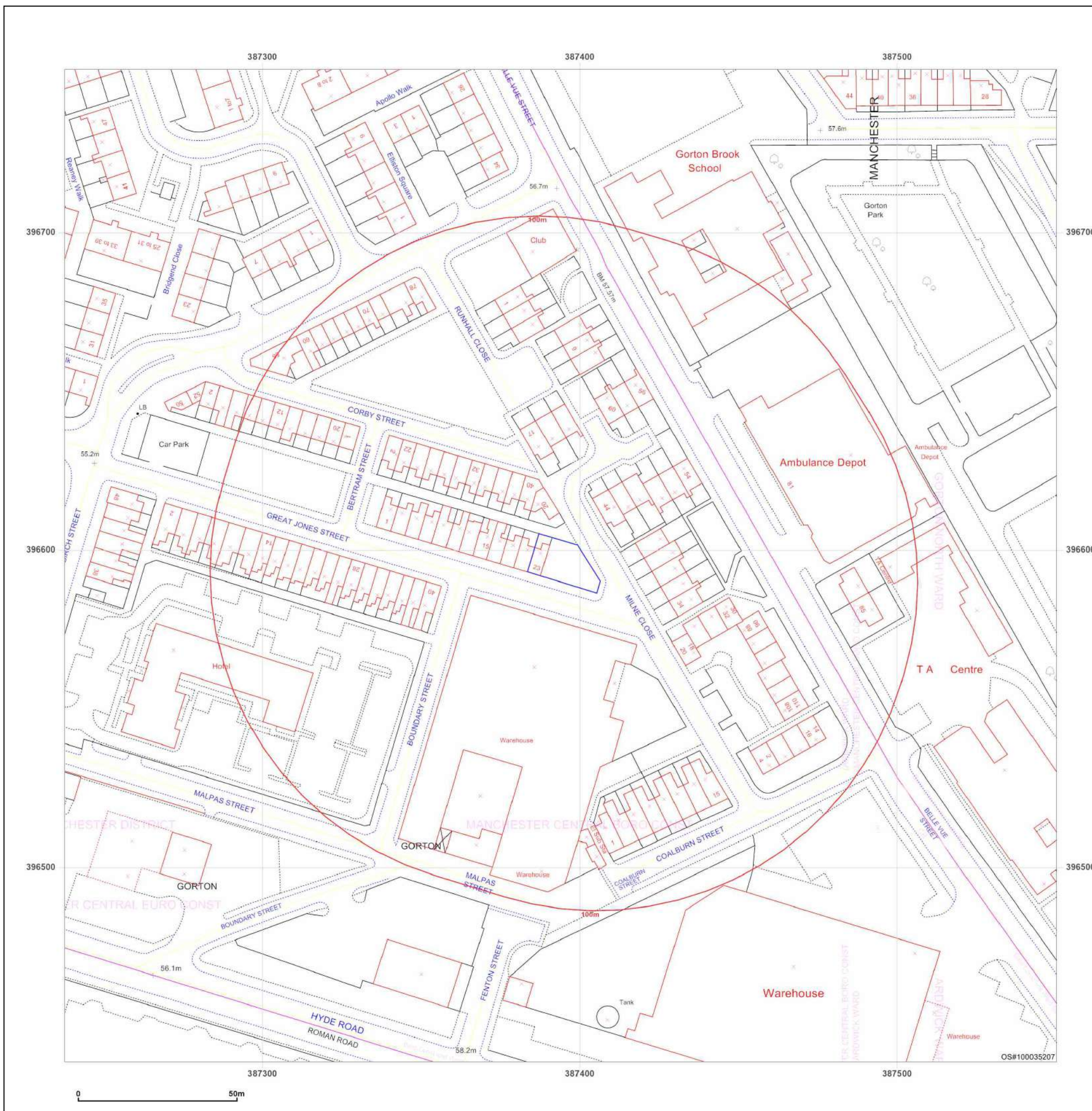


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Client Ref: 4015  
Report Ref: GS-L44-AOE-YZC-WS9  
Grid Ref: 387394, 396595

Map Name: County Series

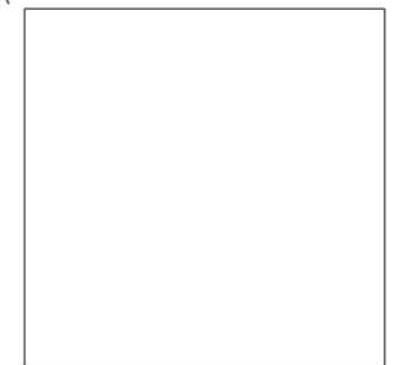
Map date: 1848

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1845  
Revised N/A  
Edition 1848  
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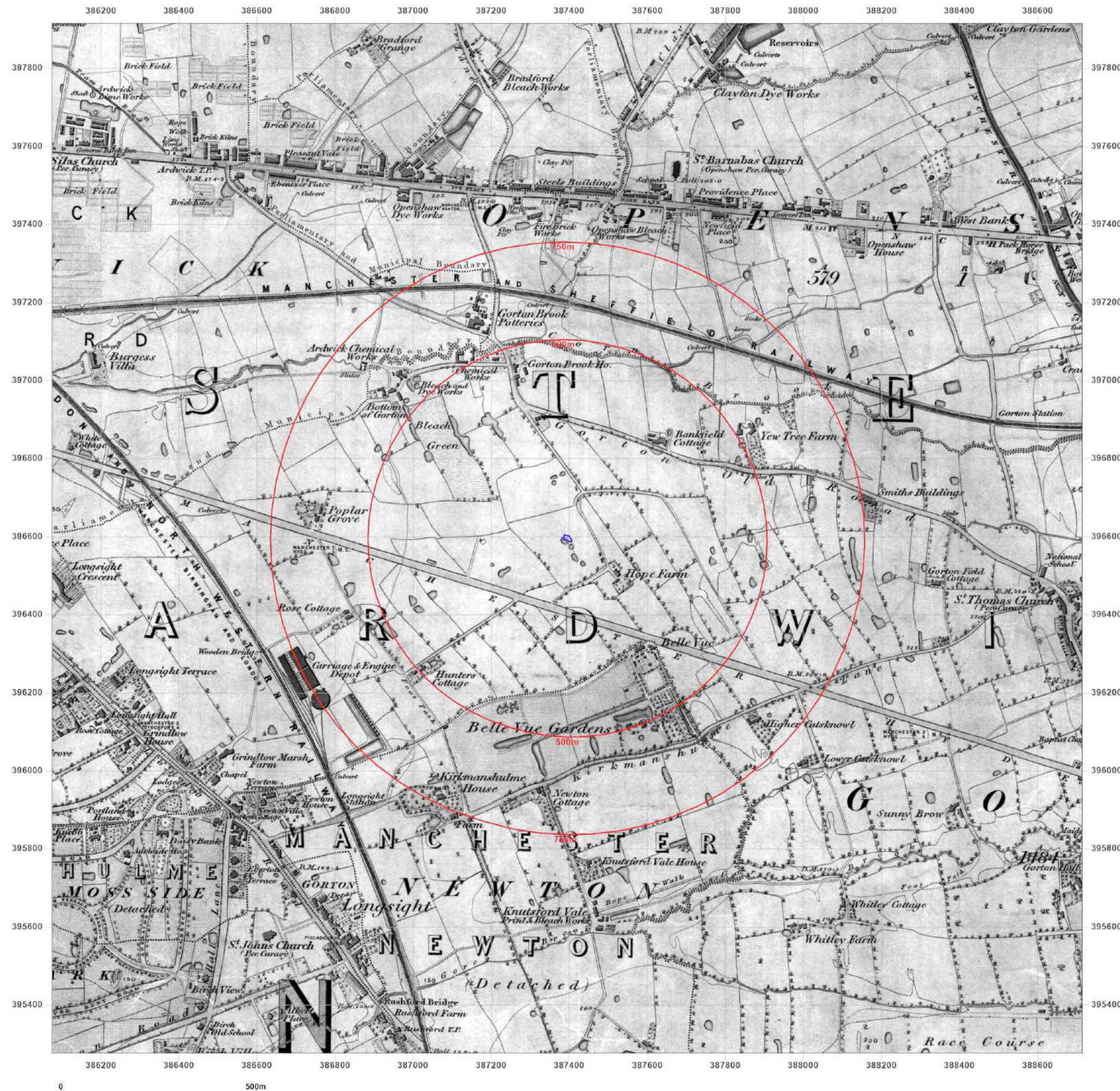


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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** County Series

**Map date:** 1890

**Scale:** 1:10,560

**Printed at:** 1:10,560



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**Client Ref:** 4015  
**Report Ref:** GS-L44-AOE-YZC-WS9  
**Grid Ref:** 387394, 396595

**Map Name:** County Series

**Map date:** 1905

**Scale:** 1:10,560

**Printed at:** 1:10,560



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