

|              |                                     |
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| Report type: | Phase I Site Appraisal (Desk Study) |
| Site:        | Aintree Hospital                    |
| Client:      | VINCI                               |
| Ref:         | GRM/P10738/DS.1                     |
| Date:        | January 2025                        |



## AINTREE UNIVERSITY HOSPITAL

### PHASE I DESK STUDY REPORT FOR VINCI CONSTRUCTION

**Project Ref:**  
P10738

**Date:**  
January 2025

**Prepared for:**  
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This report has been prepared in accordance with GRM's Accredited Quality Procedures.

If you have any queries regarding this report please contact the project manager in the first instance.

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## **1 INTRODUCTION**

### **1.1 PREAMBLE**

GRM Development Solutions Limited (GRM) has been appointed by VINCI Construction (Client) to undertake a Phase I Site Appraisal (desk study). The desk study and site inspection form Phase I of the assessment and allow the geotechnical and geo-environmental setting of the site to be determined and the identification of areas of particular concern that require targeted investigation.

This site appraisal is intended to provide information that will assist decision making by identifying potential ground engineering and contamination issues.

GRM Standard Limitations of Reporting are provided in Appendix A of this report.

The Client proposes to develop the site with up to 5 healthcare related buildings (up to 3 storeys) with associated infrastructure including an electrical substation and a multi-storey car park. The proposed end use includes areas of hardstanding and soft landscaping.

The outline development proposals provided by the Client are presented in Appendix B.

The Client has not informed GRM of any potential development hazards.

### **1.2 OBJECTIVES OF THE SITE APPRAISAL**

The principal aims of the Phase I Site Appraisal (desk study) are as follows:

- a) Obtain information, from easily accessible sources, about the soil and groundwater conditions within the area of the site.
- b) Determine the possible ground related geotechnical and contamination hazards within the site boundaries that may affect the proposed development.
- c) Provide preliminary development recommendations.
- d) Provide advice on further works required for the cost-effective reduction of risks to the development and procedures likely to satisfy regulators.

Whilst every effort has been made to pre-empt the likely requirements of the Local Authority and the Environment Agency, they are likely to have specific requirements that will need to be discussed and addressed at a later date.

## **2 PHASE I DESK STUDY AND SITE OBSERVATIONS**

### **2.1 INFORMATION SOURCES**

In addition to the general sources of information listed in Appendix A (i) the Client has supplied the following information that has been used in the assessment of the site:

- the location of the site
- past site usage
- utilities plans
- proposed development layout

### **2.2 SITE DESCRIPTION**

#### **2.2.1 Geographical Setting**

Aintree Hospital is located approximately 7.3km north east of Liverpool city centre. The National Grid Reference (NGR) for the approximate centre of the development site is SJ379970. A Site Location and Boundary Plan is presented in Appendix C.

The development site is located within the hospital grounds and primarily used for car parking. The northern, eastern and southern boundaries are formed by various existing hospital buildings and car parks comprising hardstanding and limited soft landscaping. The western boundary is formed by treelines separating residential housing and gardens along the western border of the development site. The site comprises an approximately rectangular parcel of land, the topography of the site is flat.

#### **2.2.2 Site Inspection Observations**

The Site Features Plan/General Site Photographs presented in Appendix D illustrate the salient observations made during a site inspection on 25<sup>th</sup> November 2024.

The development area covers an area of approximately 2.4 hectares and can be divided into three distinct sections: western, central and eastern. The sector to the west is presently used as car parking. The ground surface of this area primarily consists of mixed hardstanding comprising concrete / tarmacadam / asphalt with areas of soft landscaping comprising grass verges scattered throughout the car park and various species of trees along the western border of the development area. Due to the expected presence of cohesive strata, an arboricultural specialist should be informed to carry out a tree survey to review the potential impact these may have on the underlying strata.

The central portion of the development area is fenced off with blue hoarding and has four gated access points. It is currently used as storage for various building materials including hospital ventilation units, various construction materials and a shipping

container, this is likely to be associated with construction activity close to the south of the development area. The ground surface of the central sector consists of primarily soft landscaping, comprising scrub grassland with numerous mature tree species observed along the northern and southern borders inside the blue panelling. Areas of hardstanding were also observed in the form of three roads running from north to south. The site does not presently reflect what is shown on current free to view aerial maps, the three large buildings shown in the centre of the development site, parallel to sixth, seventh and eighth avenue are no longer standing and have been demolished. From observing the ground surface, the topsoil in the central area comprises various gravels of building debris at surface level which may include asbestos containing materials (ACM) as a result of demolition. No ACMs were observed during the walkover.

The eastern section of the development site is primarily used for miscellaneous industrial use associated with workshops in the south east and minimal parking. The ground surface is predominantly of hardstanding areas, comprising roads and pavements, made of tarmac/adam/asphalt and concrete. In the north eastern area, soft landscaping features were observed, comprising well-maintained grass.

Inspection covers, drains and water hydrants have been observed in various locations across the development site.

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| <b>Significant Features identified during site inspection:</b> |
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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Trees</b> – deepened foundations in association with cohesive strata. Tree survey recommended.</p> <p><b>Made ground</b> – potential source of contamination, including ACMs and ground gas.</p> <p><b>Hardstanding</b> – potential investigation constraint.</p> <p><b>Buried utilities</b> – caution required during intrusive works.</p> <p><b>Nearby active site</b> – workers from neighbouring site require access throughout the day.</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 2.3 HISTORICAL DEVELOPMENT OF THE SITE

A review of the available historical Ordnance Survey (OS) maps gives an insight into the development of the site and can highlight potential hazards. Extracts of the maps reviewed are provided in Appendix E.

The proposed development also includes an area immediately adjacent to the eastern boundary of the historical map search area. This area is proposed to be a multi storey car park.

The summary below identifies the significant features identified on the historical mapping data considered likely to have the potential to affect the site.

| Date from and to | Significant On-site Features                         | Significant Off-site Features                              |
|------------------|------------------------------------------------------|------------------------------------------------------------|
| Pre 1893         | The development site is shown to be part of a field. | A well has been identified approximately 50m north east of |

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|             |                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             |                                                                                                                                                                                                                                                                                                               | the development site, and is no longer recorded after the 1893 map.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 1893 - 1906 | Three hospital buildings are shown, now labelled as 'City Hospital (Fever Wards)'. A fourth building is shown; however, it is not representative of the current layout of the development site. The existing road layout is shown to have developed. Treelines are shown to border the western site boundary. | The existing hospital buildings are largely shown now labelled as 'City Hospital (Fever Wards)' on the northern and eastern borders of the development area. The road network similar to the existing layout is shown to have developed. The southern and eastern borders remain undeveloped.                                                                                                                                                                                                                              |
| 1906 - 1925 | The development site remains relatively unchanged with the exception of two smaller buildings appearing on the western portion of the site. The complex is now labelled as 'Fazakerley Isolation Hospital'. Treelines are shown along the southern border of the development site.                            | Hospital buildings and associated roads are now shown to have been developed south of the site labelled as part of the Fazakerley Sanatorium and the buildings to the east of the development site are shown to have developed further, with a chimney and labelled as 'Laundry', though the exact building is unclear, and no longer labelled as a laundry by the map for 1967. This is shown to be off site on the historical OS map search area, but is located beneath the proposed multi storey car park development. |
| 1925 - 1938 | An additional building is shown in the south western portion of the development site. The complex is now labelled 'Fazakerley Hospital' The rest of the development site remains unchanged.                                                                                                                   | A large building is shown south west of the development site.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 1938 - 1956 | The last building to be developed is no longer shown and presumed demolished.                                                                                                                                                                                                                                 | No significant changes identified.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 1956 - 1987 | The building in the west of the development site is shown to have either been demolished and rebuilt, or extended to a size similar to the other three larger buildings on the development site. Two new buildings are shown in the southern west corner of the development site. Trees located               | No significant changes identified.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

|             |                                                                                                                                                                                        |                                                                                                        |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
|             | on the southern border of the site are no longer shown. Large scale mapping labels the complex as 'Fazakerley Hospital (Infectious Diseases)'.                                         |                                                                                                        |
| 1987 - 1994 | Tennis courts are shown in the west of the development site. One of the two new buildings in the south west corner of the development site is no longer shown and presumed demolished. | No significant changes identified.                                                                     |
| 2003 - 2010 | The tennis courts are no longer shown and presumed to have been removed for use of car parking. The hospital complex is labelled as 'University Hospital Aintree'.                     | A large building immediately north of the development site is no longer shown and presumed demolished. |
| 2010 - 2024 | The building at the west is no longer shown and presumed demolished leaving only the three original hospital buildings remaining.                                                      | A small building immediately north of the site is no longer shown and presumed demolished.             |

**Significant Features identified on OS Maps:**

**Potential asbestos contamination** – associated with the made ground, demolition of buildings and age of buildings.

**Trees** – deepened foundations in association with cohesive strata.

**Former buildings** – buried foundations and substructures.

**Existing buildings** – Area immediately east of map search area, potential source of ACMs and development constraint. Asbestos survey required before demolition.

**Offsite well** – potential receptor for site derived contamination, however due to distance from site, considered to be a negligible risk.

**Offsite laundry** - potential source of soil and groundwater contamination.

## 2.4 ANTICIPATED GEOLOGY

The BGS Geological Sheet for this area shows the site to be underlain by:

- Superficial deposits of Shirdley Hill Sand Formation comprising moderately to well-sorted, fine-grained sand with peat layers at lower depths. The formation is divisible into an upper 'white' sand and a lower 'brown' sand that is olive grey and brown respectively.
- Solid geology of the Wilmslow Sandstone Formation comprising red-brown to brick-red, fine to medium-grained sandstones that are generally free of pebbles and feature cross-bedding, with occasional siltstone layers.

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The BGS holds borehole records close to the site (approximately 200m to the north) copies of which are presented in Appendix F. The BGS boreholes suggest superficial deposits to at least 25m begl depth with the base not proven. The strata are described as firm to very stiff brown sandy clay with pebbles (boulder clay/glacial till).

Archive information about previous work in the area by GRM confirms the presence of the Shirdley Hill Sand Formation to depths of between 0.40m to 3.50m begl. Historic ground investigation also confirms the presence of cohesive Glacial Deposits underlying the Shirdley Hill Sand Formation to depths up to 4.0m, the base of the Glacial Deposits was not confirmed. The strata is described as:

- Soft to stiff, brown, variably sandy, variably gravelly CLAY with gravel of sandstone, mudstone and quartzite.
- Loose to medium dense, light brown, slightly clayey, variably gravelly SAND with gravel of sandstone, quartzite and mudstone.

Made ground can be expected due to the presence and then demolition of former buildings. Buried sub-structures may also be present. GRM archive information suggests the made ground within the soft landscaping areas is likely to comprise 0.40m of re-laid topsoil.

Due to the expected presence of bedrock at depths exceeding 25m begl, underlying a significant thickness of superficial deposits, the risks to human health associated with naturally elevated levels of arsenic and sulphates within the Wilmslow Sandstone Formation are considered to be **negligible**.

The local solid strata are reported to dip at 4° to the east. The site is not indicated to be directly affected by faulting; the nearest indicated fault being >1km to the east.

| Significant Features identified from geological data: |
|-------------------------------------------------------|
|-------------------------------------------------------|

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|--------------------------------------------------------------------------|
| <b>Cohesive strata</b> – deepened foundations in association with trees. |
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| <b>Made ground</b> – deepened foundations. Potential source of contamination |
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|--------------------------------------------------------------|
| <b>Variable strata</b> – deepened foundations/reinforcement. |
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| <b>Soft/loose strata</b> (Shirdley Hill Sand) – Geotechnical and excavation risk. No peat recorded in previous GI information. |
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|---------------------------------------------------|
| <b>Buried sub-structures</b> – excavation hazard. |
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|------------------------------------------------------------------------------------------------------|
| <b>Elevated sulphate</b> – risk to buried concrete / considered negligible risk due to likely depth. |
|------------------------------------------------------------------------------------------------------|

|                                                                                                             |
|-------------------------------------------------------------------------------------------------------------|
| <b>Elevated arsenic</b> – risk to end users / considered negligible risk due to likely depth of occurrence. |
|-------------------------------------------------------------------------------------------------------------|

## 2.5 HYDROGEOLOGICAL INFORMATION

The BGS borehole records report water strikes between 5.0m and 8.5m below ground level in the Glacial Till; however, the groundwater level is likely to be subject to seasonal variations.

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Previous GRM investigations in the area include shallow groundwater recorded between 0.90m and 4.0m begl. This is anticipated to be perched volumes contained within granular horizons in the largely cohesive Glacial Deposits.

The Environment Agency has classified the underlying superficial strata (Shirdley Hill Sand Formation) as a Secondary A Aquifer and the underlying Solid strata (Wilmslow Sandstone Formation) as a Principal Aquifer. Any Glacial Till present is likely to be classified as a Secondary (undifferentiated) aquifer.

There are no recorded active groundwater abstraction licenses within 500m of the site. The site is recorded to be within a Zone 3 Total Catchment Groundwater Source Protection Zone relating to the Principal Aquifer (Wilmslow Sandstone Formation). However, due to the anticipated thickness of the underlying cohesive superficial deposits and the urbanisation of the surrounding area the impact of the development on the source protection zone is considered negligible.

The groundwater previously encountered by the BGS boreholes and local GRM investigation are likely to be indicative of perched volumes in the Glacial Till. Due to the largely cohesive nature of the Glacial Till, hydraulic continuity is not expected between the perched volumes and the deeper regional groundwater table anticipated to be present in the Wilmslow Sandstone Formation at depth.

|                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Significant Features identified from hydrogeological data:</b>                                                                                                          |
| <b>Secondary A Aquifer</b> (Shirdley Hill Sandstone Formation) – potential receptor for any site derived contamination. <b>Moderate risk.</b>                              |
| <b>Secondary (undifferentiated) Aquifer</b> (Glacial Till) – potential receptor for any site derived contamination. <b>Very low risk.</b>                                  |
| <b>Principal Aquifer</b> (Wilmslow Sandstone Formation) and associated abstraction borehole – potential receptor for any site derived contamination. <b>Very low risk.</b> |

## 2.6 HYDROLOGICAL INFORMATION

The only identified local surface water feature comprises; Fazakerley Brook situated 221m to the south (flowing to the south); however, given the distance the brook is not considered a viable receptor for any site derived contamination, should any be present.

There are no nearby surface water or potable water abstraction licenses recorded.

Nearby recorded pollution incidents to controlled waters include:

- 276m to the south west - assessed as category 3 and 4 indicating minor or no impact.
- 337m to the west – assessed as category 3 and 4 indicating minor or no impact.

Accordingly, none of the above pollution incidents are considered likely to have impacted the site.



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| <b>Significant Features identified from hydrological data:</b> |
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| None. |
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## 2.7 FLOOD RISK

The BGS suggests the site is underlain by the Shirdley Hill Sand Formation and is within an area of potential groundwater flooding related to Clearwater Flooding (unconfined aquifer) and that the confidence level is low. A Phase II ground investigation would provide information on the local groundwater regime so that the risk can be assessed by the projects infrastructure engineer. Any risk associated with the groundwater regime should be catered for within the development infrastructure design.

Although the site is within 250m of an indicative fluvial floodplain, the Environment Agency's Internet based flood risk maps suggest there is no risk from river flooding.

The highest risk on site from the Risk of Flooding from Rivers and the Sea (RoFRaS) rating is very low.

A Flood Risk Assessment (FRA) is required for this site as it is over 1ha in size.

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| <b>Significant Flood Risk Features identified:</b> |
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| <b>Site in excess of 1ha – FRA required.</b> |
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| <b>Potential Groundwater Flooding – ground investigation required.</b> |
|------------------------------------------------------------------------|

## 2.8 MINING

### 2.8.1 Coal

The site is not within an area recorded to require a Mining Remediation Authority, formally the Coal Authority, mining report. There are no shallow coal bearing strata illustrated on the geological mapping data; therefore, the risk from shallow coal mining is considered to be negligible.

### 2.8.2 Brine

The site is not within the area defined by the Brine Compensation Board and no soluble strata are recorded at shallow depth beneath the site.

### 2.8.3 Oil And Gas

GRM have conducted an on-line search, which has shown that the Oil and Gas Authority does not record the site to be within an on-shore licence area. Additionally, the site is not recorded to be within either an On-shore Hydrocarbon Field or a Shale Prospecting Area.

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|----------------------------------|
| <b>Significant Mining Risks:</b> |
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| <b>No risk identified.</b> |
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## 2.9 QUARRYING

There is no evidence of any non-coal mineral extraction having taken place within, or close to, the site area.

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| <b>Significant Quarrying Risks:</b> |
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| <b>None identified.</b> |
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## 2.10 MINERAL RESOURCE PROTECTION

The BGS Aggregate Safeguarding Map for Merseyside has been used to provide an initial assessment of the known reserves of aggregates in the area of the site.

The site is indicated to be in a known reserve area for the Shirdley Hill Sand, with this deposit being a historically important reserve of silica sand used in the glass making industry of the region. However; the Safeguarding map does detail that the deposit is no longer of economic importance due to the thin occurrence of the deposit and large area required to make extraction economically viable; therefore, other more easily winnable deposits are now used instead.

Furthermore, this area is part of a working hospital so the proposed development will not sterilise any additional land. Any extraction of material would be considered impractical and socially unacceptable.

Overall it is considered unlikely that the site is underlain by significant and easily exploitable reserves of sand and so a detailed Mineral Risk Assessment is unlikely to be required.

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| <b>Mineral Risk Assessment:</b> |
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| <b>None identified.</b> |
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## 2.11 ENVIRONMENTAL INFORMATION

An Environmental Report has been acquired for a larger site area, inclusive of the desk study site. The full report is presented in Appendix G. A summary of the relevant information is presented below:

- There are no recorded landfill or waste sites within influencing distance.
- Various environmental permits are recorded relating to keeping, using and disposal of radioactive materials. These are likely related to the hospital activities and therefore subject to rigorous regulation. These activities therefore pose a negligible risk to the development.

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- A historical laundry is recorded adjacent to map search area up to 1967, this is assumed to have served the hospital. The laundry represents a potential source of solvents and volatile organic compounds (VOCs). This is located beneath the proposed multi storey car park, immediately east of the map search area.
- Railway station approximately 250m to the north, however due to the distance, this poses a negligible risk to the site.

|                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Significant Features identified from Environmental data:</b>                                                                                                                                                                                                                                                                                          |
| <b>Historic laundry</b> – potential source of soil and groundwater contamination / potential source of ground gas. The laundry is last shown on the historical OS mapping from 1967, and the nature of solvent or VOC contamination is readily mobile, accordingly the risk of encountering remnant contamination from it, is considered to be very low. |

## 2.12 ARCHAEOLOGY

Archaeological information has not been sought as part of this desk study and has not been identified as an issue by the Client. Some Local Authorities require at least an initial archaeological appraisal for development sites. GRM can undertake such appraisals if required. Archaeological investigations occasionally reveal ground-related problems from ancient times (prior to the 1<sup>st</sup> Edition OS maps) and can occasionally cause foundation and contamination development hazards.

|                                |
|--------------------------------|
| <b>Archaeological Hazards:</b> |
| <b>Not assessed.</b>           |

## 2.13 INVASIVE PLANT SPECIES/ECOLOGY

GRM is not a specialist in this topic and has not conducted such a survey; however, we will endeavour to report easily recognisable issues such as Japanese Knotweed, Giant Hogweed, badger sets etc, when seen on site. No such issues were observed during the walkover; however, an ecological specialist should be consulted.

|                                                   |
|---------------------------------------------------|
| <b>Invasive Plant Species/Ecological Hazards:</b> |
| <b>None.</b>                                      |

## 2.14 RADON ASSESSMENT

The site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings' (BR211 2015 revised 2023). The site is not within an area recorded to require radon protection measures.

|                      |
|----------------------|
| <b>Radon Hazard:</b> |
| <b>None.</b>         |

## 2.15 UNEXPLODED ORDNANCE (UXO)

A preliminary and detailed UXO Risk Assessment provided by 1<sup>st</sup> Line Defence is presented in Appendix H.

The preliminary UXO assessment states that during WWII the site was located in the County Borough of Liverpool, which recorded 2,499no. incidents consisting of primarily high explosive bombs, as well as, parachute mines and oil bombs, averaging 91.5 items of ordnance recorded per 1000 acres. Anecdotal evidence referencing Fazakerley Hospital comprises a land mine falling within the grounds of the hospital and states that bombing resulted in “devastation” and the interiors of buildings “completely gutted” by blasts. Using the information provided in the preliminary assessment, the risk associated from unexploded ordnance on site is considered **moderate**.

Further research from the detailed UXO assessment concludes that the risk associated with allied unexploded ordnance is considered **negligible**. The risk of encountering German and anti-aircraft unexploded ordnance on site is considered to be **low**, accordingly, precautions are recommended when undertaking intrusive groundworks such as site investigations and it is recommended to complete a UXO Risk Management Plan and ensure all site workers are aware of the risk before intrusive works commence.

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|---------------------------------------------------------------------------------|
| <b>UXO Hazard:</b>                                                              |
| <b>Low Risk</b> – UXO Risk mitigation measures required during intrusive works. |

## 2.16 SUMMARY OF POTENTIAL GEOTECHNICAL/GENERAL HAZARDS

Potential geotechnical/general hazards have been identified in earlier sections and are summarised below.

| Potential Hazard                                            | Potential Consequence                  | Action                                                |
|-------------------------------------------------------------|----------------------------------------|-------------------------------------------------------|
| Existing buildings (area of proposed MSCP)                  | Danger to personnel                    | Demolition required – Health & Safety guidelines      |
| Live services (buried utilities)                            | Danger to personnel                    | Inform relevant parties for disconnection / diversion |
| Previous buildings                                          | Deepened foundations/buried structures | Ground investigation                                  |
| Made ground associated with existing and former development | Deepened foundations                   | Ground investigation                                  |
| Soft/loose strata                                           | Deepened foundations                   | Ground investigation                                  |
| Variable strata                                             | Deepened foundations                   | Ground investigation                                  |

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|                                       |                                                   |                                                       |
|---------------------------------------|---------------------------------------------------|-------------------------------------------------------|
| Shrinkable clay/trees                 | Deepened foundations                              | Ground investigation plasticity testing/tree survey   |
| UXO                                   | Danger to personnel/structures                    | UXO risk mitigation measures.                         |
| Site Area >1ha / Groundwater Flooding | Danger to structures                              | Flood Risk Assessment required. Ground Investigation. |
| Areas of Hardstanding                 | Deepened foundations and investigation constraint | Ground investigation                                  |
| Nearby active sites                   | Access issues                                     | Liaison on site.                                      |

Potential sources, pathways and receptors are summarised in the Phase I Conceptual Model in Section 3, which is based on current relevant guidance, the principles of which are set out in Appendix A (iii).

## 2.17 CONTAMINANTS OF CONCERN

In addition to the general contaminants listed in Appendix A (ii), the following site specific contaminants have been identified:

- Solvents and VOCs associated with former laundry.
- Asbestos associated with existing and historic buildings.

### 3 PHASE I CONCEPTUAL SITE MODEL

| HUMAN HEALTH                                                                      |                                                                                                                         |                                                      |                |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|----------------|
| Source                                                                            | Pathway                                                                                                                 | Receptor                                             | Level of Risk  |
| Potentially contaminated made ground / fill associated with previous development. | Indoor and outdoor inhalation of soil dust, the ingestion of, and dermal contact with, contaminated soil and soil dust. | End users.                                           | Low to Medium. |
|                                                                                   |                                                                                                                         | Construction and Maintenance Workers.                |                |
| Made ground / fill.                                                               | Inhalation of ground gas.                                                                                               | End users.                                           | Low.           |
| Asbestos containing materials associated with buildings.                          | Inhalation of asbestos fibres.                                                                                          | Construction and Maintenance Workers, and end users. | Low.           |
| Made ground.                                                                      | Water pipes.                                                                                                            | End users.                                           | Low.           |

| CONTROLLED WATERS        |                                                                                                                       |                                                               |           |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|-----------|
| Made ground / fill.      | Leaching of contaminants and vertical migration to the groundwater (risk reduced due to intervening cohesive strata). | Principal and Secondary A Aquifers, and abstraction borehole. | Very Low. |
| Former off-site laundry. | Leaching of contaminants and vertical migration to the groundwater (risk reduced due to intervening cohesive strata). | Principal and Secondary A Aquifers.                           | Very Low. |

## 4 CONTAMINATION / REMEDIATION RECOMMENDATIONS

The risk from ground contamination is considered to be low to medium.

The risk from ground gas is considered to be low.

Prior to development a ground investigation will be required, the scope of which is outlined in Section 6. As the development proposals comprise a multi-storey car park and new hospital buildings, the risk to end users is considered to be low to medium and significant remedial measures are not anticipated to be required. At this stage, based on the desk study information available, it is considered that allowance be made for the following:

- Due to the likely occurrence and unknown thickness of made ground, an allowance should be made for gas protection measures, although this is considered to be a low risk.
- Upgraded water pipes are considered unlikely to be required.
- Potential soil capping in soft landscaped areas, and asbestos hotspot removal.

## 5 PRELIMINARY GEOTECHNICAL ASSESSMENT

It should be noted that the following comments and recommendations are based on the findings of this desk study which may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). Prior to development a ground investigation will be required to confirm the initial recommendations outlined below, the scope of which is outlined in Section 6. However, at this stage based on the desk based information available it is considered:

- The ground conditions are likely to comprise made ground overlying a thin layer of Shirdley Hill Sand with Glacial Till beneath. Rock is not expected to be present at shallow depth.
- Providing deep made ground and/or soft or loose materials are not present the site may be suitable for the use of traditional trench or pad foundations (not applicable for the multi-storey car park).
- Due to the suspected presence of cohesive soils and the presence of trees, allowance should be made for some deepening of foundations.
- Due to the likely disturbance from previous development and demolition, and the influence of trees, the use of suspended floor slabs with provision of has protection measures and locally heave precautions are recommended. The use of ground bearing floor slabs is potentially possible, but will likely require ground engineering measures to facilitate this.

- Overly aggressive ground conditions in the Shirdley Hill Sand and Glacial Till are not expected and standard concrete should be suitable.
- Given the anticipated geology the adoption of a soakaway drainage system is considered possible in areas overlying Shirdley Hill Sand. However, this is dependent on the existing groundwater conditions, therefore, testing is required to assess the thickness and extent.
- Given the anticipated geology CBR values of between 2% and 4% are considered likely in the cohesive Glacial Till and circa 5% in the natural granular strata when suitably drained. Made Gound soils are likely to be <2%. These values are expected to decrease in inclement weather.
- The site is at low risk from UXO. As a result, the provision of toolbox talks for site investigation and groundworks staff and a UXO Risk Mitigation Plan is recommended.

## 6 FURTHER INVESTIGATION

A Phase II ground investigation is recommended to determine more accurately the effect of the identified hazards on the development. Initially, this should include:

### Works That GRM Can Complete

- A ground investigation designed to BS10175:2011 and BS5930:2015 comprising window sampling, trial pitting and deeper cable percussion/rotary boreholes will be required to confirm ground conditions and collect samples for analysis.
- Chemical analysis of soils followed by risk assessment so that the risk to human health and controlled waters can be determined.
- Based on the Phase I Conceptual Model (Section 3) the ground gas risk has been assessed as low. A ground gas investigation designed to current guidance will be required to determine the ground gas regime beneath the site and allow any necessary mitigation measures to be recommended. At this stage allowance for 6 visits over 3 months should be made to assess potential liabilities.
- Geotechnical soils testing of the founding strata to assess its character and suitable grades of buried concrete.

### Works That A Specialist Will Need To Complete

- Flood Risk Assessment
- Arboricultural Report

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Following your review of this document, a copy of it should be submitted to the Planning Department of the Local Authority for comment and approval prior to any ground investigation works being undertaken, as this is often a condition of planning.

## **7 CONCLUSIONS**

This Phase I Site Appraisal has shown the site is suitable for the proposed development, assuming compliance with all the recommendations contained within this report.



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## **GENERAL APPRAISAL COMMENTS**

### **i INFORMATION SOURCES**

Where available the following sources have been used for the identification and assessment of potential ground hazards:

- Relevant British Standards
- British Geological Survey (BGS) Geology Map Scale 1:10,000 for local area
- British Geological Survey (BGS) Geology Map Scale 1:50,000/1:63,320
- BGS Memoir
- BGS Borehole Records: <https://mapapps2.bgs.ac.uk/geoindex/home.html>
- BGS online viewer: <https://geologyviewer.bgs.ac.uk>
- Magic Groundwater Vulnerability Maps
- Historical Ordnance Survey (OS) Maps
- Environmental Data Report
- Environment Agency Website: <http://www.environment-agency.gov.uk/>
- Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UKWIR, 2010.
- Coal Authority Records / Coal Mining Report
- DEFRA/Environment Agency Contaminated Land publications and DoE Industry Profiles
- BRE Guide BR211 (2023), 'Radon: Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment projects)'
- UK HSA Radon Maps: <https://www.ukradon.org/information/ukmaps>
- CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'
- BS8485:2015 +A1: 2019, 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'
- Other technical references used throughout this document are detailed in the text.

### **ii CONTAMINANTS OF CONCERN**

The DoE Industry Profiles are normally used to assess likely contaminants from past land use and potential nearby industrial sources. For land uses where no profile is available, likely contaminants of concern are selected by GRM based on past experience of similar sites, a general screening suite of contaminants covered by CLEA and common contaminants from the Industry Profiles.

- |            |                   |                                          |
|------------|-------------------|------------------------------------------|
| · Arsenic  | · Copper          | · Water soluble sulphate                 |
| · Cadmium  | · Nickel          | · PAH (polycyclic aromatic hydrocarbons) |
| · Chromium | · Zinc            |                                          |
| · Lead     | · Phenols         |                                          |
| · Mercury  | · cyanide (total) |                                          |
| · Selenium | · pH              |                                          |

Asbestos and PCBs are listed in the vast majority of profiles. PCBs are listed as the profiles expect electricity substations and switch boxes on all industrial sites. There is the potential for asbestos containing material to be mixed up with made ground, following any demolition works.

### iii CONCEPTUAL MODEL METHODOLOGY

The consideration of contamination is based upon the principles of risk assessment, using the 'source-pathway-receptor' model in order to establish the presence, or potential presence, of a pollutant linkage.

To create a risk, contamination must have the potential to cause harm to susceptible targets or receptors such as humans, the water environment or the built environment. The potential for harm to occur requires three conditions to be satisfied to form a pollutant linkage:

- The presence of substances that may cause harm (SOURCE).
- The presence of a target which may be harmed (RECEPTOR).
- The existence of a plausible migration route between the source and the receptor (PATHWAY).

In the absence of a plausible pollutant linkage there is no risk. Where a potential linkage is identified in order for it not to pose a risk to the identified receptor it must be broken.

### iv INTRUSIVE INVESTIGATION SAMPLING METHODOLOGY

The ground investigation (including fieldwork, sampling, monitoring and laboratory analyses) has been designed to identify and assess potential ground related problems and to allow cost effective solutions to be advised. It has been planned on the basis of the desk study, site inspection and the proposed development layout (where available). All fieldwork and soil descriptions were carried out in general accordance with relevant British Standards.

The exploratory holes have been positioned and advanced to depths to determine the general ground/groundwater/gas conditions below the site. A general grid pattern has been adopted, where possible, to provide sufficient information based on the current proposed layout scheme. Some holes have been targeted at particular hazards identified in the Phase I assessment. The resultant exploratory hole density is considered to be commensurate with the complexity of the site conditions and detail of information required for this phase of the investigation.

### v GROUND GAS RISK ASSESSMENT METHODOLOGY

Gas monitoring programmes undertaken by GRM are designed to broadly comply with the recommendations outlined in CIRIA Report C665 'Assessing risks posed by hazardous ground gas to buildings' (2007) and BS8576 'Guidance on Investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs) (2013).

To assess the risks posed by ground gases such as radon, carbon dioxide and methane, the relevant current guidance has been used. For radon the site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings (including supplementary advice for extensions, conversions and refurbishment projects) (BR211: 2023)'. For methane and carbon dioxide the primary guidance document used to determine if protection measures are required is *BS8485:2015 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates ( $Q_{hg}$ ), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Flow Rate (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

Where flow is not recorded during the monitoring a default flow rate of 0.1l/hr will be used in the assessment to produce a positive result.

**vi HUMAN HEALTH RISK ASSESSMENT METHODOLOGY**

Guidance contained in the Environment Agency's CLEA Reports has been used to assess the risks posed to human health.

For residential developments that include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land with plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered including the consumption of home-grown vegetables.

For residential developments that do not include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land without plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered except the consumption of home-grown vegetables. For commercial/industrial developments the default Tier 1 Assessment Criteria (TAC) for 'commercial/industrial' are used, i.e. a female with a start age class of sixteen and an end age class of eighteen. All pathways are considered except the consumption of home-grown vegetables.

The TAC used by GRM include Category 4 Screening Levels (C4SLs) published by DEFRA, values calculated by GRM using the CLEA v1.071 risk assessment, and values and Suitable for Use Levels (S4UL) developed by LQM/CIEH. The TAC used in the assessment are selected based on the lowest site specific SOM values returned as part of the chemical analysis.

Where soil chemical analysis results are found to exceed the TAC, Site-Specific Risk Assessments may be undertaken using the CLEA v1.071 risk assessment software using the age classes and pathways described above.

**vii RISK TO SITE WORKERS – GENERAL COMMENTS**

The risks to site workers are similar to those posed to site end users, although likely to be less severe due to the site workers' shorter exposure to the identified contamination. However, site workers (particularly groundworkers) are more likely to come into direct contact with contaminated soils due to the nature of their work. On this basis ground and construction workers should be provided with basic Personal Protective Equipment based on the site's general health and safety risk assessment, but including as a minimum safety footwear, gloves and overalls.

A site specific risk assessment should be carried out for all hazards identified within the ground investigation in accordance with current health and safety legislation. This assessment should identify any measures required to further reduce risks i.e. providing further Personal Protective Equipment, welfare facilities and if necessary preventing access to certain areas.

Demolition and dismantling of existing structures on the site must be carried out to a safe and acceptable standard, in accordance with current UK guidance and best practice. Whilst not ground related, asbestos and hazardous substances surveys should be conducted prior to any demolition.

Any unusual colours, odours and suspicious ground should be reported immediately to site management and then GRM.

Whilst this appraisal has considered the long-term effects of contamination, GRM can also help during the formulation of Health and Safety documentation, if required.

**viii CONTROLLED WATERS RISK ASSESSMENT METHODOLOGY**

Where the desk study and fieldwork do not reveal a potential source of contamination no leachate or groundwater testing will be performed. Where a potential source is identified the testing will comprise leachate testing on the material considered most likely to pose a risk, groundwater testing will be undertaken if water is present at shallow depth.

The UK Drinking Water Standards (UKDWS) or Environmental Quality Standards (EQS) are usually adopted for comparison with the leachate/groundwater test results. When the most sensitive receptor is considered to be the aquifer (groundwater) UKDWS will be adopted as the Initial Tier 1 screening values.

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Where the most sensitive receptor is a surface water feature the EQS values will be used as Initial Tier I Screening values.

**ix CONSTRUCTION MATERIALS RISK ASSESSMENT METHODOLOGY**

The 'screening levels' adopted for the assessment of risk to construction materials are taken from the following documents:

- UK Water Industry Research (UKWIR) Contamination thresholds for sub-surface water pipes, for the protection of buried pipes.
- Building Research Establishment (BRE) Special Digest SD1 (2005), 'Concrete in Aggressive Ground', for the protection of buried concrete.

**x WASTE DISPOSAL, SITE WASTE MANAGEMENT PLANS AND MATERIAL MANAGEMENT PLANS**

Under current Waste Management Regulations, waste soil materials produced from the site will require characterisation to enable it to be disposed of correctly.

The chemical analysis results included in this report should be provided to the relevant landfill operators to establish the characterisation of the waste, confirm its suitability for landfill disposal and provide estimated costings. If material is classified as hazardous, then the site will need to be registered with the Environment Agency prior to the movement of the waste. Depending on the receiving landfill's current permit, further chemical analysis, incorporating Waste Acceptance Criteria (WAC) leachate analysis, may be required.

All materials removed from the site will be classified as 'waste' and therefore must be removed by a suitably licensed carrier of waste. This applies whether or not the waste is contaminated. All waste removed to landfill will attract Landfill Tax.

The developer/builder is likely to be classed as the waste producer and therefore, has a duty of care to ensure that all waste is disposed of appropriately. This includes ensuring the waste carrier is licensed and disposes of the waste to a suitably licensed landfill site. They are also required to keep a paper trail from 'cradle to grave' including copies of the waste disposal tickets.

Efficient materials management on site is recommended as it can lead to significant cost savings when compared to the traditional side casting or single stockpile of arisings. GRM can assist in the production of Material Management Plans under the CL:AIRE Definition of Waste: Code of Practice. The DoWCoP enables:

- The direct transfer and re-use of clean naturally occurring soil materials between sites, and
- The re-use of both contaminated and uncontaminated materials on their site of origin and between sites within defined Cluster projects.

GRM can also undertake the role of Qualified Person and submit the DoW CoP project Declaration.

Likewise making the site as volume neutral as possible will reduce the costs of development. Whilst not a statutory requirement, Site Waste Management Plans allow better waste management practices, help to reduce the amount of waste produced and identify best environmental disposal options. Implementing a Site Waste Management Plan (SWMP) can reduce costs (increasing business profits) and maximise resource efficiency.

**xi GEOTECHNICAL ASSESSMENT GENERAL COMMENTS**

Where finished floor levels of proposed structures have not been provided by the Client, then for the purposes of initial assessment, GRM will assume that finished levels will not vary appreciably from the existing ground levels. If the depths of any underground engineering works (i.e. sewers, pumping stations etc.) are unknown they will not be taken in to account in the assessment and it will be assumed that any such works will not compromise foundation or ground stability.

Should the development proposals or finished levels be different from these assumptions then the comments/recommendations in the Geotechnical Assessment may require revising.

It should be noted that the results of window sampling and/or cable percussive boreholes may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). GRM consider that that prior to development trial pitting should be undertaken to confirm the recommendations in the Geotechnical Assessment.

**xii GEOTECHNICAL ASSESSMENT – ENGINEERING GROUND TREATMENT**

Near surface soils have the potential to be disturbed by weathering and site traffic. Precautions should always be taken to avoid this, as excessive disturbance may leads to more onerous floor slab designs, road cap thickness and increased amounts of off-site disposal etc.

Near surface soils may need treatment or reinforcing to allow safe movement of construction plant and labour. An assessment by the contractor should be undertaken once the type of machinery/plant needed to complete the development is known.

**xiii GEOTECHNICAL ASSESSMENT – EXCAVATIONS**

Excavation instability (over-break) can result in damage to existing services or structures (e.g. foundations, roads or boundary walls/fences) both on and off-site, as well as increased foundation concrete costs. In order to minimise this, all excavations deeper than 1.2m deep (or any excavation within 1.5m of any existing structure or service) should be supported. Full support should be provided to the full depth of all near vertically sided excavations in made ground, soft and very soft clays and granular soils. A reduction to intermediate support should be acceptable within firm and stiffer natural clays.

Wherever possible, man entry into excavations should be prevented; however, where this is not possible, entry to, and time spent in, excavations should be kept to a minimum.

The build program should be tailored to reflect the impact that deep excavations through potentially unstable strata can have on adjacent properties, so that they are not undermined.

All excavations on site should be in accordance with HSE guidelines and stability should be practically maintained at all times. Reference should be made to HSE construction information sheet No. 8 (Revision 1) 'Safety in Excavations'.

Care should be taken to ensure that falls from excavation faces do not adversely affect the integrity of foundation concrete.

If contaminated water enters excavations it should be removed and transported to an appropriate treatment facility by a suitably licensed carrier before construction begins.

**xiv GEOTECHNICAL ASSESSMENT – SUBSTRUCTURES**

Where practicable, existing buried construction should be fully removed; however, if this is not practicable all new foundations should be carried down to fully penetrate it and it should be broken well away from all new structures.

There may be existing structures and/or infrastructure in close proximity to the proposed development. New build foundations may be constructed next to pavements with existing underground services beneath them, or excavations may be required near existing footings associated with adjacent properties. These potential hazards need to be taken into consideration when designing foundations and the groundworker needs to be made aware of their potential impact during the redevelopment works. Foundations close to existing underground services or buildings may require alternative foundation techniques (such as piling) to protect the integrity of these structures.

The contractor for the works should carry them out in such a fashion so as to not cause excessive overbreak, concrete usage or undermine existing buildings/roads/ services that are to be retained.

#### xv **GEOTECHNICAL ASSESSMENT – SOAKAWAYS**

Soakaway testing in trial pits by GRM is broadly carried out in accordance with BRE DG 365 (2016). The testing comprises the excavation of a test pit to a suitable depth, and the placement of water into the pit. The level of water present is then monitored over time. For borehole installations, the permeability testing (falling head/rising head) is undertaken in accordance with BS5930.

If it is decided to proceed with the use of soakaway drainage, then the following general points should be noted:

- Soakaways should not be placed so that water can be discharged through potentially contaminated made ground.
- The Environment Agency may require soakaways to be sealed systems such that only roof run off falls to soakaway.
- Interceptors are likely to be required for soakaways for highway drainage. The adopting authority for the highways should be consulted at the earliest opportunity regarding the use of soakaways for highways drainage.
- Consideration of site levels and slopes should be taken into account during the design.
- The construction of all soakaways should be in accordance with the current building regulations.
- Soakaways should not be placed within 5m of a proposed building.
- Placement of soakaways needs to be considered so as to avoid ponding of water down slope.
- The base of a soakaway should not be below the highest recorded water level.
- The Environment Agency prefer 1m of dry soil to be present between the base of a soakaway and the water table to provide attenuation for contamination.

#### xvi **GEOTECHNICAL ASSESSMENT – FOUNDATIONS**

If soft or hard spots are encountered during foundation excavation then they should be replaced with suitably compacted material or the footings deepened to suitable strata, to avoid differential settlement.

If strata of differing bearing character (e.g. sand and clay) are encountered at foundation levels within the excavations for a single plot then the excavation depths should be altered as appropriate to ensure the foundations rest on a single stratum, or strata that will not induce differential settlement. Where this is impractical then GRM should be contacted to assess a reinforced concrete detail or an alternative foundation solution (e.g. piles or vibro-replacement).



## NOTES ON LIMITATIONS

### General

GRM Development Solutions Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement had been executed, or with whom an assignment had been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from GRM Development Solutions Limited; a charge may be levied against such approval.

GRM Development Solutions Limited accepts no responsibility or liability for:

- a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and
- b) the consequences of this document being used by any third party with whom an agreement has not been executed.

### Phase I Environmental Audits/ Desk Studies

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, GRM Development Solutions Limited reserves the right to review such information and as considered necessary and appropriate to modify the opinions accordingly. It should be noted that any risks identified in a Phase 1 report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

### Phase II Environmental Audits (Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated with potential human targets, building materials, and controlled waters.

The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to the areas unoccupied by the building(s) on the site and by buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as provisional only and must, in any event, be confirmed by a commercial adviser.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. Whilst exploratory testing is intended to gain an accurate representation of the site, the very nature of sampling and testing is such that it cannot ensure that all localised conditions are detected.

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

### Phase II Geo-environmental Investigations (Combined Geotechnical and Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions to provide a reasonable assessment of the environment risks together with engineering and development implications. If costs have been included in relation to site development a commercial adviser must confirm these.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site for each of the exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time the site work was conducted. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather related effects. The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.



The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.



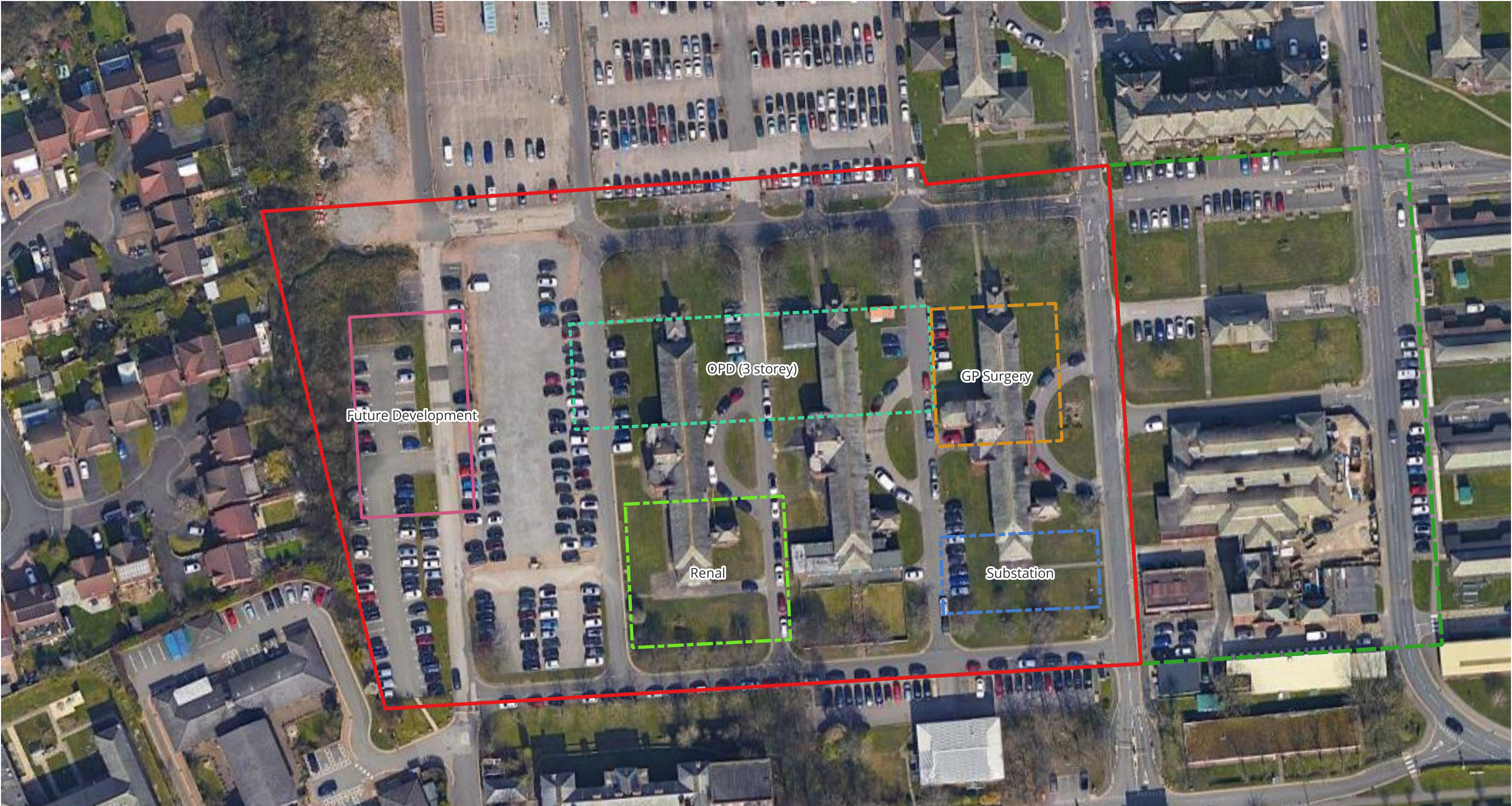
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Site Boundary - hoarding and car park  
Possible MSCP



NOTES:

CLIENT: A J P / VINCI CONSTRUCTION

PROJECT: AINTREE HOSPITAL

TITLE: Proposed Development Footprint Drawing

PROJECT No: P10738

DATE: JAN 2025

DESIGN/DRAWN: RJH

DRAWING NUMBER: 002

ISSUE: FINAL

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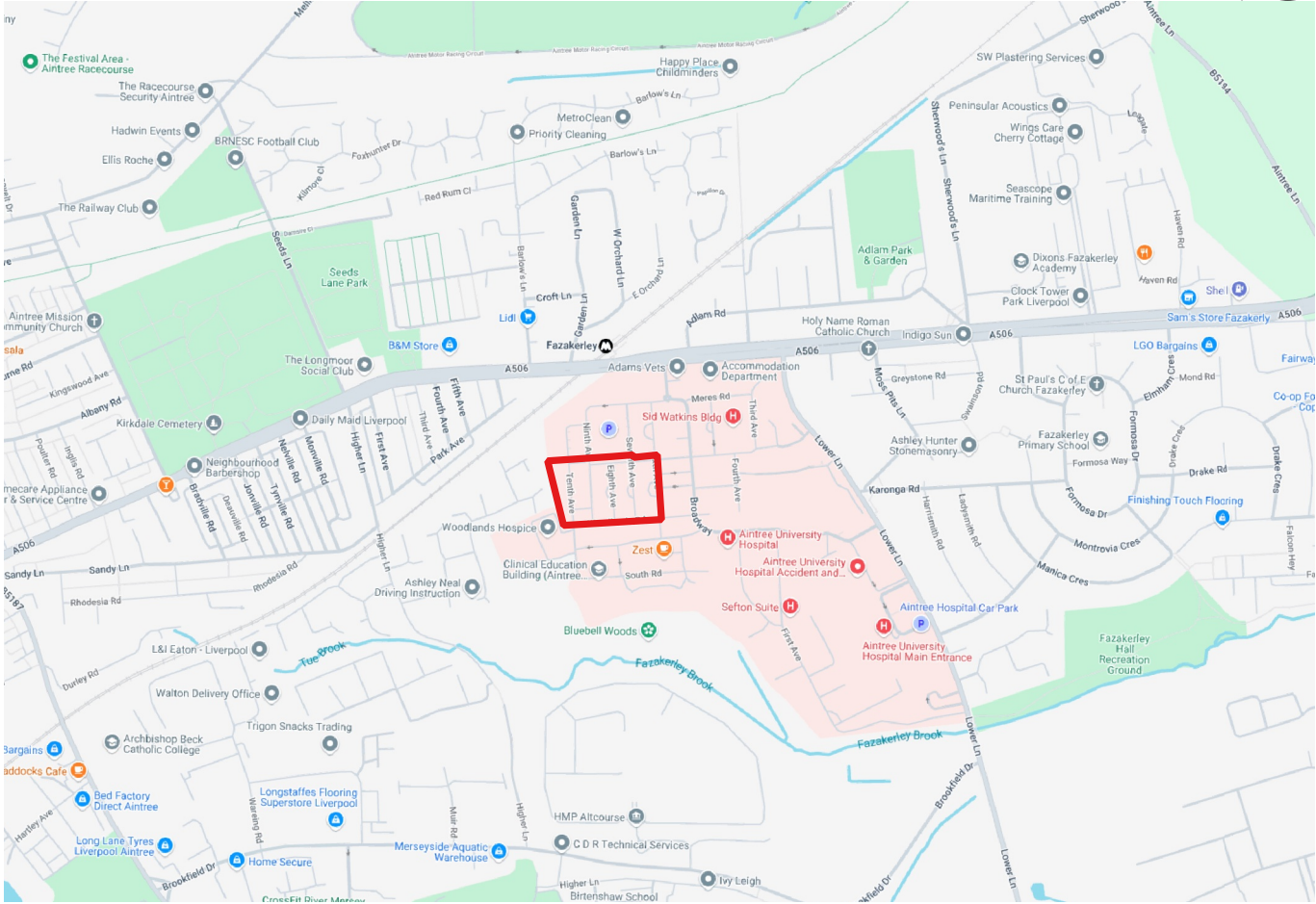
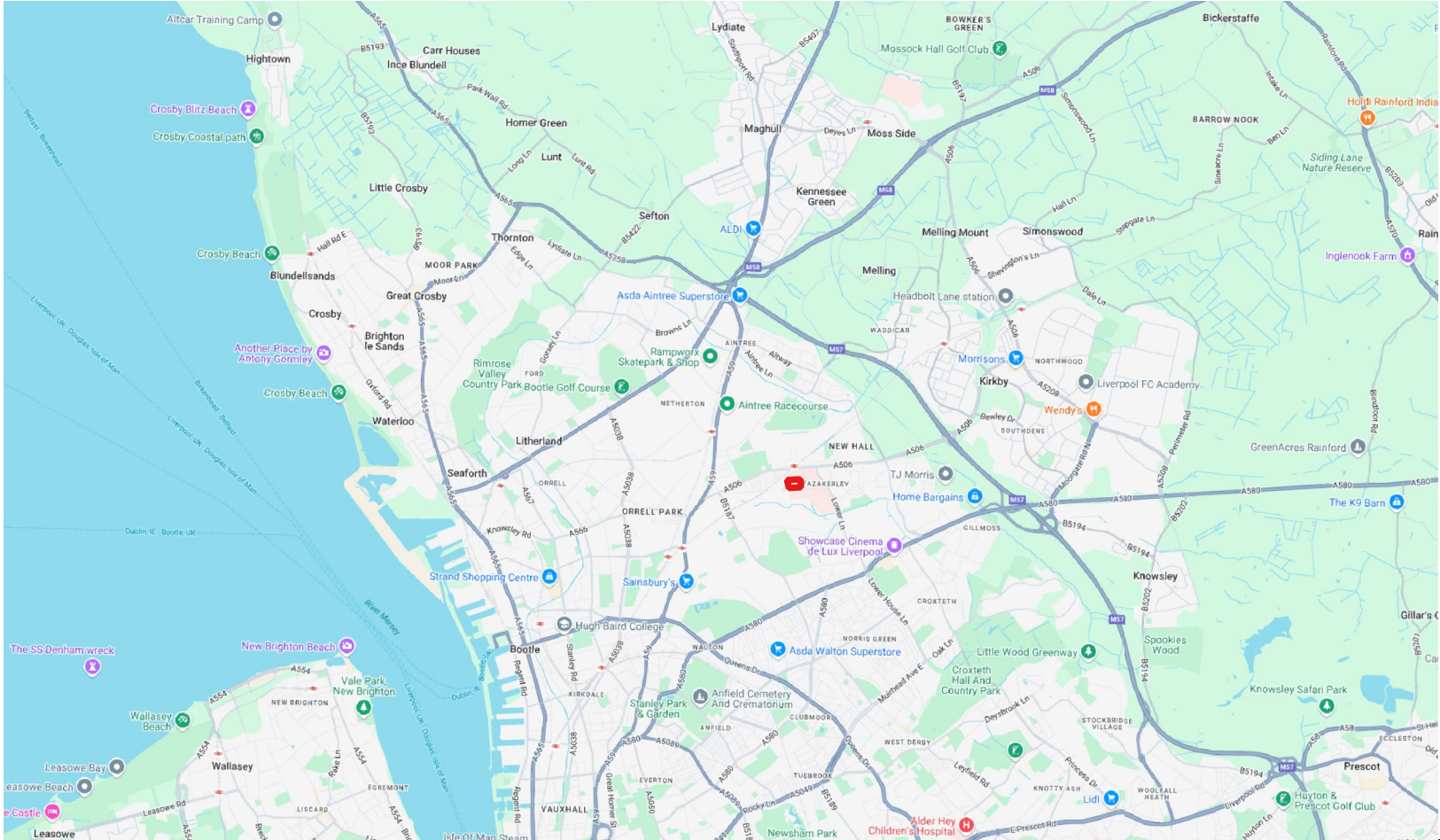
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KEY

Site Boundary



NOTES:

CLIENT:

A J P / VINCI CONSTRUCTION

PROJECT:

AINTREE HOSPITAL

TITLE:

Site Location Plan

PROJECT No:

P10738

DATE:

JAN 2025

DESIGN/DRAWN:

AW

DRAWING NUMBER:

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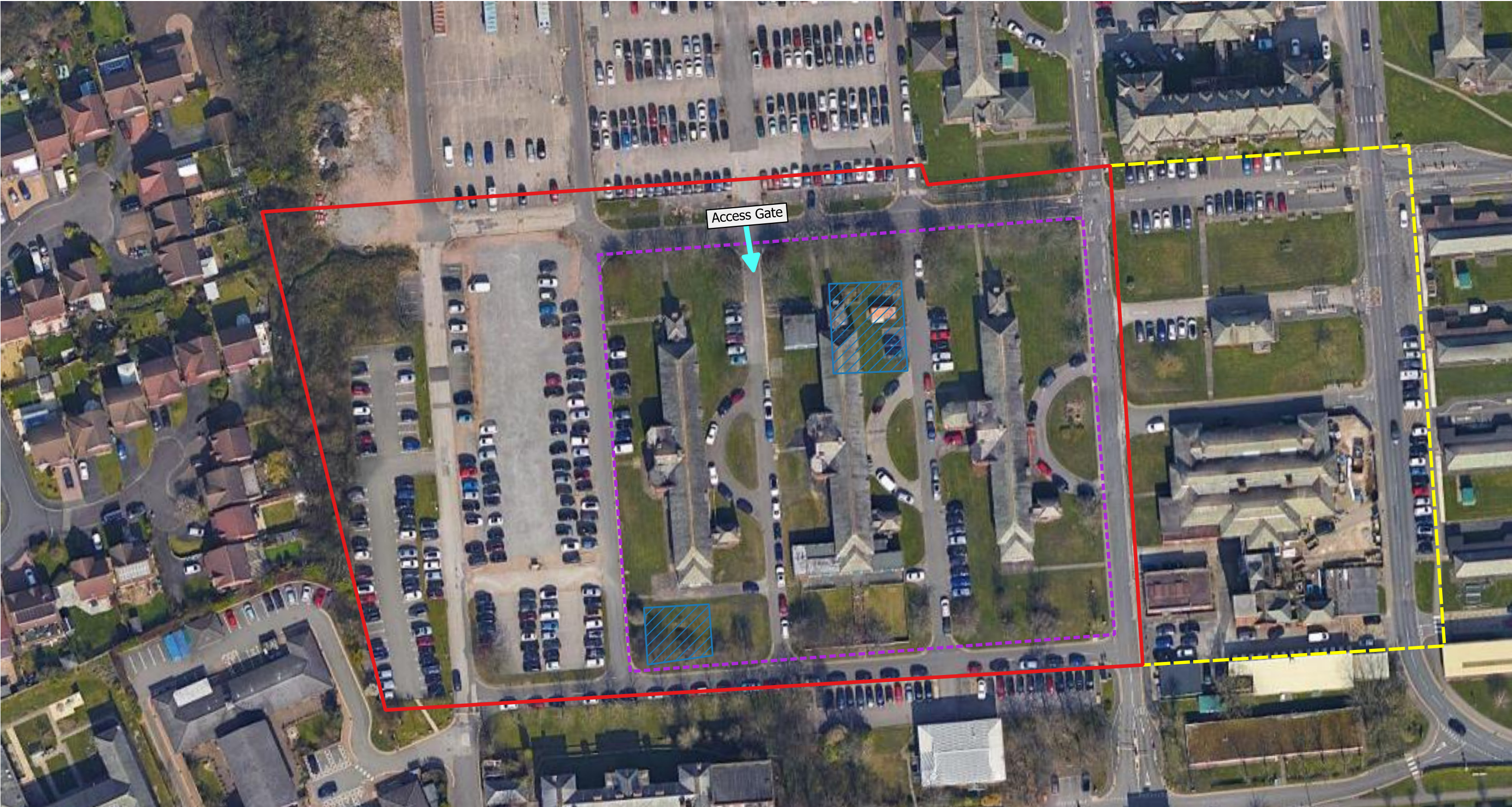
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KEY

- Site Boundary
- Hospital equipment
- Fencing



NOTES:

Buildings within the fenced area have all been demolished, all that remains are the roads, grass, trees, small gravel stockpiles and abandoned hospital equipment.

|          |                    |
|----------|--------------------|
| CLIENT:  | VINCI Construction |
| PROJECT: | Aintree Hospital   |
| TITLE:   | Site Features Plan |

|                                                                 |        |        |          |               |    |
|-----------------------------------------------------------------|--------|--------|----------|---------------|----|
| PROJECT No:                                                     | P10738 | DATE:  | JAN 2025 | DESIGN/DRAWN: | AW |
| DRAWING NUMBER:                                                 |        | ISSUE: |          |               |    |
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NOTES:

DO NOT SCALE

Approximate Site Boundary



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Tel: 01283 551 249  
[info@grm-uk.com](mailto:info@grm-uk.com) [www.grm-uk.com](http://www.grm-uk.com)

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PROJECT:

**AINTREE HOSPITAL**

TITLE:

**Site Photographs**

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| NTS            | FINAL       |
| DESIGN/DRAWN : | DATE:       |
| AW             | JAN 2025    |
| PROJECT No:    | DRAWING No: |
| P10738         | Figure 3a   |



1



2



3



4



DO NOT SCALE

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Figure 3b

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5



6



7



8



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Figure 3c

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9



10



11



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| VINCI CONSTRUCTION |             |
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| AINTREE HOSPITAL   |             |
| TITLE:             |             |
| Site Photographs   |             |
| SCALE@SIZE :       | ISSUE:      |
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| AW                 | JAN 2025    |
| PROJECT No:        | DRAWING No: |
| P10738             | Figure 3d   |

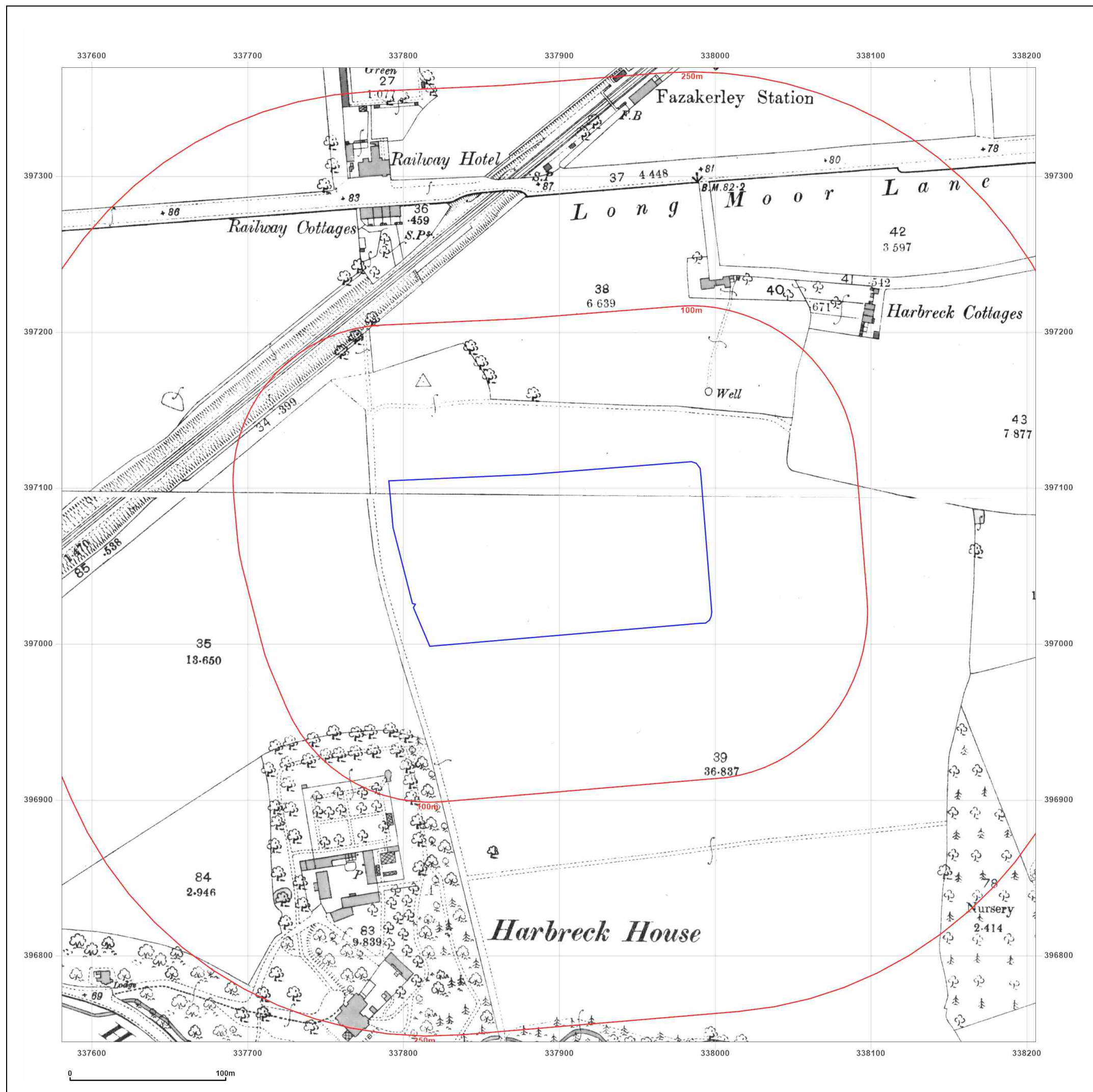




# A P P E N D I X E

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**Site Details:**

Aintree Hospital, Aintree  
University Hospital, Lower Lane,  
Fazakerley, Liverpool, L9 7AL

**Client Ref:** EMS\_985401\_1225787  
**Report Ref:** EMS-985401\_1248633  
**Grid Ref:** 337893, 397057

**Map Name:** County Series

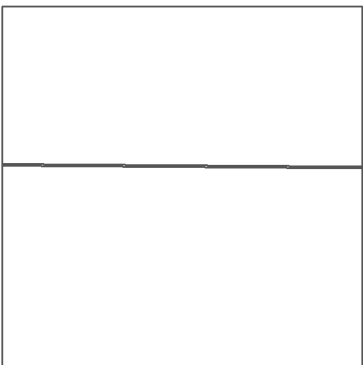
**Map date:** 1893

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



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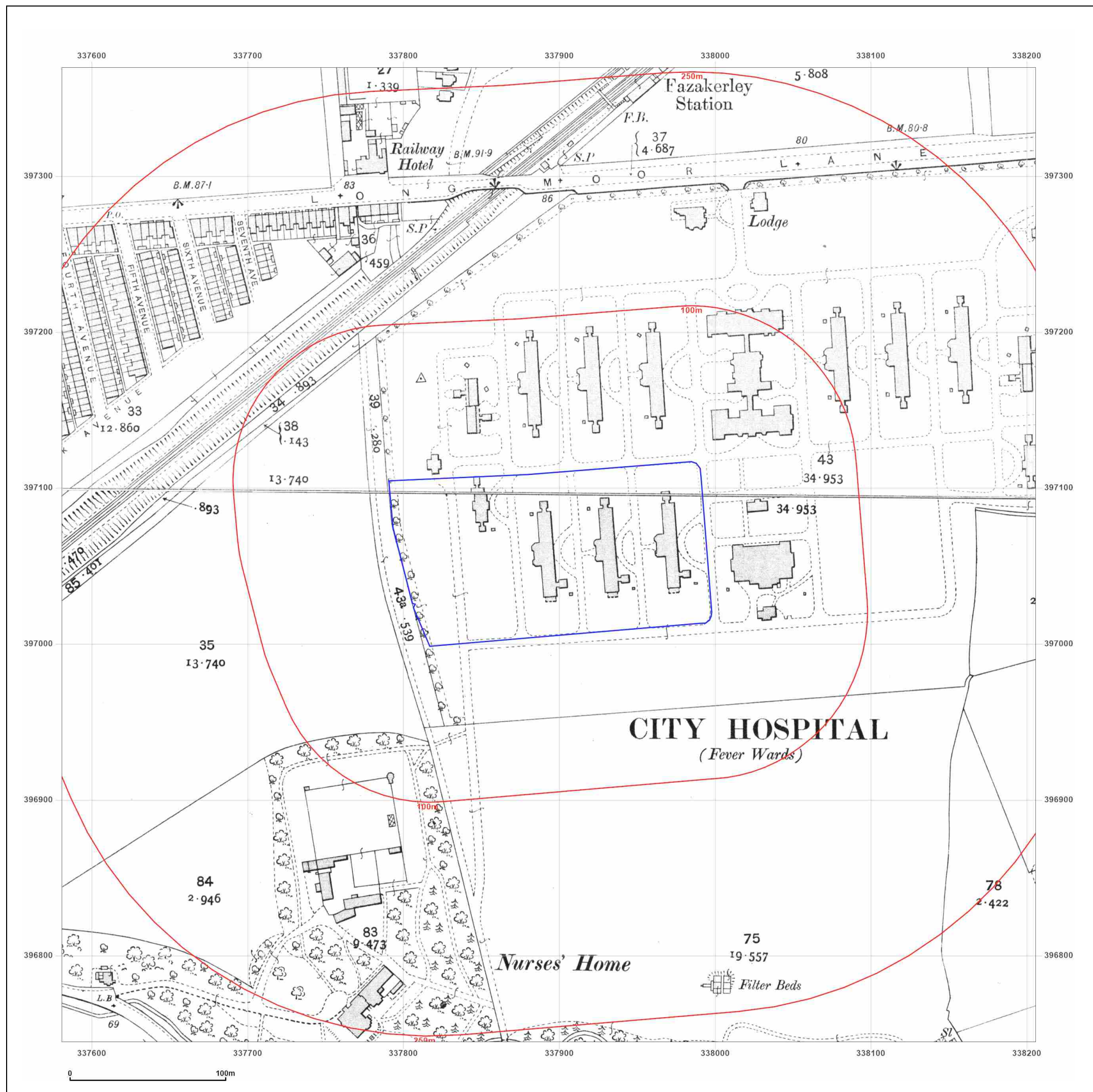
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Fazakerley, Liverpool, L9 7AL

**Client Ref:** EMS\_985401\_1225787  
**Report Ref:** EMS-985401\_1248633  
**Grid Ref:** 337893, 397057

**Map Name:** County Series

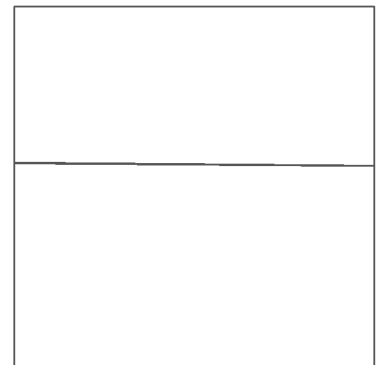
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**Report Ref:** EMS-985401\_1248633  
**Grid Ref:** 337893, 397057

**Map Name:** County Series

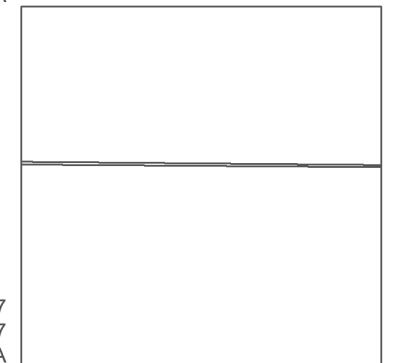
**Map date:** 1927

**Scale:** 1:2,500

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



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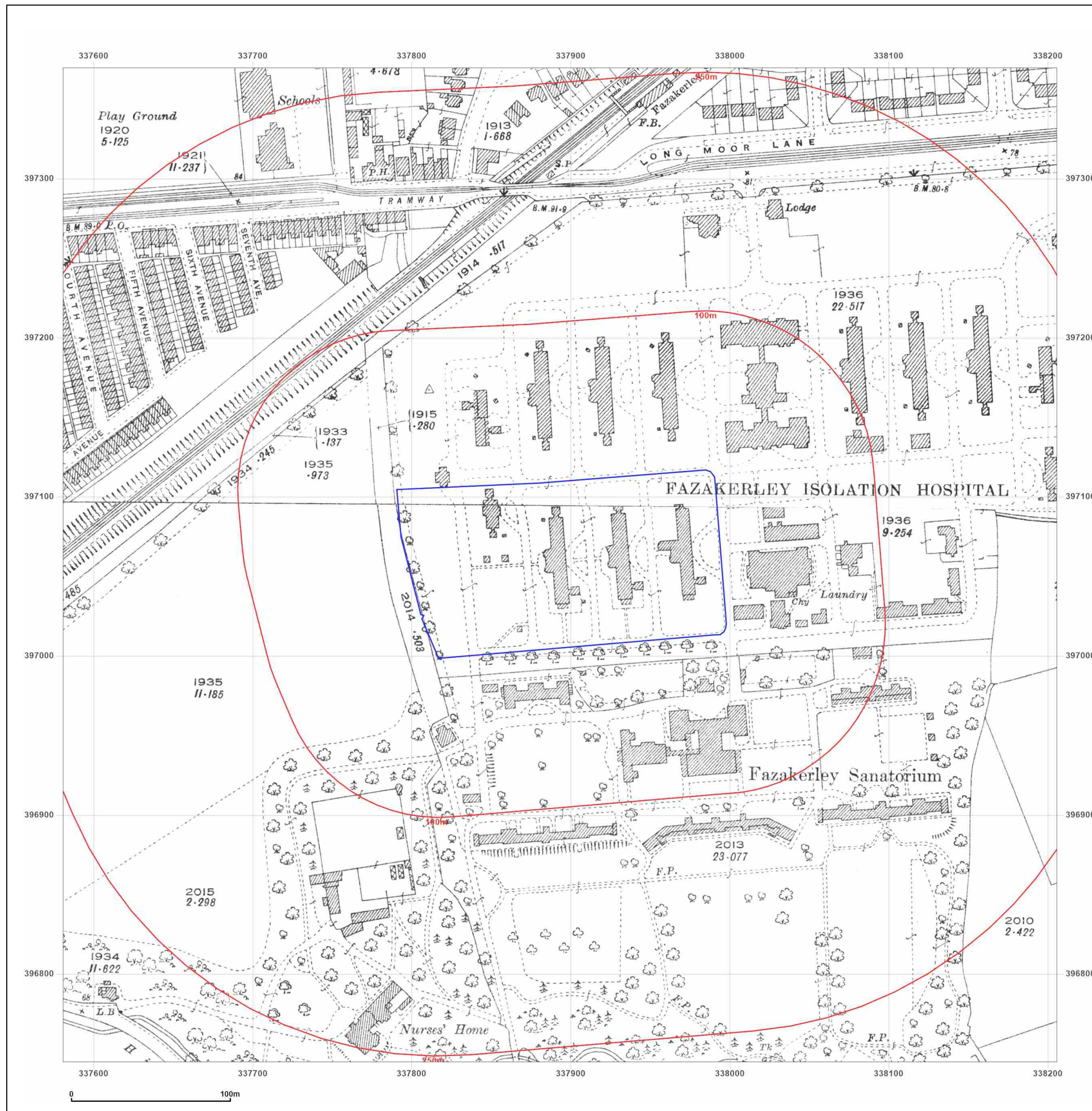


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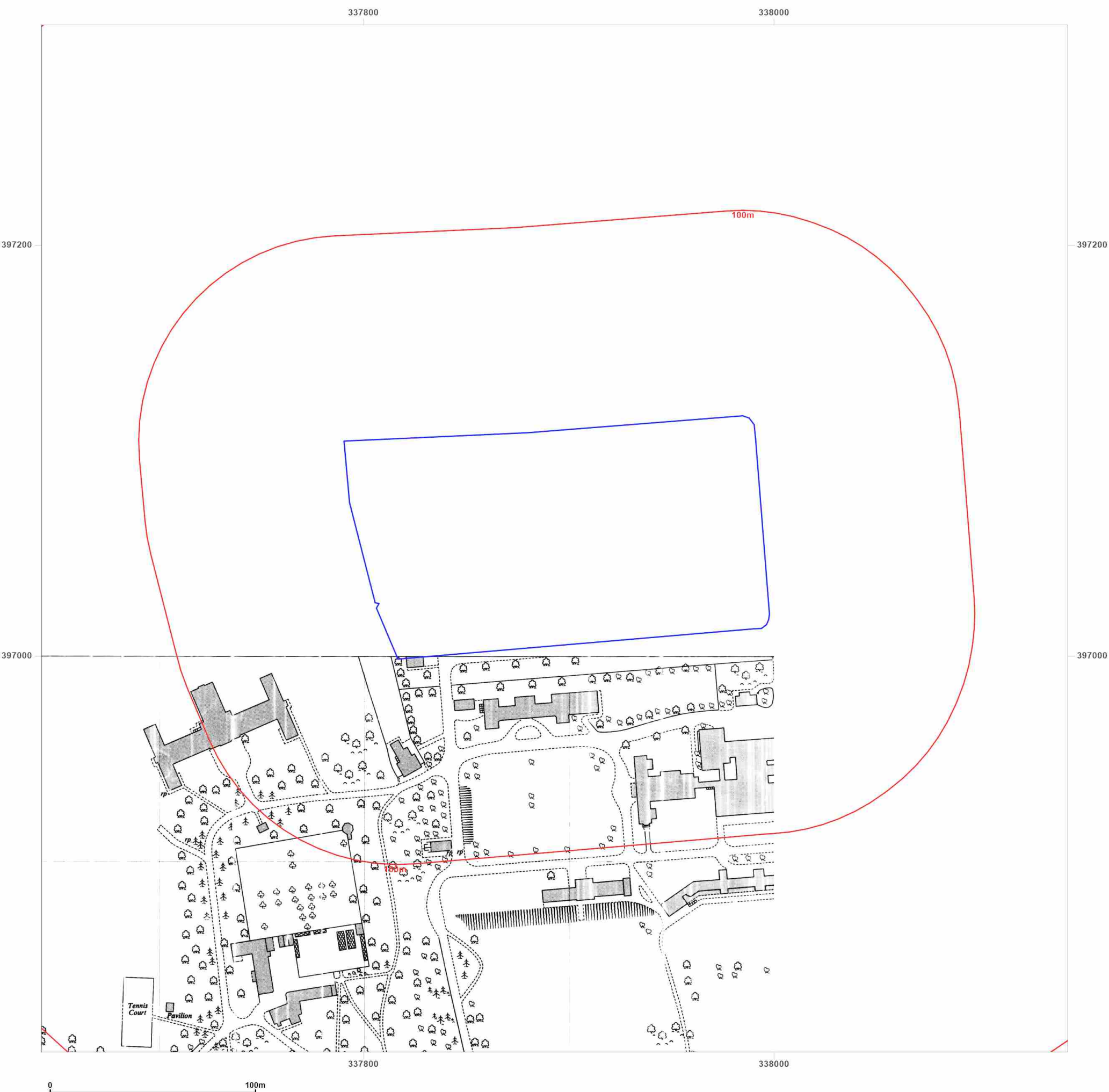
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**Report Ref:** EMS-985401\_1248633  
**Grid Ref:** 337893, 397057

**Map Name:** National Grid  
**Map date:** 1956  
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**Client Ref:** EMS\_985401\_1225787  
**Report Ref:** EMS-985401\_1248633  
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**Map Name:** National Grid  
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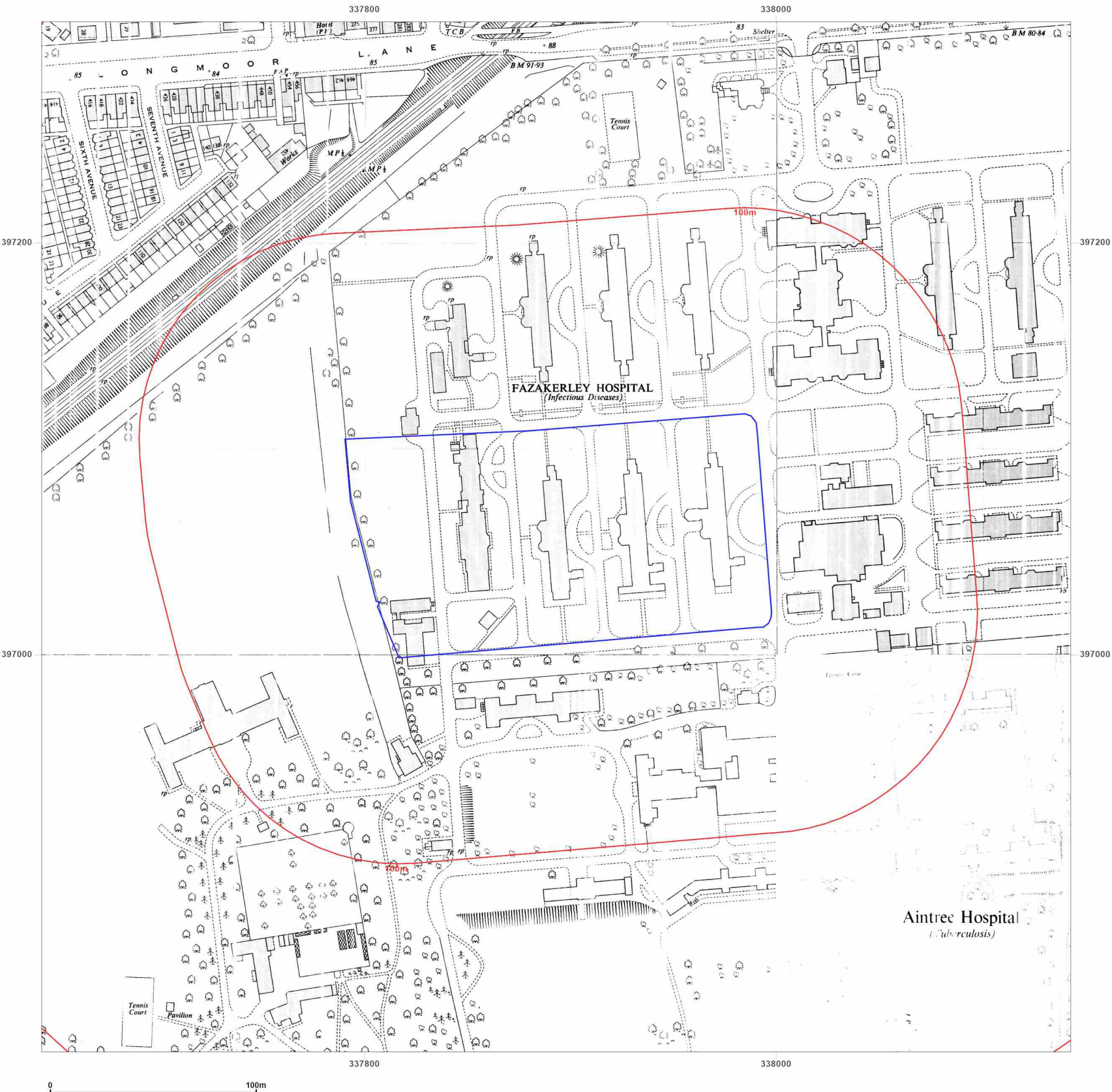


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**Grid Ref:** 337893, 397057

**Map Name:** National Grid  
**Map date:** 1955-1959  
**Scale:** 1:1,250  
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Scale: 1:2,500

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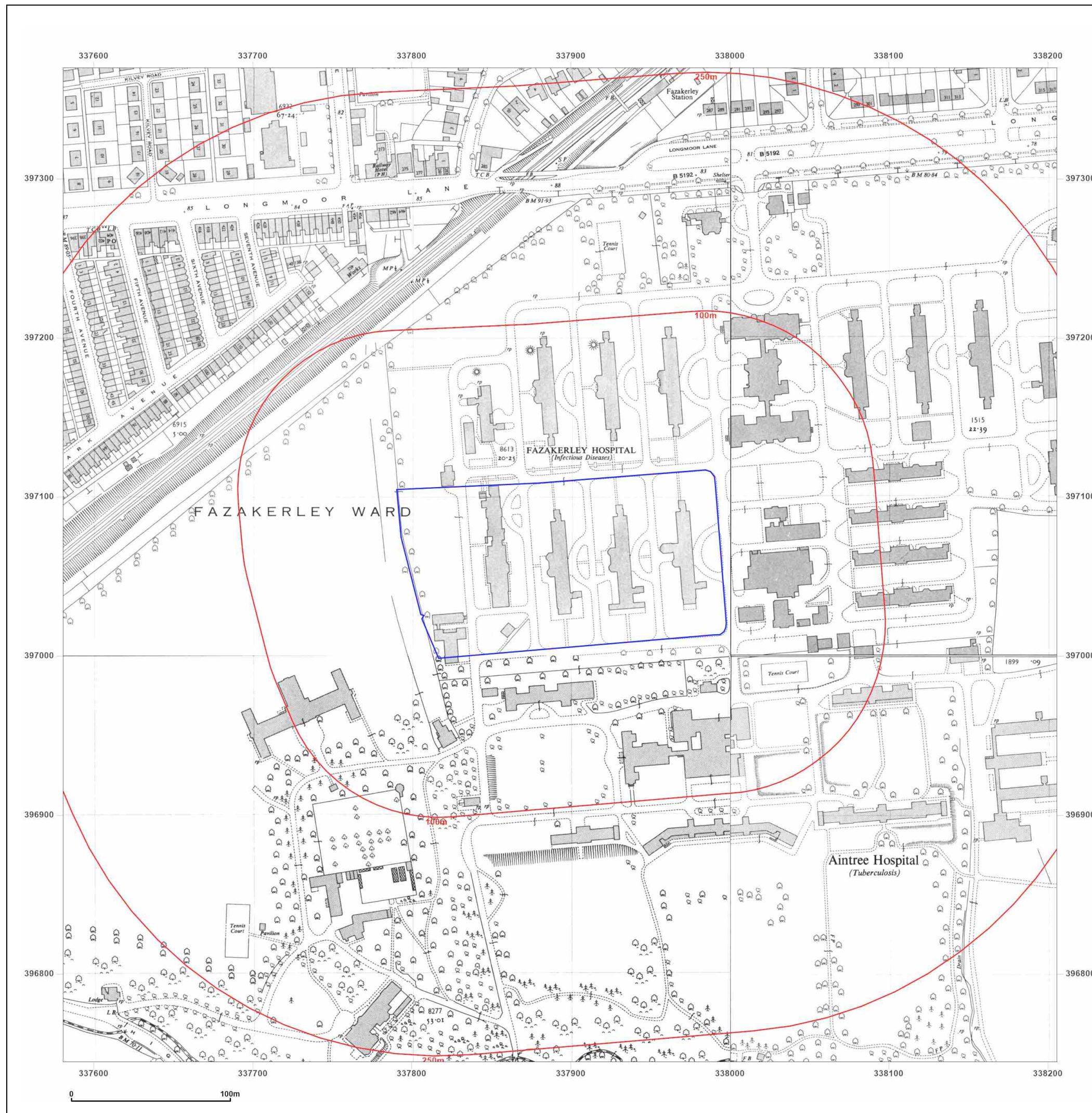


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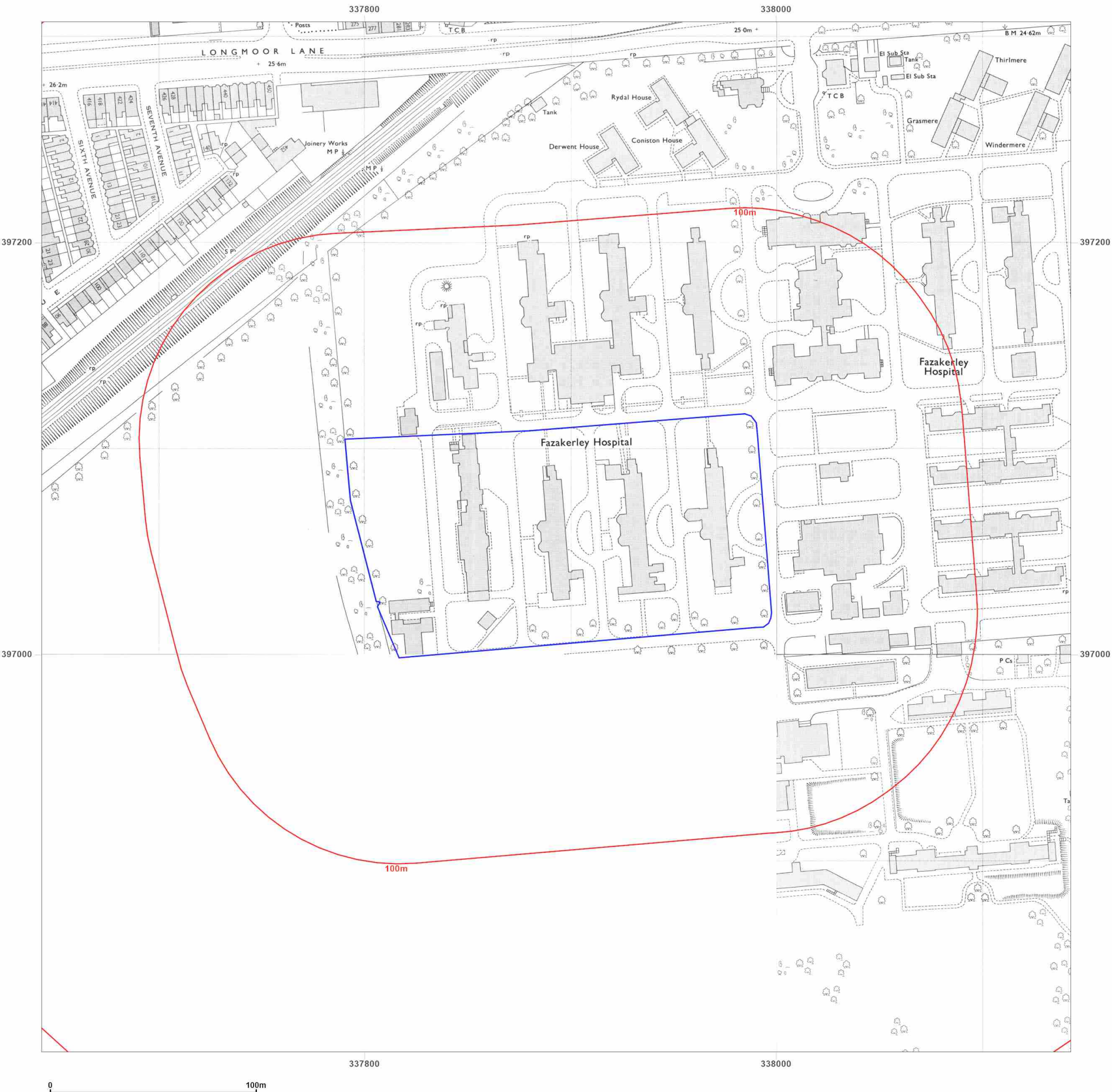
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**Client Ref:** EMS\_985401\_1225787  
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**Grid Ref:** 337893, 397057

**Map Name:** National Grid  
**Map date:** 1972-1975  
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**Map Name:** National Grid  
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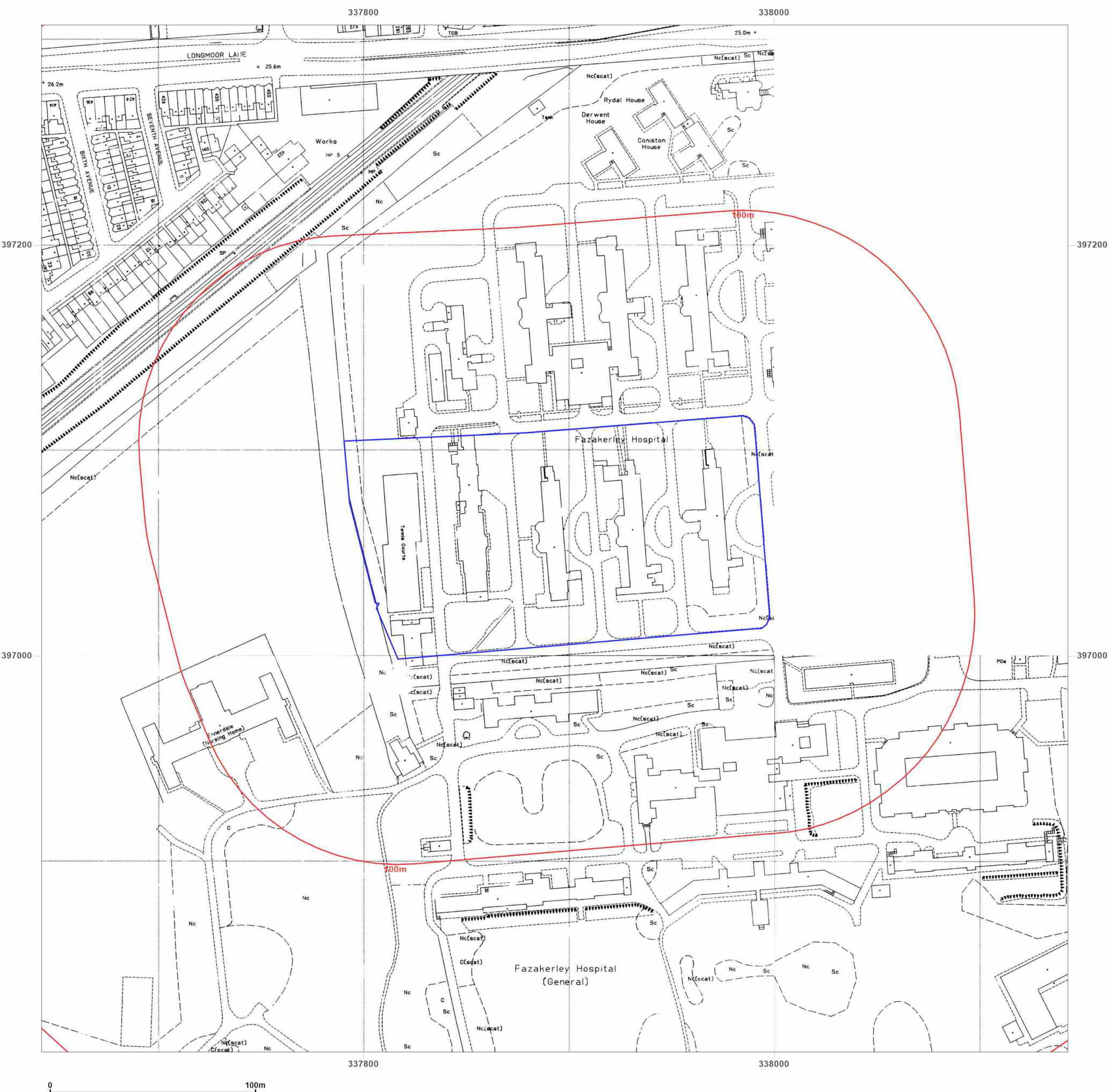


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**Grid Ref:** 337893, 397057

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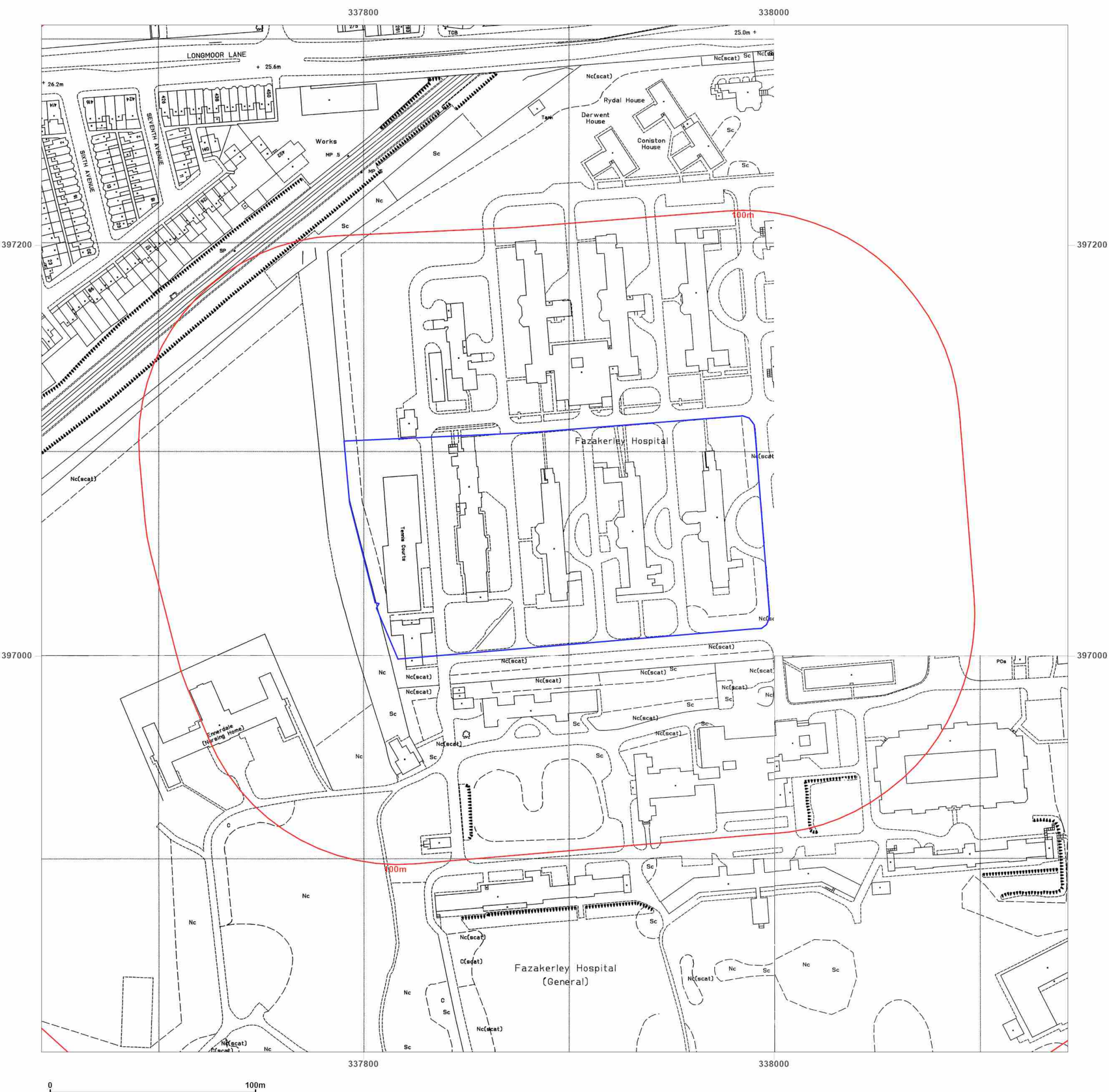


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**Grid Ref:** 337893, 397057

**Map Name:** National Grid  
**Map date:** 1994  
**Scale:** 1:1,250  
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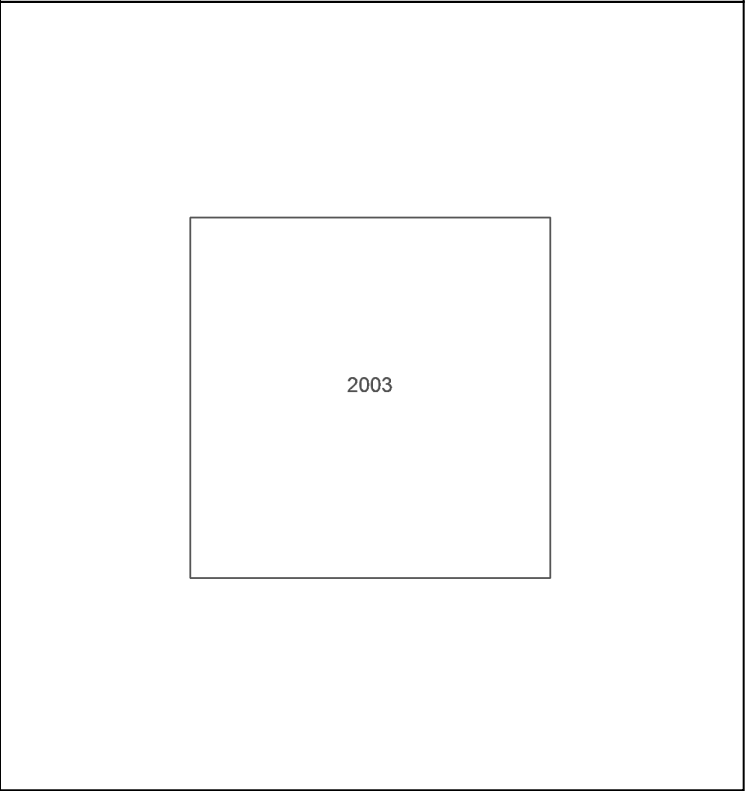


Site Details:

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Client Ref: EMS\_985401\_1225787  
Report Ref: EMS-985401\_1248633  
Grid Ref: 337893, 397057

Map Name: LandLine  
Map date: 2003  
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WINDY ARBOUR · WINSTANLEY · WIGAN  
BOREHOLE RECORD SHEET

ST 39NE/87

NGR ST 37919731

Job No. 747

Date 27-29.2.68.

Location FRANKLEY.

Carried out for LIVERPOOL CORPORATION.

Borehole No. 1

Diameter 6"

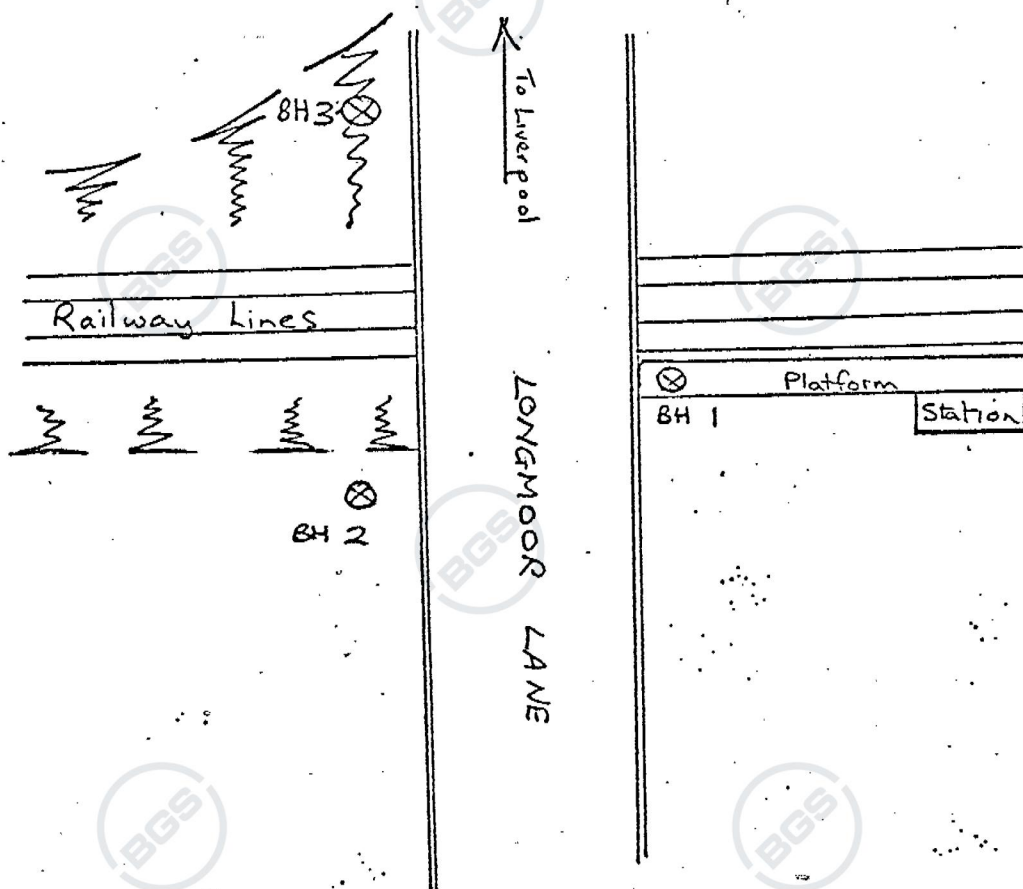
Ground Level

Scale 1/4" to 1'0"

| Description                                                       | M/C % | O.S.D. | Legend | Depth | Thick-ness | Sample       | S.P.T. Value | Water Levels     |
|-------------------------------------------------------------------|-------|--------|--------|-------|------------|--------------|--------------|------------------|
| 2" ASPHALT. Shale FILL.                                           |       |        |        | 0'0   |            |              |              |                  |
| Sandstone, shale FILL.                                            |       |        |        | 2'6   | 2'6        | 0'10         |              |                  |
|                                                                   |       |        |        | 5'0   | 2'6        | 0'26         |              |                  |
| Firm to very stiff brown sandy CLAY with pebbles. (boulder CLAY.) |       |        |        | 15'2  |            | 3'0          |              | slight entry 5'6 |
|                                                                   |       |        |        |       |            | 4'6          |              |                  |
|                                                                   |       |        |        |       |            | 8'0          |              |                  |
|                                                                   |       |        |        |       |            | 9'6          |              |                  |
|                                                                   |       |        |        |       |            | 13'6         |              |                  |
|                                                                   |       |        |        |       |            | 15'0         |              |                  |
|                                                                   |       |        |        |       |            |              |              | Final 15'2/15'0  |
|                                                                   |       |        |        |       |            |              |              | 1.5.68. 4. a.m.  |
|                                                                   |       |        |        |       |            |              |              | entry 19'0       |
|                                                                   |       |        |        |       |            | 22'6         |              |                  |
|                                                                   |       |        |        |       |            | 24'6         |              |                  |
|                                                                   |       |        |        |       |            | 02'0         |              |                  |
|                                                                   |       |        |        |       |            | 69'6         |              |                  |
|                                                                   |       |        |        |       |            | 21'17        |              |                  |
|                                                                   |       |        |        |       |            | 32'6         |              |                  |
|                                                                   |       |        |        |       |            | 34'0         |              |                  |
|                                                                   |       |        |        |       |            | 36'0         |              |                  |
|                                                                   |       |        |        |       |            | 38'6         |              |                  |
|                                                                   |       |        |        |       |            | 43'0         |              |                  |
|                                                                   |       |        |        |       |            | 44'6         |              |                  |
|                                                                   |       |        |        |       |            | 48'0         |              |                  |
|                                                                   |       |        |        |       |            | 49'6         |              |                  |
|                                                                   |       |        |        |       |            | 53'0         |              |                  |
|                                                                   |       |        |        |       |            | 54'6         |              |                  |
|                                                                   |       |        |        |       |            | 57'0         |              |                  |
|                                                                   |       |        |        |       |            | 60'6         |              |                  |
|                                                                   |       |        |        |       |            | 64'0         |              |                  |
|                                                                   |       |        |        |       |            | 65'6         |              |                  |
|                                                                   |       |        |        |       |            | 74'6         |              |                  |
|                                                                   |       |        |        |       |            | 75'6         |              |                  |
| Hard brown sandy boulder CLAY.                                    |       |        |        | 74'6  |            |              |              |                  |
|                                                                   |       |        |        | 77'0  |            |              |              |                  |
|                                                                   |       |        |        | 82'0  |            |              |              |                  |
|                                                                   |       |        |        | 84'0  |            |              |              |                  |
|                                                                   |       |        |        |       |            | 80'6         |              |                  |
|                                                                   |       |        |        |       |            | 82'0         |              |                  |
|                                                                   |       |        |        |       |            | END OF BORE. |              |                  |



SJ 39 NE/87-89



SOUTH LANC'S BORING CO. LTD.  
JOB NO 747 FAZAKERLEY





WINDY ARBOUR · WINSTANLEY · WIGAN

BOREHOLE RECORD SHEET

SJ 39 NE / 88.

NGR SJ 37869727  
(approx)

Job No. 7A7

Date 2.4.3.68

Location FAZAKERLEY.

Carried out for LIVERPOOL CORPORATION.

Borehole No. 2

Diameter 4"

Ground Level

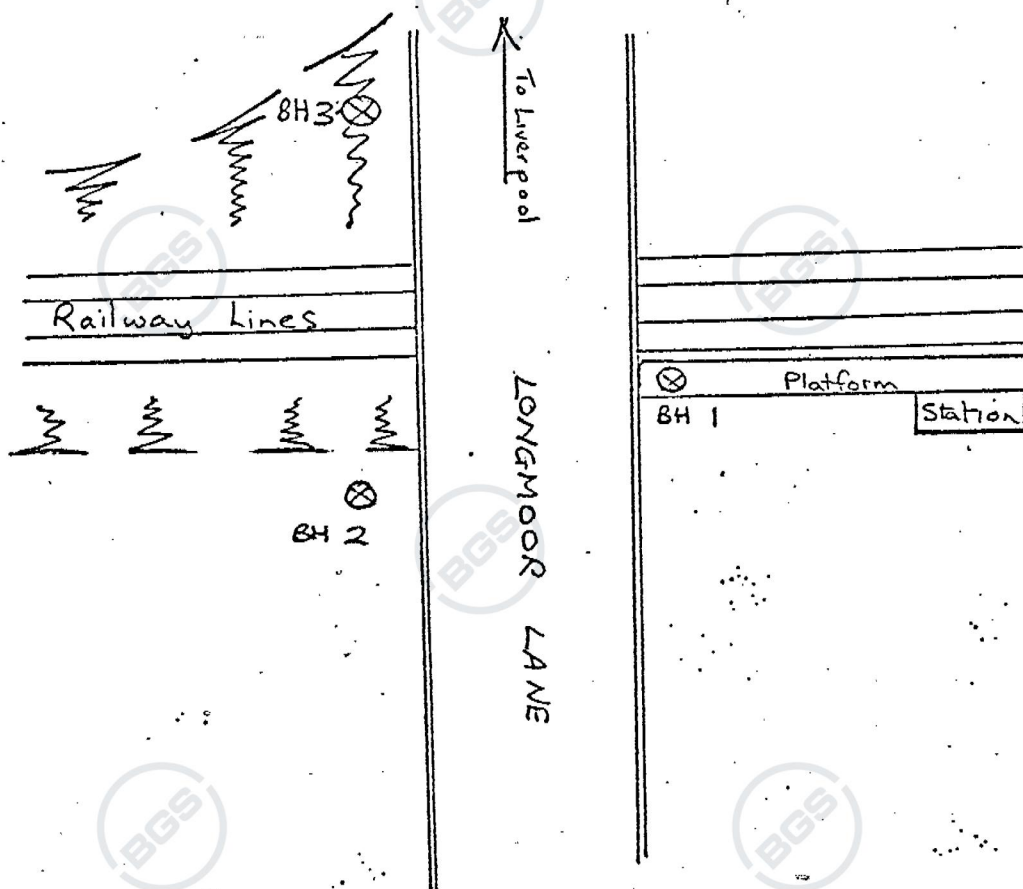
Scale 1/4" to 1'

| Description                            | M/C % | O.S.D. | Legend | Depth        | Thick-<br>ness | Sample                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | S.P.T.<br>Value | Water Levels |
|----------------------------------------|-------|--------|--------|--------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------|
| Sand, silt, & clay FILL.               |       |        |        | 0'0          |                | 0'0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |              |
| Dry brown, medium SAND.                |       |        |        | 3'0<br>6.9   | 3'0            | 0'3<br>5'0<br>6'0<br>8'0<br>9'0<br>10'0<br>11'0<br>12'0<br>13'0<br>14'0<br>15'0<br>16'0<br>17'0<br>18'0<br>19'0<br>20'0<br>21'0<br>22'0<br>23'0<br>24'0<br>25'0<br>26'0<br>27'0<br>28'0<br>29'0<br>30'0<br>31'0<br>32'0<br>33'0<br>34'0<br>35'0<br>36'0<br>37'0<br>38'0<br>39'0<br>40'0<br>41'0<br>42'0<br>43'0<br>44'0<br>45'0<br>46'0<br>47'0<br>48'0<br>49'0<br>50'0<br>51'0<br>52'0<br>53'0<br>54'0<br>55'0<br>56'0<br>57'0<br>58'0<br>59'0<br>60'0<br>61'0<br>62'0<br>63'0<br>64'0<br>65'0<br>66'0<br>67'0<br>68'0<br>69'0<br>70'0<br>71'0<br>72'0<br>73'0<br>74'0<br>75'0<br>76'0<br>77'0<br>78'0<br>79'0<br>80'0<br>81'0<br>82'0<br>83'0<br>84'0<br>85'0<br>86'0<br>87'0<br>88'0<br>89'0<br>90'0<br>91'0<br>92'0<br>93'0<br>94'0<br>95'0<br>96'0<br>97'0<br>98'0<br>99'0<br>100'0 | 12<br>15        |              |
| Firm to very-stiff brown boulder CLAY. |       |        |        | 11'0<br>3.37 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |              |
|                                        |       |        |        | 62'0<br>17.8 | END            | OF BORE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |              |

Final level 5.3.68 9 a.m.  
water entry 50c



SJ 39 NE/87-89



SOUTH LANC'S BORING CO. LTD.  
JOB NO 747 FAZAKERLEY





WINDY ARBOUR · WINSTANLEY · WIGAN

BOREHOLE RECORD SHEET NGR SJ 37799727.

SJ 39 NE / 89

(approx.)

Job No. Z47

Date 5-6-3-68

Location EZZAKERLEY

Carried out for LIVERPOOL CORPORATION

Borehole No. 3

Diameter 6"

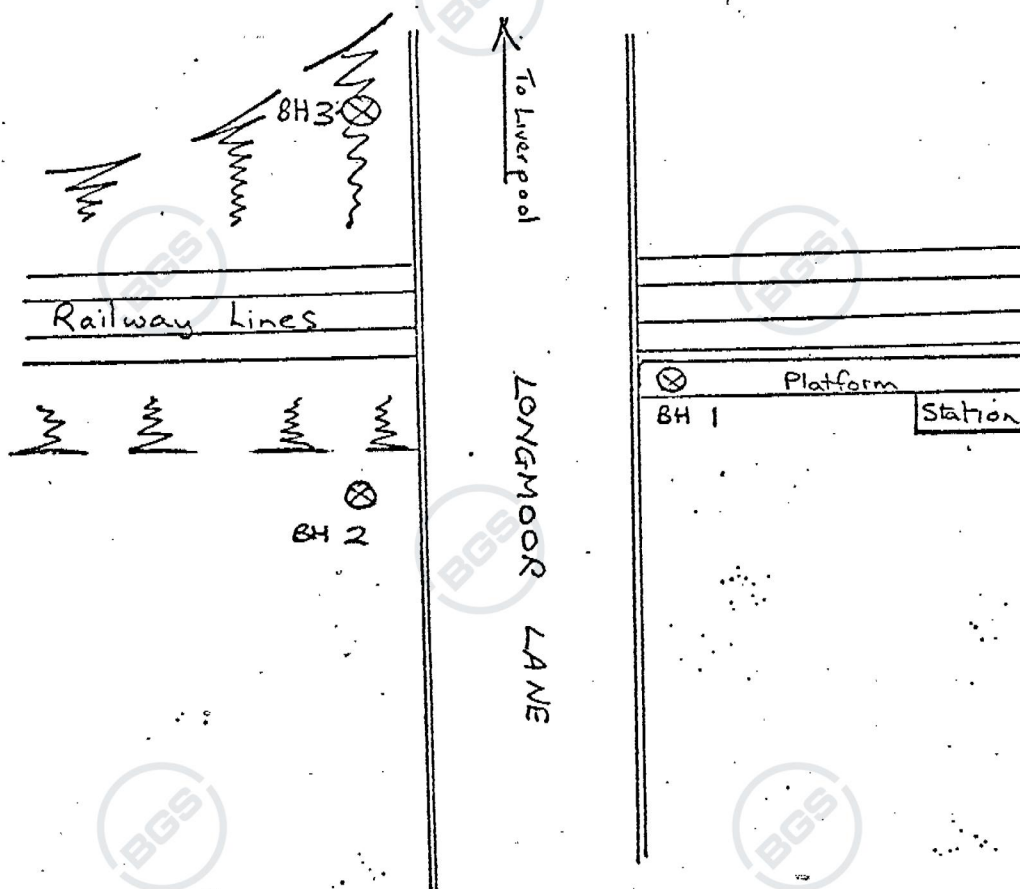
Ground Level

Scale No. to 1'

| Description                            | M/C % | O.S.D. | Legend | Depth      | Thick-ness | Sample                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | S.P.T. "N" Value | Water Levels |
|----------------------------------------|-------|--------|--------|------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------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| Sandy FILL.                            |       |        |        | 0'0        | 5'6        | 0'1'0<br>X 3'0<br>4'6<br>0'5'6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 9                |              |
| Firm to very stiff brown boulder CLAY. |       |        |        | 6'6<br>1'7 |            | 8'6<br>10'0<br>11'0<br>12'6<br>14'0<br>14'6<br>16'0<br>16'6<br>18'0<br>18'6<br>20'0<br>20'6<br>22'0<br>22'6<br>24'0<br>24'6<br>26'0<br>26'6<br>28'0<br>28'6<br>30'0<br>30'6<br>32'0<br>32'6<br>34'0<br>34'6<br>36'0<br>36'6<br>38'0<br>38'6<br>40'0<br>40'6<br>42'0<br>42'6<br>44'0<br>44'6<br>46'0<br>46'6<br>48'0<br>48'6<br>50'0<br>50'6<br>52'0<br>52'6<br>54'0<br>54'6<br>56'0<br>56'6<br>58'0<br>58'6<br>60'0<br>60'6<br>62'0<br>62'6<br>64'0<br>64'6<br>66'0<br>66'6<br>68'0<br>68'6<br>70'0<br>70'6<br>72'0<br>72'6<br>74'0<br>74'6<br>76'0<br>76'6<br>78'0<br>78'6<br>80'0<br>80'6<br>82'0<br>82'6<br>84'0<br>84'6<br>86'0<br>86'6<br>88'0<br>88'6<br>90'0<br>90'6<br>92'0<br>92'6<br>94'0<br>94'6<br>96'0<br>96'6<br>98'0<br>98'6<br>100'0<br>100'6<br>102'0<br>102'6<br>104'0<br>104'6<br>106'0<br>106'6<br>108'0<br>108'6<br>110'0<br>110'6<br>112'0<br>112'6<br>114'0<br>114'6<br>116'0<br>116'6<br>118'0<br>118'6<br>120'0<br>120'6<br>122'0<br>122'6<br>124'0<br>124'6<br>126'0<br>126'6<br>128'0<br>128'6<br>130'0<br>130'6<br>132'0<br>132'6<br>134'0<br>134'6<br>136'0<br>136'6<br>138'0<br>138'6<br>140'0<br>140'6<br>142'0<br>142'6<br>144'0<br>144'6<br>146'0<br>146'6<br>148'0<br>148'6<br>150'0<br>150'6<br>152'0<br>152'6<br>154'0<br>154'6<br>156'0<br>156'6<br>158'0<br>158'6<br>160'0<br>160'6<br>162'0<br>162'6<br>164'0<br>164'6<br>166'0<br>166'6<br>168'0<br>168'6<br>170'0<br>170'6<br>172'0<br>172'6<br>174'0<br>174'6<br>176'0<br>176'6<br>178'0<br>178'6<br>180'0<br>180'6<br>182'0<br>182'6<br>184'0<br>184'6<br>186'0<br>186'6<br>188'0<br>188'6<br>190'0<br>190'6<br>192'0<br>192'6<br>194'0<br>194'6<br>196'0<br>196'6<br>198'0<br>198'6<br>200'0<br>200'6<br>202'0<br>202'6<br>204'0<br>204'6<br>206'0<br>206'6<br>208'0<br>208'6<br>210'0<br>210'6<br>212'0<br>212'6<br>214'0<br>214'6<br>216'0<br>216'6<br>218'0<br>218'6<br>220'0<br>220'6<br>222'0<br>222'6<br>224'0<br>224'6<br>226'0<br>226'6<br>228'0<br>228'6<br>230'0<br>230'6<br>232'0<br>232'6<br>234'0<br>234'6<br>236'0<br>236'6<br>238'0<br>238'6<br>240'0<br>240'6<br>242'0<br>242'6<br>244'0<br>244'6<br>246'0<br>246'6<br>248'0<br>248'6<br>250'0<br>250'6<br>252'0<br>252'6<br>254'0<br>254'6<br>256'0<br>256'6<br>258'0<br>258'6<br>260'0<br>260'6<br>262'0<br>262'6<br>264'0<br>264'6<br>266'0<br>266'6<br>268'0<br>268'6<br>270'0<br>270'6<br>272'0<br>272'6<br>274'0<br>274'6<br>276'0<br>276'6<br>278'0<br>278'6<br>280'0<br>280'6<br>282'0<br>282'6<br>284'0<br>284'6<br>286'0<br>286'6<br>288'0<br>288'6<br>290'0<br>290'6<br>292'0<br>292'6<br>294'0<br>294'6<br>296'0<br>296'6<br>298'0<br>298'6<br>300'0<br>300'6<br>302'0<br>302'6<br>304'0<br>304'6<br>306'0<br>306'6<br>308'0<br>308'6<br>310'0<br>310'6<br>312'0<br>312'6<br>314'0<br>314'6<br>316'0<br>316'6<br>318'0<br>318'6<br>320'0<br>320'6<br>322'0<br>322'6<br>324'0<br>324'6<br>326'0<br>326'6<br>328'0<br>328'6<br>330'0<br>330'6<br>332'0<br>332'6<br>334'0<br>334'6<br>336'0<br>336'6<br>338'0<br>338'6<br>340'0<br>340'6<br>342'0<br>342'6<br>344'0<br>344'6<br>346'0<br>346'6<br>348'0<br>348'6<br>350'0<br>350'6<br>352'0<br>352'6<br>354'0<br>354'6<br>356'0<br>356'6<br>358'0<br>358'6<br>360'0<br>360'6<br>362'0<br>362'6<br>364'0<br>364'6<br>366'0<br>366'6<br>368'0<br>368'6<br>370'0<br>370'6<br>372'0<br>372'6<br>374'0<br>374'6<br>376'0<br>376'6<br>378'0<br>378'6<br>380'0<br>380'6<br>382'0<br>382'6<br>384'0<br>384'6<br>386'0<br>386'6<br>388'0<br>388'6<br>390'0<br>390'6<br>392'0<br>392'6<br>394'0<br>394'6<br>396'0<br>396'6<br>398'0<br>398'6<br>400'0<br>400'6<br>402'0<br>402'6<br>404'0<br>404'6<br>406'0<br>406'6<br>408'0<br>408'6<br>410'0<br>410'6<br>412'0<br>412'6<br>414'0<br>414'6<br>416'0<br>416'6<br>418'0<br>418'6<br>420'0<br>420'6<br>422'0<br>422'6<br>424'0<br>424'6<br>426'0<br>426'6<br>428'0<br>428'6<br>430'0<br>430'6<br>432'0<br>432'6<br>434'0<br>434'6<br>436'0<br>436'6<br>438'0<br>438'6<br>440'0<br>440'6<br>442'0<br>442'6<br>444'0<br>444'6<br>446'0<br>446'6<br>448'0<br>448'6<br>450'0<br>450'6<br>452'0<br>452'6<br>454'0<br>454'6<br>456'0<br>456'6<br>458'0<br>458'6<br>460'0<br>460'6<br>462'0<br>462'6<br>464'0<br>464'6<br>466'0<br>466'6<br>468'0<br>468'6<br>470'0<br>470'6<br>472'0<br>472'6<br>474'0<br>474'6<br>476'0<br>476'6<br>478'0<br>478'6<br>480'0<br>480'6<br>482'0<br>482'6<br>484'0<br>484'6<br>486'0<br>486'6<br>488'0<br>488'6<br>490'0<br>490'6<br>492'0<br>492'6<br>494'0<br>494'6<br>496'0<br>496'6<br>498'0<br>498'6<br>500'0<br>500'6<br>502'0<br>502'6<br>504'0<br>504'6<br>506'0<br>506'6<br>508'0<br>508'6<br>510'0<br>510'6<br>512'0<br>512'6<br>514'0<br>514'6<br>516'0<br>516'6<br>518'0<br>518'6<br>520'0<br>520'6<br>522'0<br>522'6<br>524'0<br>524'6<br>526'0<br>526'6<br>528'0<br>528'6<br>530'0<br>530'6<br>532'0<br>532'6<br>534'0<br>534'6<br>536'0<br>536'6<br>538'0<br>538'6<br>540'0<br>540'6<br>542'0<br>542'6<br>544'0<br>544'6<br>546'0<br>546'6<br>548'0<br>548'6<br>550'0<br>550'6<br>552'0<br>552'6<br>554'0<br>554'6<br>556'0<br>556'6<br>558'0<br>558'6<br>560'0<br>560'6<br>562'0<br>562'6<br>564'0<br>564'6<br>566'0<br>566'6<br>568'0<br>568'6<br>570'0<br>570'6<br>572'0<br>572'6<br>574'0<br>574'6<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# A P P E N D I X G

Land Appraisal | Environmental | Geotechnical | Design | Mining | Inspections

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emapsite

Report Reference: EMS-565955\_760428

Building A2 Office 1052 Cody Technology Park,  
Old Ively Road,  
Farnborough, GU14 0LX

Your Reference: EMS\_565955\_760428

Report Date 11 Sep 2019

Report Delivery Email - pdf  
Method:

## Geo Insight

Address: Aintree Hospital,

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Geo Insight** as requested.

If you would like further assistance regarding this report then please contact the emapsite customer services team on 0118 9736883 quoting the above report reference number.

Yours faithfully,

emapsite customer services team

Enc.  
Groundsure Geo Insight

Address: Aintree Hospital,  
Date: 11 Sep 2019  
Reference: EMS-565955\_760428  
Client: emapsite

NW N NE

W E



SW S SE

Aerial Photograph Capture date: 11-Jun-2015  
Grid Reference: 337944,397107  
Site Size: 6.7891ha



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# Overview of Findings

The Groundsure Geo Insight provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 and 1:10,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Non-coal mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database, Johnson Poole and Bloomer mining data and Groundsure's unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

## Section 1: Geology 1:10,000 Scale

|                                                |                                                                                                           |    |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------|----|
| 1.1 Artificial Ground                          | 1.1 Is there any Artificial Ground/ Made Ground present beneath the study site at 1:10,000 scale?         | No |
| 1.2 Superficial Geology and Landslips          | 1.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site at 1:10,000 scale?*    | No |
|                                                | 1.2.2 Are there any records of landslide within 500m of the study site boundary at 1:10,000 scale?        | No |
| 1.3 Bedrock, Solid Geology and linear features | 1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section. |    |
|                                                | 1.3.2 Are there any records of linear features within 500m of the study site boundary at 1:10,000 scale?  | No |

## Section 2: Geology 1:50,000 Scale

|                                       |                                                                                                           |     |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------|-----|
| 2.1 Artificial Ground                 | 2.1.1 Is there any Artificial Ground/ Made Ground present beneath the study site?                         | No  |
|                                       | 2.1.2 Are there any records relating to permeability of artificial ground within the study site*boundary? | No  |
| 2.2 Superficial Geology and Landslips | 2.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site?*                      | Yes |
|                                       | 2.2.2 Are there any records of permeability of superficial ground within 500m of the study site?          | Yes |
|                                       | 2.2.3 Are there any records of landslide within 500m of the study site boundary?                          | No  |
|                                       | 2.2.4 Are there any records relating to permeability of landslips within the study site* boundary?        | No  |



## Section 2: Geology 1:50,000 Scale

### 2.3 Bedrock, Solid Geology and linear features

2.3.1 For records of Bedrock and Solid Geology beneath the study site\* see the detailed findings section.

2.3.2 Are there any records relating to permeability of bedrock ground within the study site boundary?

Yes

2.3.3 Are there any records of linear features within 500m of the study site boundary?

No

## Section 3: Radon

### 3. Radon

3.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?

The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

3.2 Radon Protection

No radon protective measures are necessary.

## Section 4: Ground Workings

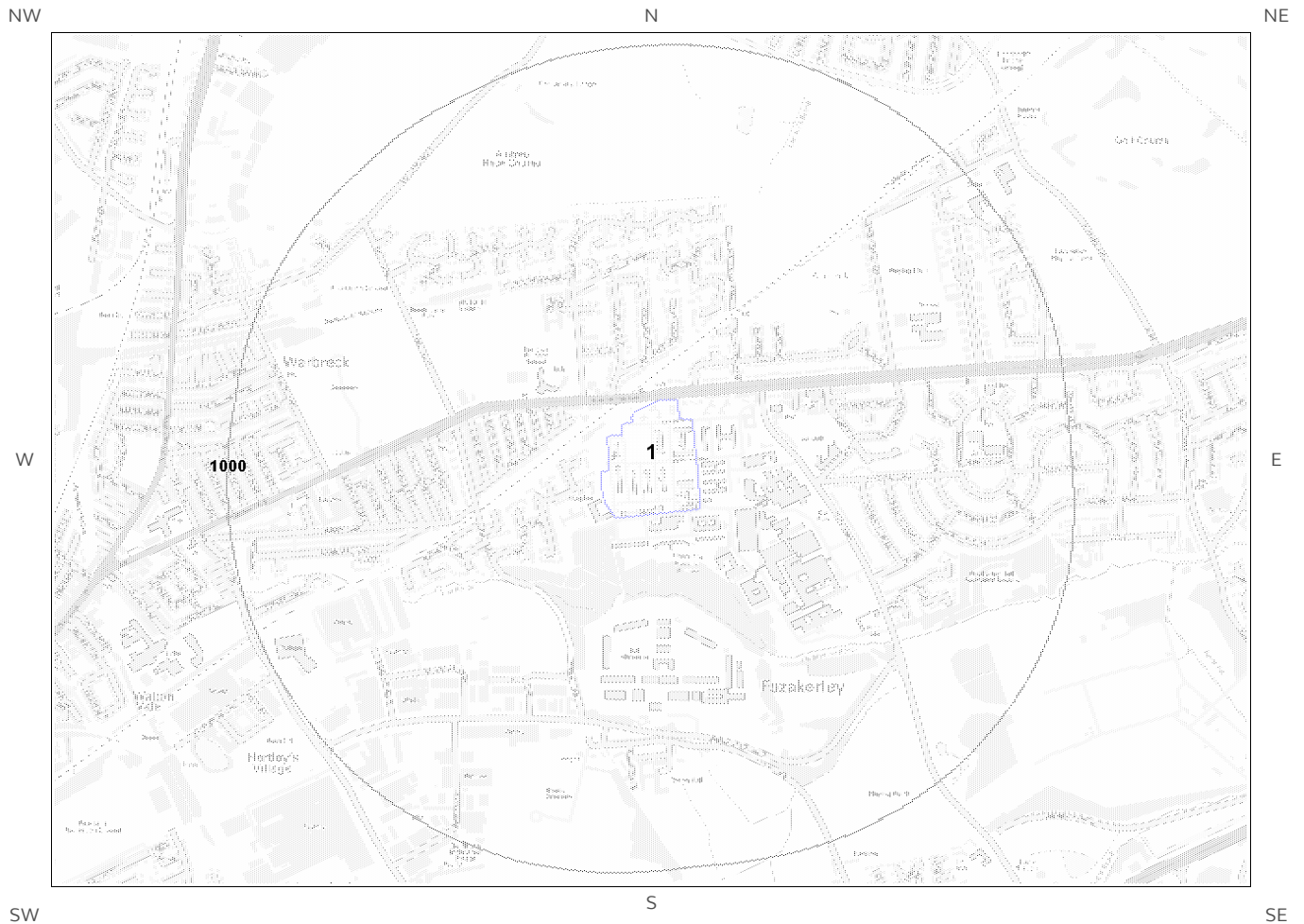
|                                                                         | On-site | 0-50m | 51-250 | 251-500      | 501-1000     |
|-------------------------------------------------------------------------|---------|-------|--------|--------------|--------------|
| 4.1 Historical Surface Ground Working Features from Small Scale Mapping | 0       | 16    | 4      | Not Searched | Not Searched |
| 4.2 Historical Underground Workings from Small Scale Mapping            | 0       | 0     | 0      | 0            | 0            |
| 4.3 Current Ground Workings                                             | 0       | 0     | 0      | 0            | 0            |

## Section 5: Mining, Extraction & Natural Cavities

|                                           | On-site | 0-50m | 51-250 | 251-500 | 501-1000 |
|-------------------------------------------|---------|-------|--------|---------|----------|
| 5.1 Historical Mining                     | 0       | 0     | 0      | 0       | 0        |
| 5.2 Coal Mining                           | 0       | 0     | 0      | 0       | 0        |
| 5.3 Johnson Poole and Bloomer Mining Area | 0       | 0     | 0      | 0       | 0        |
| 5.4 Non-Coal Mining*                      | 0       | 0     | 0      | 0       | 0        |
| 5.5 Non-Coal Mining Cavities              | 0       | 0     | 0      | 0       | 0        |
| 5.5 Natural Cavities                      | 0       | 0     | 0      | 0       | 0        |

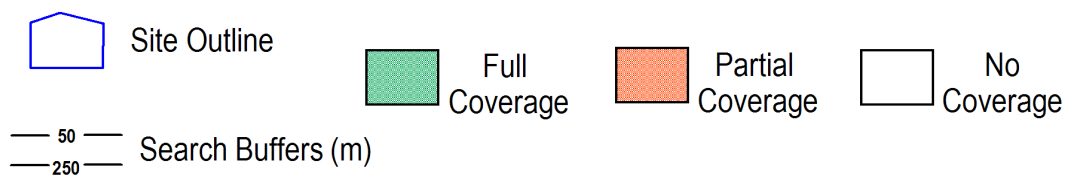
| Section 5: Mining, Extraction & Natural Cavities | On-site    | 0-50m | 51-250 | 251-500      | 501-1000 |
|--------------------------------------------------|------------|-------|--------|--------------|----------|
| 5.6 Brine Extraction                             | 0          | 0     | 0      | 0            | 0        |
| 5.7 Gypsum Extraction                            | 0          | 0     | 0      | 0            | 0        |
| 5.8 Cornwall and Devon Metalliferous Mining      | 0          | 0     | 0      | 0            | 0        |
| 5.9 Clay Mining                                  | 0          | 0     | 0      | 0            | 0        |
| Section 6: Natural Ground Subsidence             | On-site    |       |        |              |          |
| 6.1 Shrink-Swell Clay                            | Negligible |       |        |              |          |
| 6.2 Landslides                                   | Very Low   |       |        |              |          |
| 6.3 Ground Dissolution of Soluble Rocks          | Negligible |       |        |              |          |
| 6.4 Compressible Deposits                        | Negligible |       |        |              |          |
| 6.5 Collapsible Deposits                         | Very Low   |       |        |              |          |
| 6.5 Running Sand                                 | Low        |       |        |              |          |
| Section 7: Borehole Records                      | On-site    | 0-50m | 51-250 |              |          |
| 7 BGS Recorded Boreholes                         | 0          | 2     | 3      |              |          |
| Section 8: Estimated Background Soil Chemistry   | On-site    | 0-50m | 51-250 |              |          |
| 8 Records of Background Soil Chemistry           | 6          | 0     | 0      |              |          |
| Section 9: Railways and Tunnels                  | On-site    | 0-50m | 51-250 | 250-500      |          |
| 9.1 Tunnels                                      | 0          | 1     | 0      | Not Searched |          |
| 9.2 Historical Railway and Tunnel Features       | 0          | 2     | 3      | Not Searched |          |
| 9.3 Historical Railways                          | 0          | 0     | 0      | Not Searched |          |
| 9.4 Active Railways                              | 0          | 2     | 8      | Not Searched |          |
| 9.5 Railway Projects                             | 0          | 0     | 0      | 0            |          |

# 1:10,000 Scale Availability



**1\_10,000 Availability Legend**

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# Availability of 1:10,000 Scale Geology Mapping

The following information represents the availability of the key components of the 1:10,000 scale geological data.

| ID | Distance | Artificial Coverage      | Superficial Coverage | Bedrock Coverage | Mass Movement Coverage |
|----|----------|--------------------------|----------------------|------------------|------------------------|
| 1  | 0.0      | No deposits are mapped   | No coverage          | No coverage      | No coverage            |
| N2 | 1957.0   | Some deposits are mapped | Full                 | Full             | No coverage            |

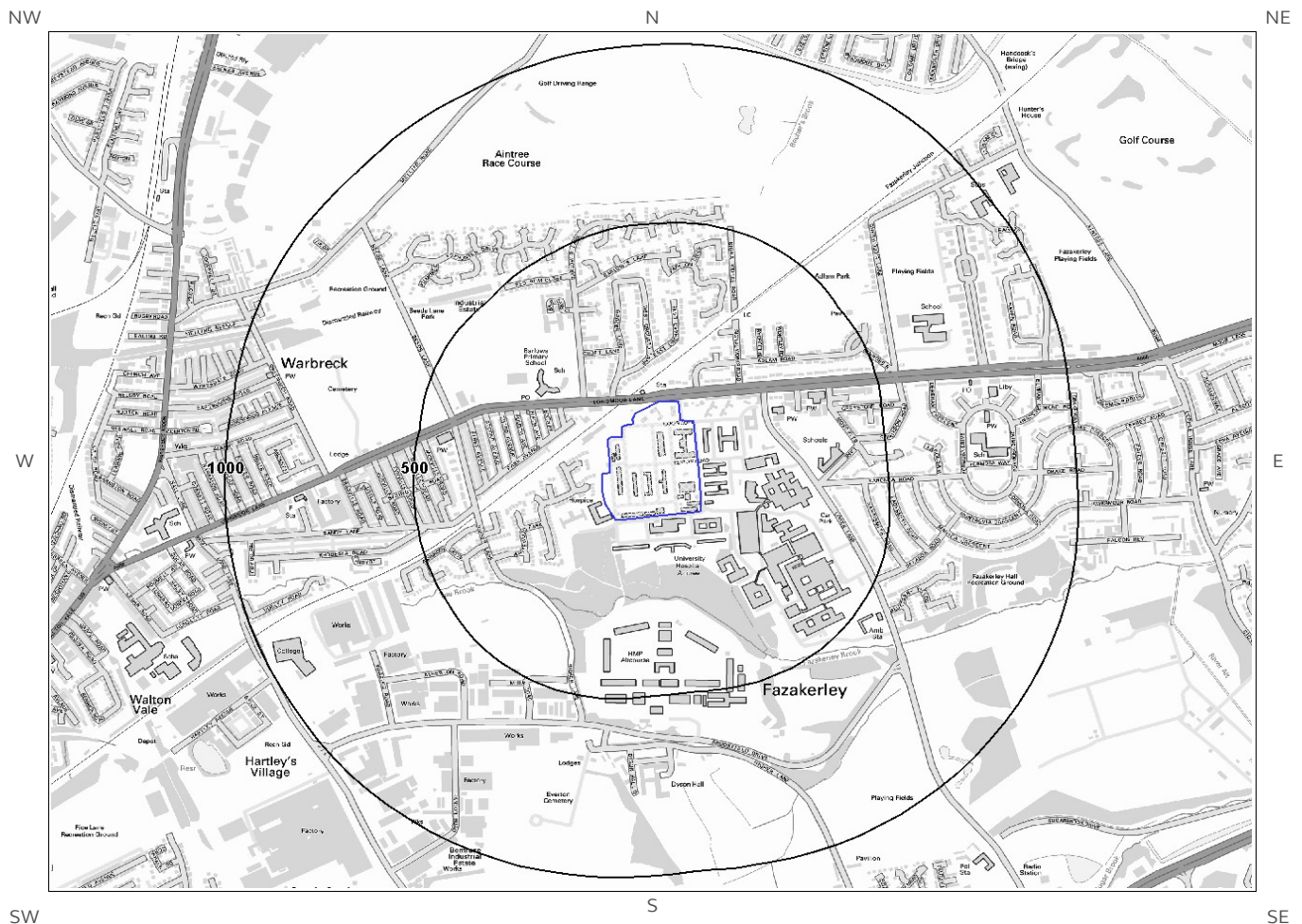
Guidance: The 1:10,000 scale geological interpretation is the most detailed generally available from BGS and is the scale at which most geological surveying is carried out in the field. The database is presented as four types of geology (artificial, mass movement, superficial and bedrock), although not all themes are mapped or available on every map sheet. Therefore a coverage layer showing the availability of the four themes is presented above.

The definitions of coverage are as follows:

| Geology       | Full Coverage                         | Partial Coverage                             | No Coverage            |
|---------------|---------------------------------------|----------------------------------------------|------------------------|
| Bedrock       | The whole tile has been mapped        | Some but not all the tile has been mapped    | No coverage            |
| Superficial   | The whole tile has been mapped        | Some but not all of the tile has been mapped | No coverage            |
| Artificial    | Some deposits are mapped on this tile | -                                            | No deposits are mapped |
| Mass Movement | Some deposits are mapped on this tile | -                                            | No coverage            |

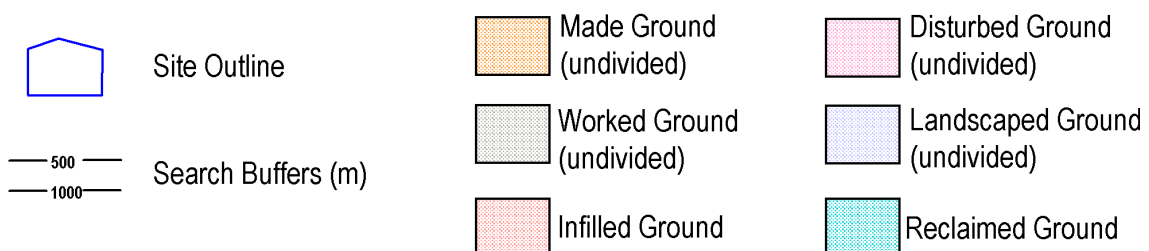
# 1 Geology (1:10,000 scale).

## 1.1 Artificial Ground map (1:10,000 scale)



**Artificial Ground Legend**

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# 1. Geology 1:10,000 scale

## 1.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping.

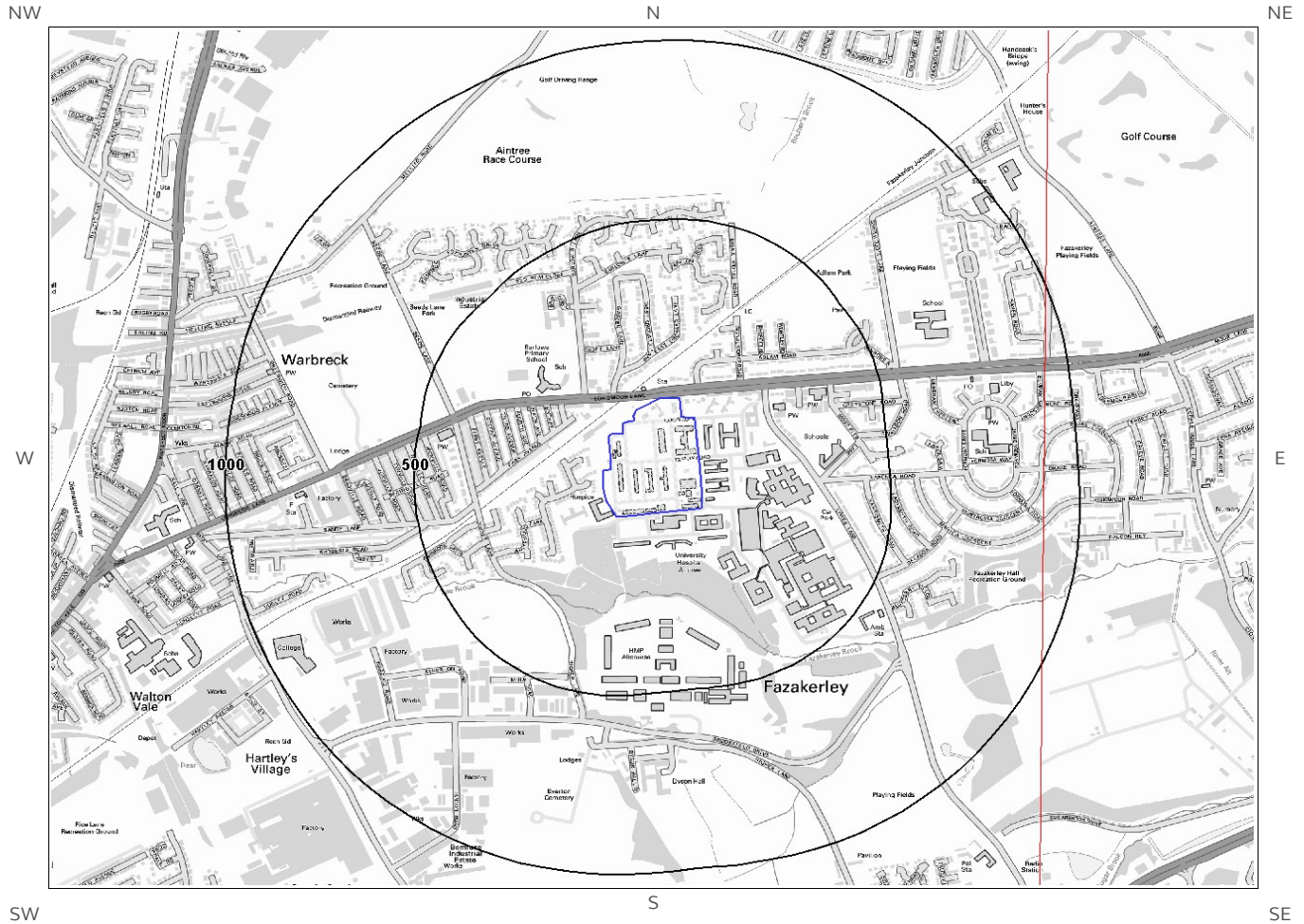
Are there any records of Artificial/ Made Ground within 500m of the study site boundary at 1:10,000 scale?    No

Database searched and no data found.

---

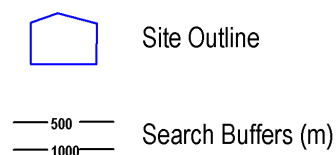


# 1.2 Superficial Deposits and Landslips map (1:10,000 scale)



**Artificial Ground Legend**

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# 1.2 Superficial Deposits and Landslips

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping

## 1.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary at 1:10,000 scale? No

Database searched and no data found.

---

## 1.2.2 Landslip

Are there any records of Landslip within 500m of the study site boundary at 1:10,000 scale? No

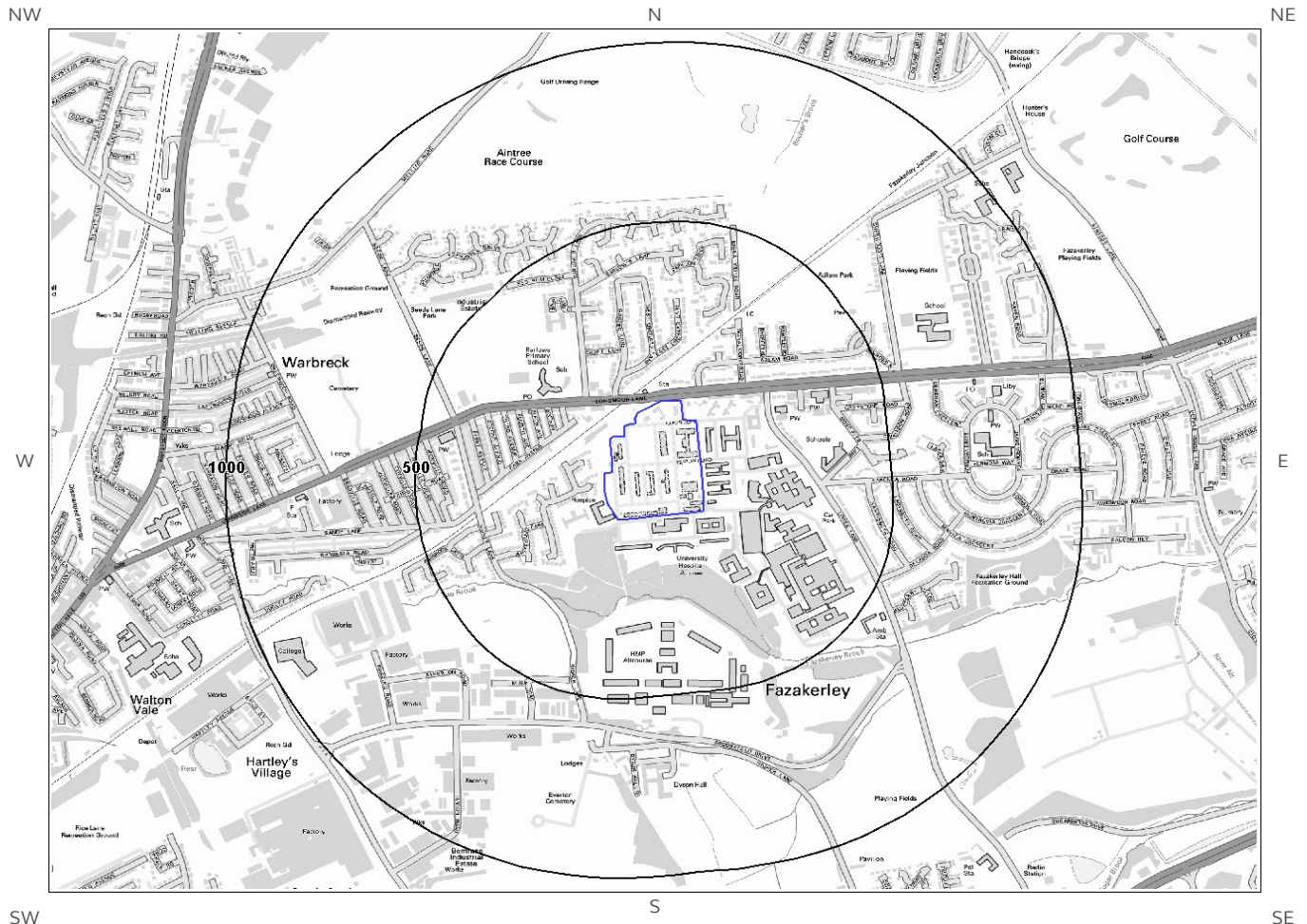
Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:10,000 scale

This Geology shows the main components as discrete layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

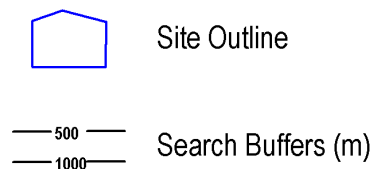
---

# 1.3 Bedrock and linear features map (1:10,000 scale)



**Bedrock and linear features Legend**

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## 1.3 Bedrock and linear features

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping.

### 1.3.1 Bedrock/ Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary at 1:10,000 scale.

Database searched and no data found at this scale.

---

### 1.3.2 Linear features

Are there any records of linear features within 500m of the study site boundary at 1:10,000 scale? No

Database searched and no data found at this scale.

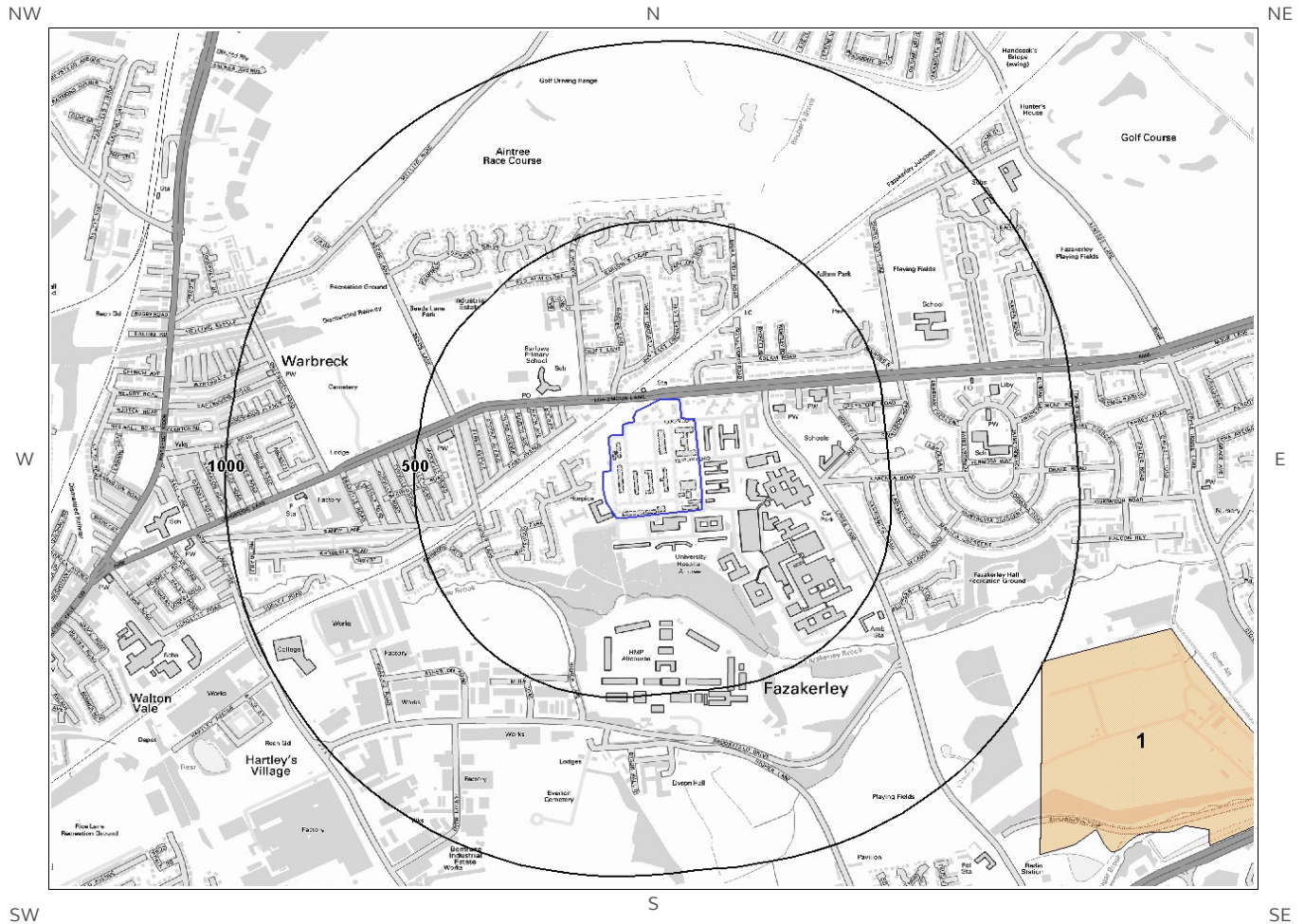
The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of great Britain at 1:10,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

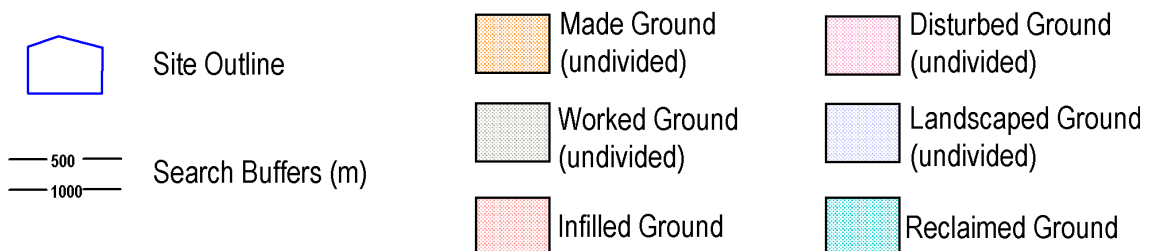
---

# 2 Geology 1:50,000 Scale

## 2.1 Artificial Ground map



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## 2. Geology 1:50,000 scale

### 2.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 083

#### 2.1.1 Artificial/ Made Ground

Are there any records of Artificial/ Made Ground within 500m of the study site boundary? No

Database searched and no data found.

---

#### 2.1.2 Permeability of Artificial Ground

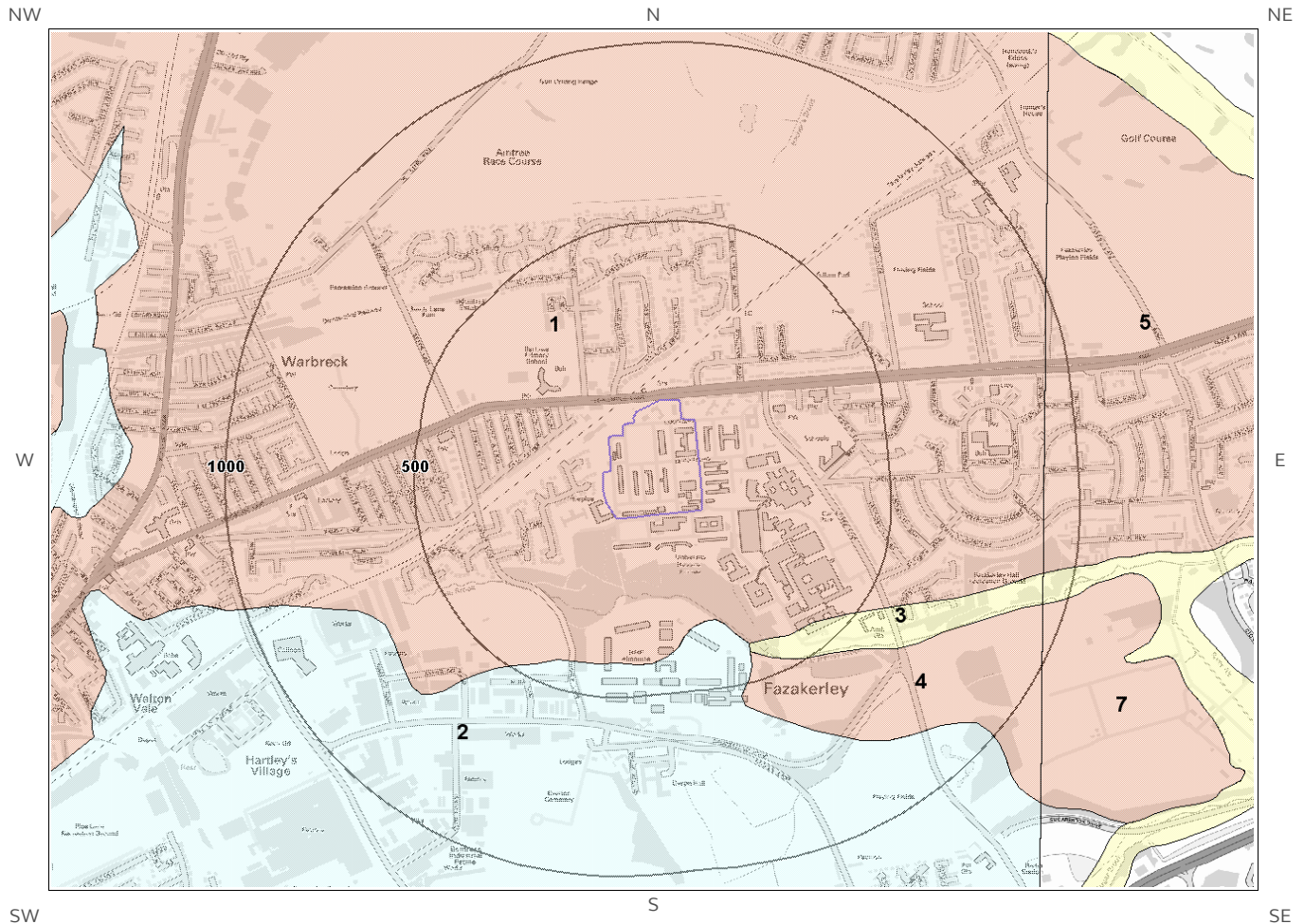
Are there any records relating to permeability of artificial ground within the study site boundary? No

Database searched and no data found.

---



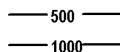
## 2.2 Superficial Deposits and Landslips map (1:50,000 scale)



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Site Outline



Search Buffers (m)

## 2.2 Superficial Deposits and Landslips

### 2.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary? Yes

| ID | Distance | Direction | LEX Code   | Description                  | Rock Description            |
|----|----------|-----------|------------|------------------------------|-----------------------------|
| 1  | 0.0      | On Site   | SSA-S      | SHIRDLEY HILL SAND FORMATION | SAND                        |
| 2  | 307.0    | S         | TILLD-DMTN | TILL, DEVENSIAN              | DIAMICTON                   |
| 3  | 393.0    | S         | ALV-XCZSV  | ALLUVIUM                     | CLAY, SILT, SAND AND GRAVEL |
| 4  | 416.0    | S         | SSA-S      | SHIRDLEY HILL SAND FORMATION | SAND                        |

### 2.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site boundary? Yes

| Distance (m) | Direction | Flow Type     | Maximum Permeability | Minimum Permeability |
|--------------|-----------|---------------|----------------------|----------------------|
| 0.0          | On Site   | Intergranular | High                 | High                 |

### 2.2.3 Landslip

Are there any records of Landslip within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

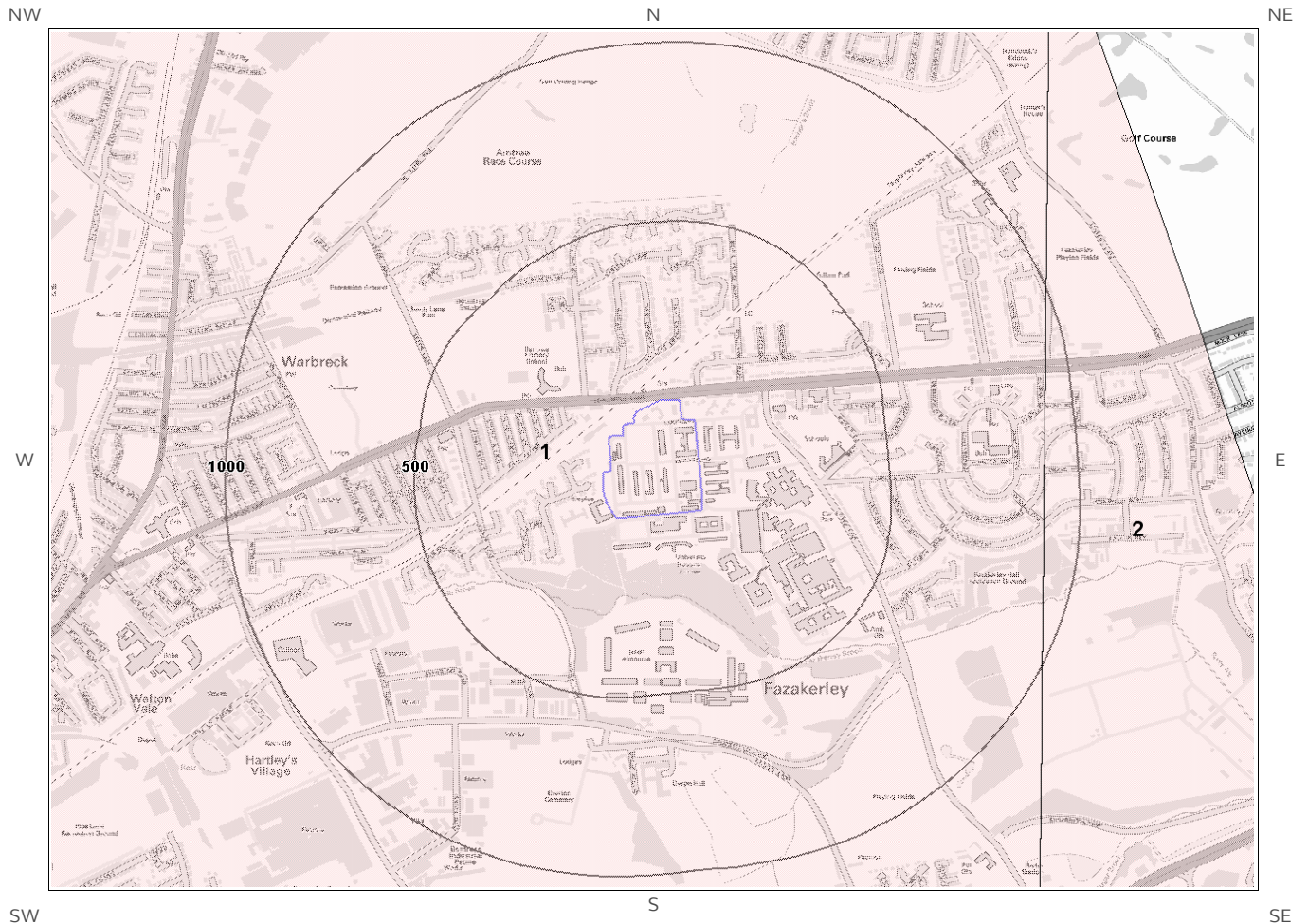
This Geology shows the main components as discrete layers, there are: Artificial/ Made Ground, Superficial/ Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

### 2.2.4 Landslip Permeability

Are there any records relating to permeability of landslips within the study site boundary? No

Database searched and no data found.

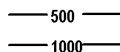
## 2.3 Bedrock and linear features map (1:50,000 scale)



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Site Outline



Search Buffers (m)



## 2.3 Bedrock, Solid Geology & linear features

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 083

### 2.3.1 Bedrock/Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary:

| ID | Distance | Direction | LEX Code  | Rock Description                         | Rock Age |
|----|----------|-----------|-----------|------------------------------------------|----------|
| 1  | 0.0      | On Site   | WLSF-SDST | WILMSLOW SANDSTONE FORMATION - SANDSTONE | -        |

### 2.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site boundary? Yes

| Distance | Direction | Flow Type     | Maximum Permeability | Minimum Permeability |
|----------|-----------|---------------|----------------------|----------------------|
| 0.0      | On Site   | Intergranular | High                 | High                 |

### 2.3.3 Linear features

Are there any records of linear features within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/Solid Geology and linear features such as faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nation wide coverage.

# 3 Radon Data

## 3.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?      The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

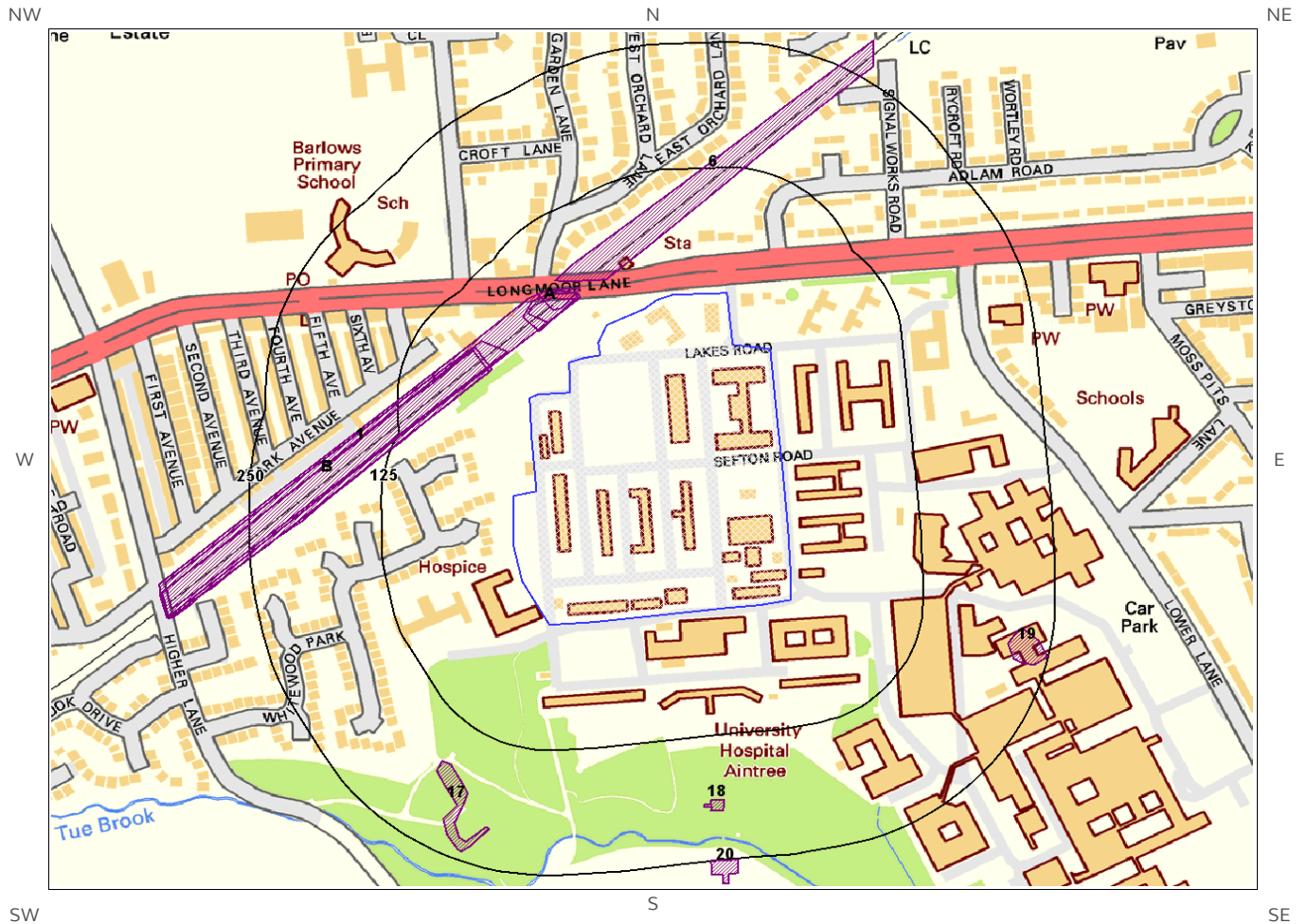
The radon data in this report is supplied by the BGS/Public Health England and is the definitive map of Radon Affected Areas in Great Britain and Northern Ireland. The dataset was created using long-term radon measurements in over 479,000 homes across Great Britain and 23,000 homes across Northern Ireland, combined with geological data. The dataset is considered accurate to 50m to allow for the margin of error in geological lines, and the findings of this report supercede any answer given in the less accurate Indicative Atlas of Radon in Great Britain, which simplifies the data to give the highest risk within any given 1km grid square. As such, the radon atlas is considered indicative, whereas the data given in this report is considered definitive.

---

## 3.2 Radon Protection

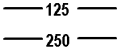
Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?      No radon protective measures are necessary.

# 4 Ground Workings map



Ground Workings Legend

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-  Site Outline
-  Search Buffers (m)
-  Historic Surface Ground Workings
-  Historic Underground Workings
-  Current Ground Workings



# 4 Ground Workings

## 4.1 Historical Surface Ground Working Features derived from Historical Mapping

This dataset is based on Groundsure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping

Are there any Historical Surface Ground Working Features within 250m of the study site boundary? Yes

| ID  | Distance (m) | Direction | NGR              | Use                         | Date |
|-----|--------------|-----------|------------------|-----------------------------|------|
| 1   | 37.0         | NW        | 337671<br>397127 | Cuttings                    | 1851 |
| 2A  | 39.0         | NW        | 337844<br>397271 | Cuttings                    | 1938 |
| 3A  | 39.0         | NW        | 337844<br>397271 | Cuttings                    | 1925 |
| 4A  | 39.0         | NW        | 337844<br>397271 | Cuttings                    | 1891 |
| 5A  | 39.0         | NW        | 337832<br>397276 | Cuttings                    | 1925 |
| 6   | 42.0         | NW        | 337997<br>397420 | Cuttings                    | 1851 |
| 7A  | 43.0         | NW        | 337850<br>397283 | Cuttings                    | 1955 |
| 8B  | 46.0         | NW        | 337631<br>397099 | Cuttings                    | 1925 |
| 9B  | 46.0         | NW        | 337630<br>397097 | Cuttings                    | 1925 |
| 10B | 46.0         | NW        | 337630<br>397097 | Cuttings                    | 1891 |
| 11B | 46.0         | NW        | 337630<br>397097 | Cuttings                    | 1906 |
| 12B | 46.0         | NW        | 337630<br>397097 | Cuttings                    | 1938 |
| 13B | 50.0         | NW        | 337639<br>397107 | Cuttings                    | 1955 |
| 14B | 50.0         | NW        | 337639<br>397107 | Cuttings                    | 1967 |
| 15B | 50.0         | NW        | 337639<br>397107 | Cuttings                    | 1974 |
| 16B | 50.0         | NW        | 337639<br>397107 | Cuttings                    | 1987 |
| 17  | 168.0        | SW        | 337759<br>396776 | Unspecified Ground Workings | 1891 |
| 18  | 189.0        | S         | 337997<br>396777 | Filter Beds                 | 1906 |
| 19  | 209.0        | E         | 338294<br>396935 | Pond                        | 1891 |
| 20  | 249.0        | S         | 338007<br>396710 | Filter Beds                 | 1906 |

## 4.2 Historical Underground Working Features derived from Historical Mapping

This data is derived from the Groundsure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary? No

Database searched and no data found.

---

## 4.3 Current Ground Workings

This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary? No

Database searched and no data found.

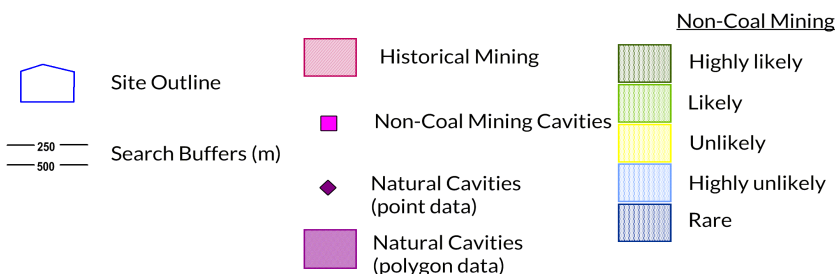
---

# 5 Mining, Extraction & Natural Cavities map



**Mining, Extraction and Natural Cavities Legend**

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# 5 Mining, Extraction & Natural Cavities

## 5.1 Historical Mining

This dataset is derived from Groundsure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

---

## 5.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

---

## 5.3 Johnson Poole and Bloomer

This dataset provides information as to whether the study site lies within an area where JPB hold information relating to mining.

Are there any JPB Mining areas within 1000m of the study site boundary? No

The following information provided by JPB is not represented on mapping: Database searched and no data found.

---

## 5.4 Non-Coal Mining

This dataset provides information as to whether the study site lies within an area which may have been subject to non-coal historic mining.

Are there any Non-Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

---

### 5.5 Non-Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled “Review of mining instability in Great Britain, 1990” PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary? No

Database searched and no data found.

---

### 5.6 Natural Cavities

This dataset provides information based on the Peter Brett Associates natural cavities database. The dataset is made up of points and polygons. Where polygons are used these represent an area in which it is expected the cavities could be found. It does not indicate that cavities are present everywhere within the polygon, and caution should be used in the interpretation of this data.

Are there any Natural Cavities within 1000m of the study site boundary? No

Database searched and no data found.

---

### 5.7 Brine Extraction

This data provides information from the Cheshire Brine Subsidence Compensation Board.

Are there any Brine Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

---

### 5.8 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

---

### 5.9 Cornwall and Devon Metalliferous Mining

This dataset provides information on metalliferous mining areas in Cornwall/Devon and is derived from records held by Mining Searches UK.

Are there any Cornwall and Devon Metalliferous Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

---

This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.

Are there any Clay Mining areas within 1000m of the study site boundary?

No

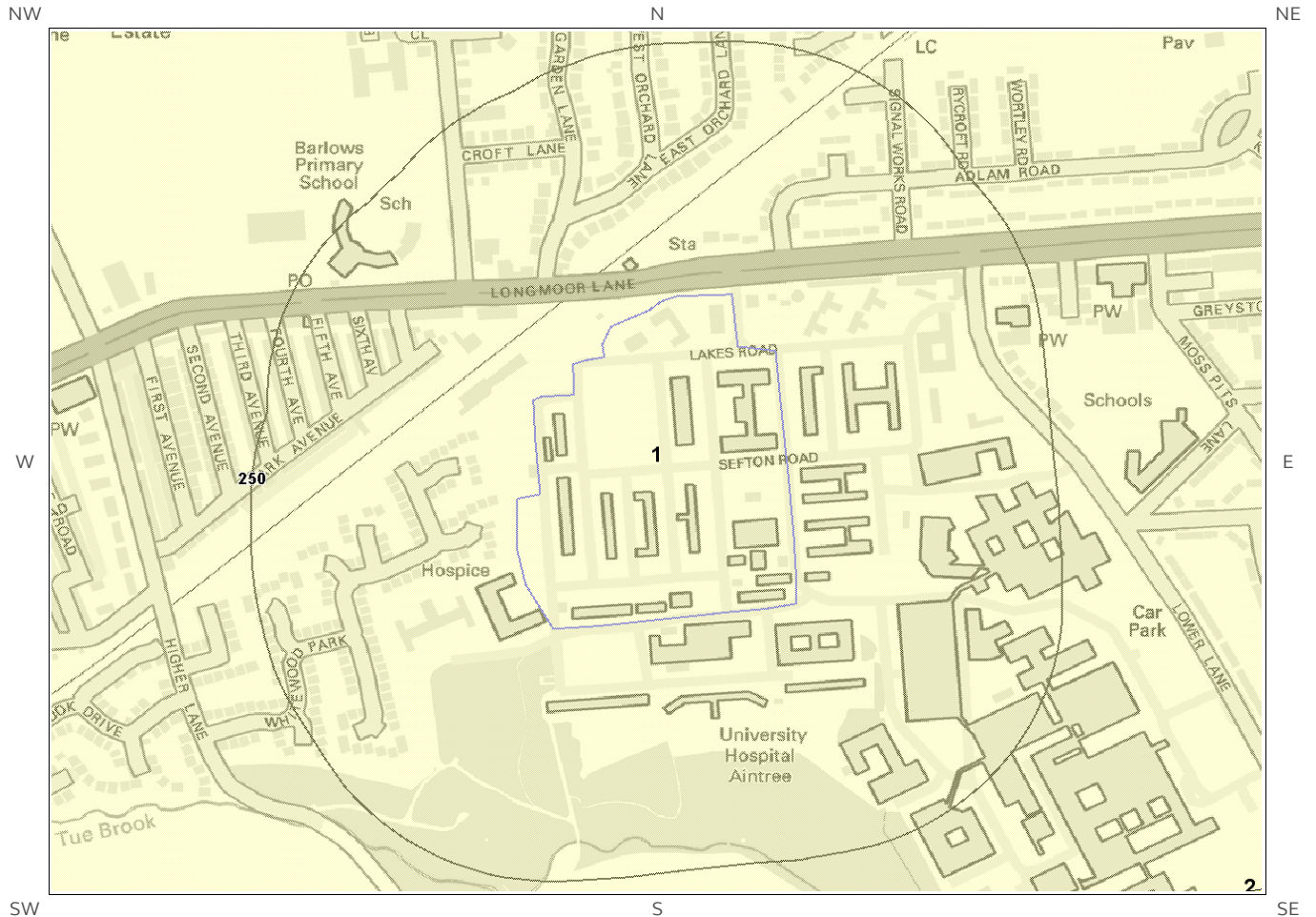
Database searched and no data found.

---



# 6 Natural Ground Subsidence

## 6.1 Shrink-Swell Clay map

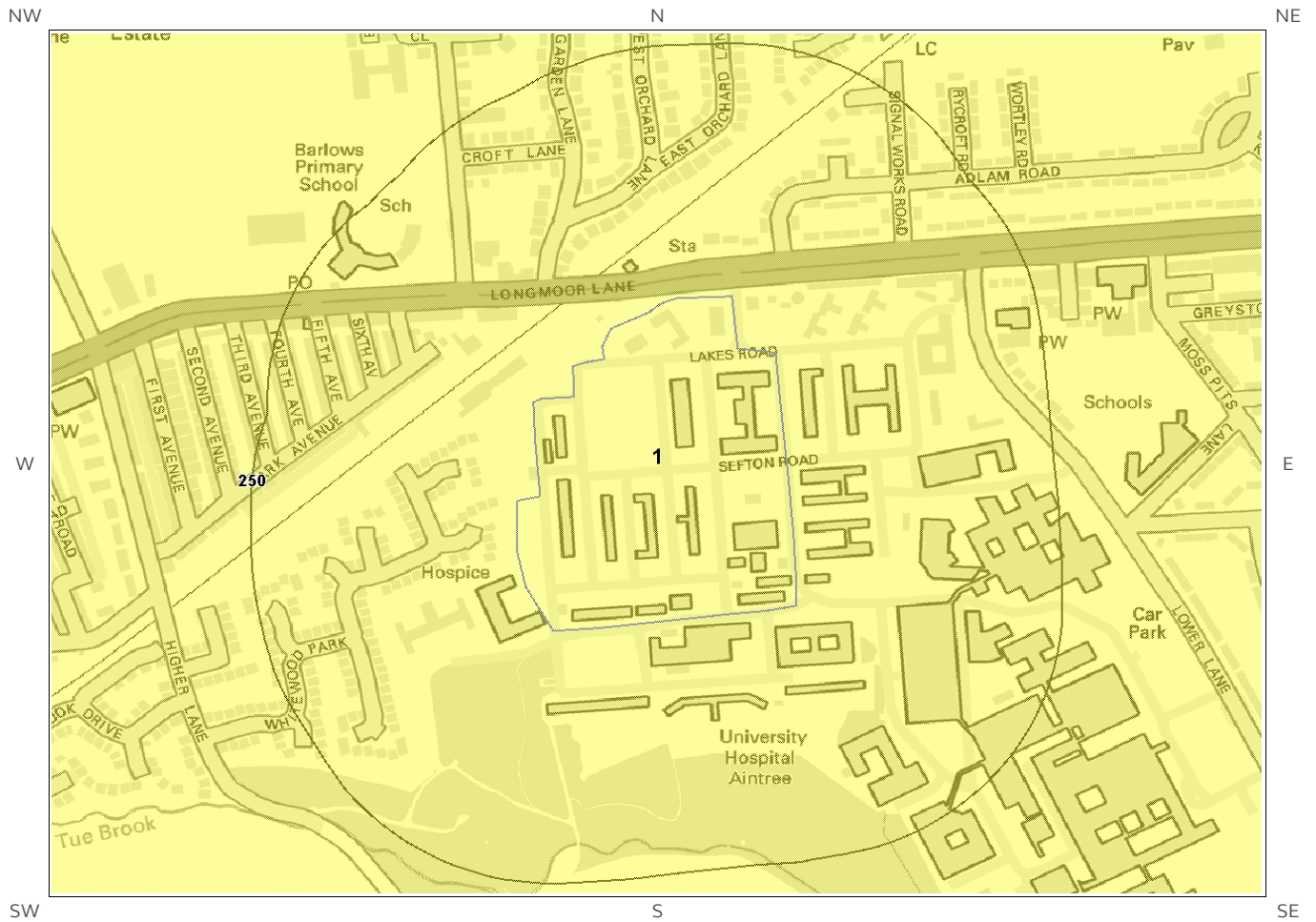


Shrink Swell Clay Legend

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## 6.2 Landslides map



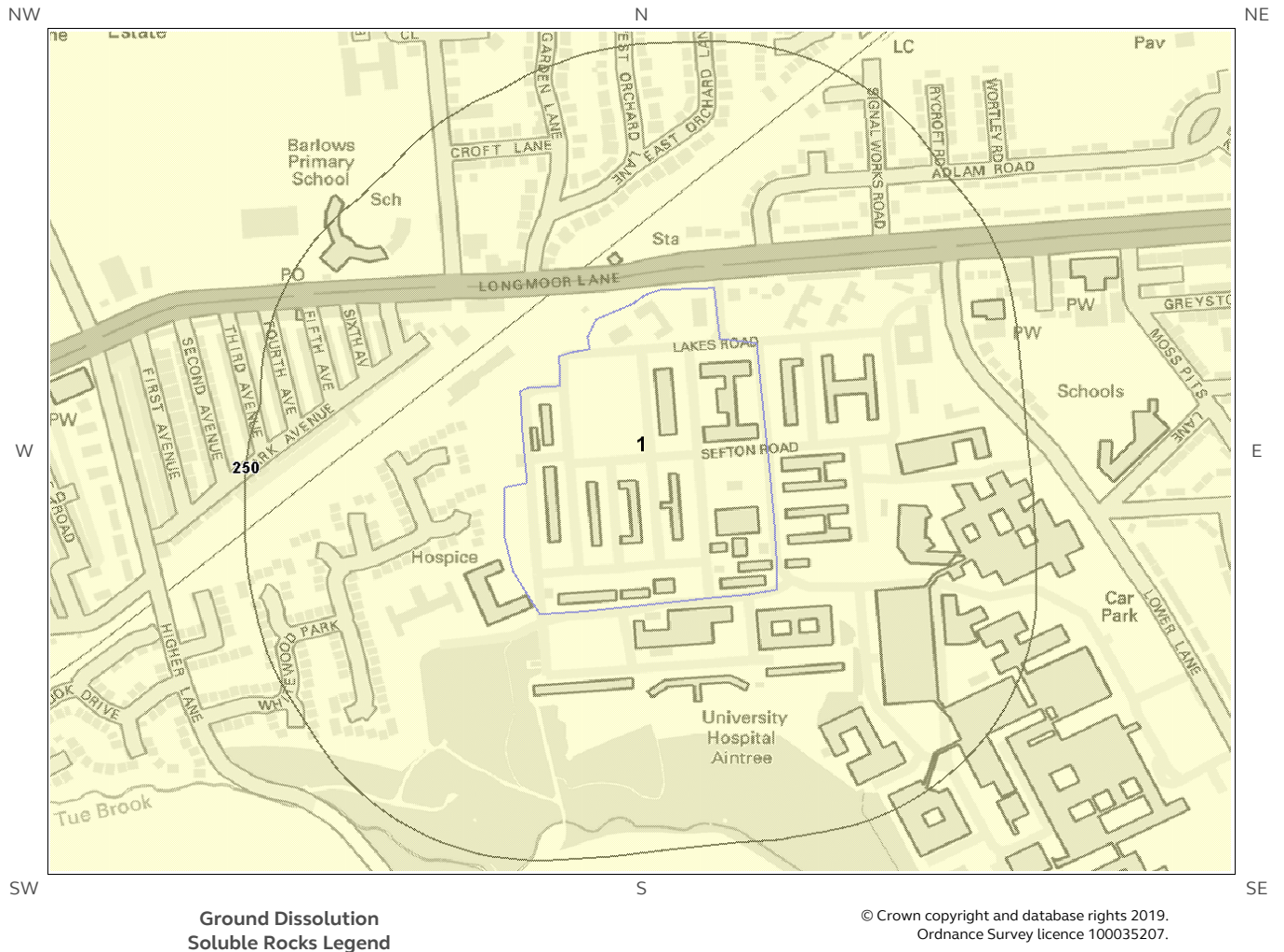
**Landslides Legend**

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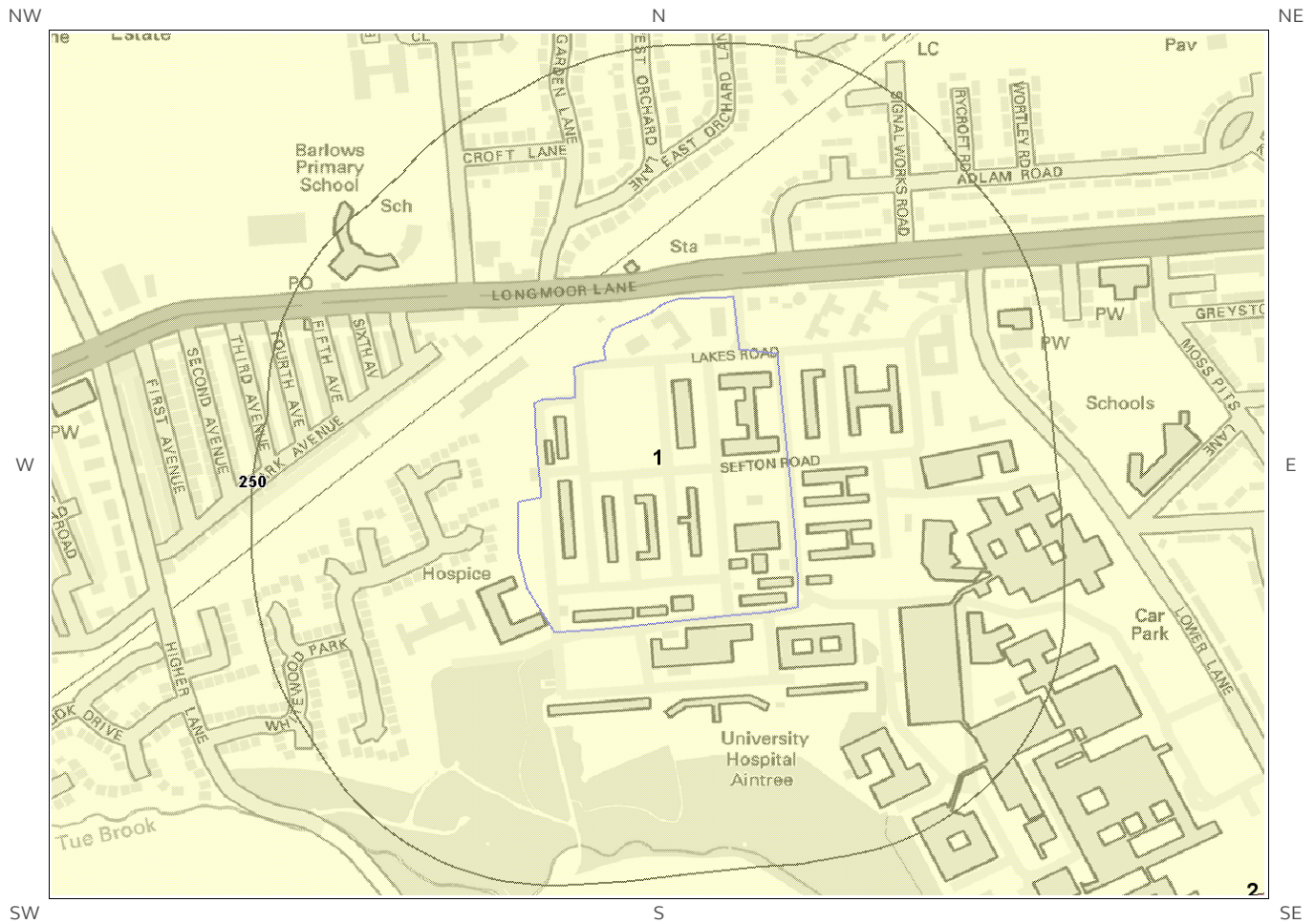


# 6.3 Ground Dissolution of Soluble Rocks map





## 6.4 Compressible Deposits map

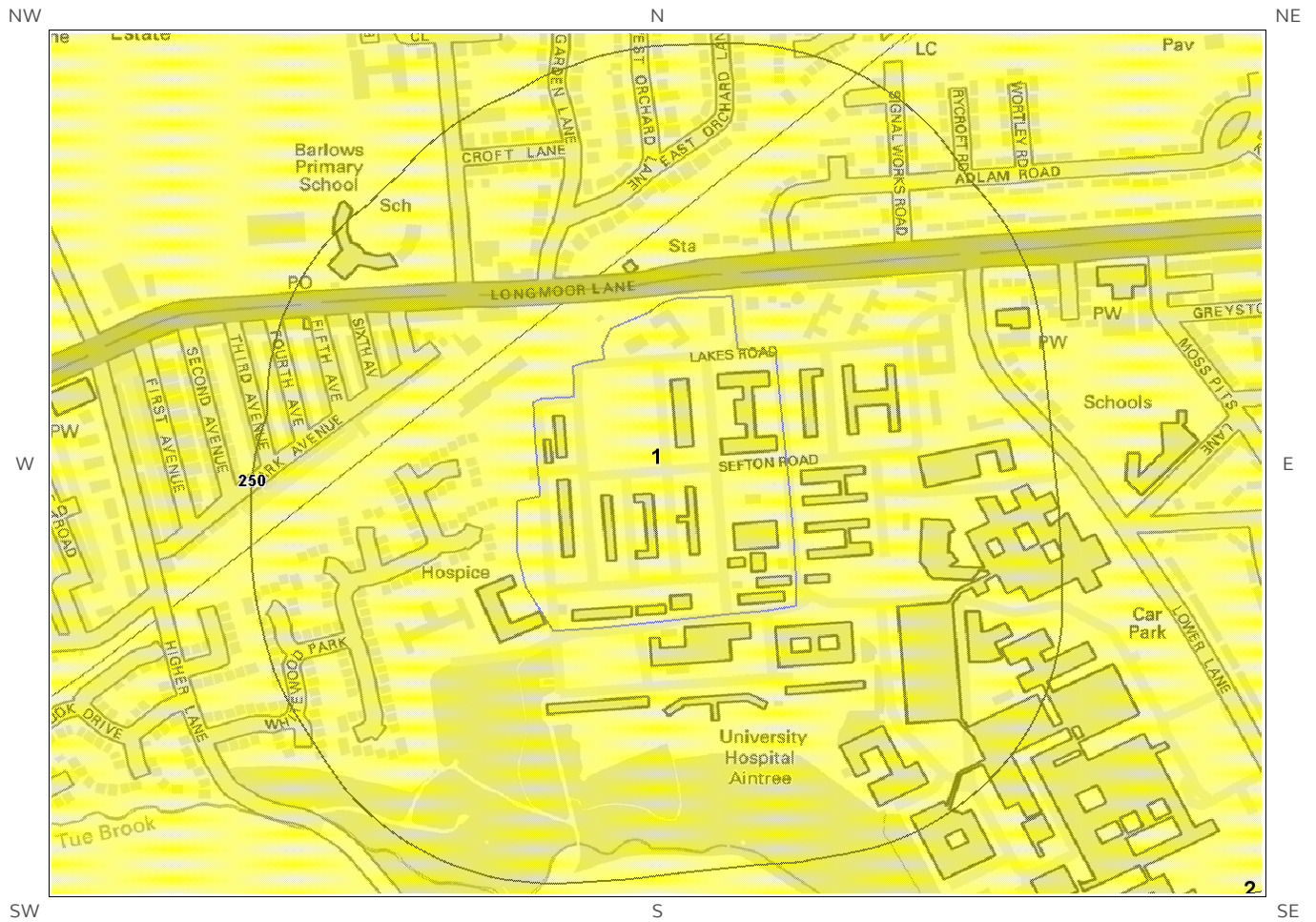


Compressible Deposits Legend

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# 6.5 Collapsible Deposits map



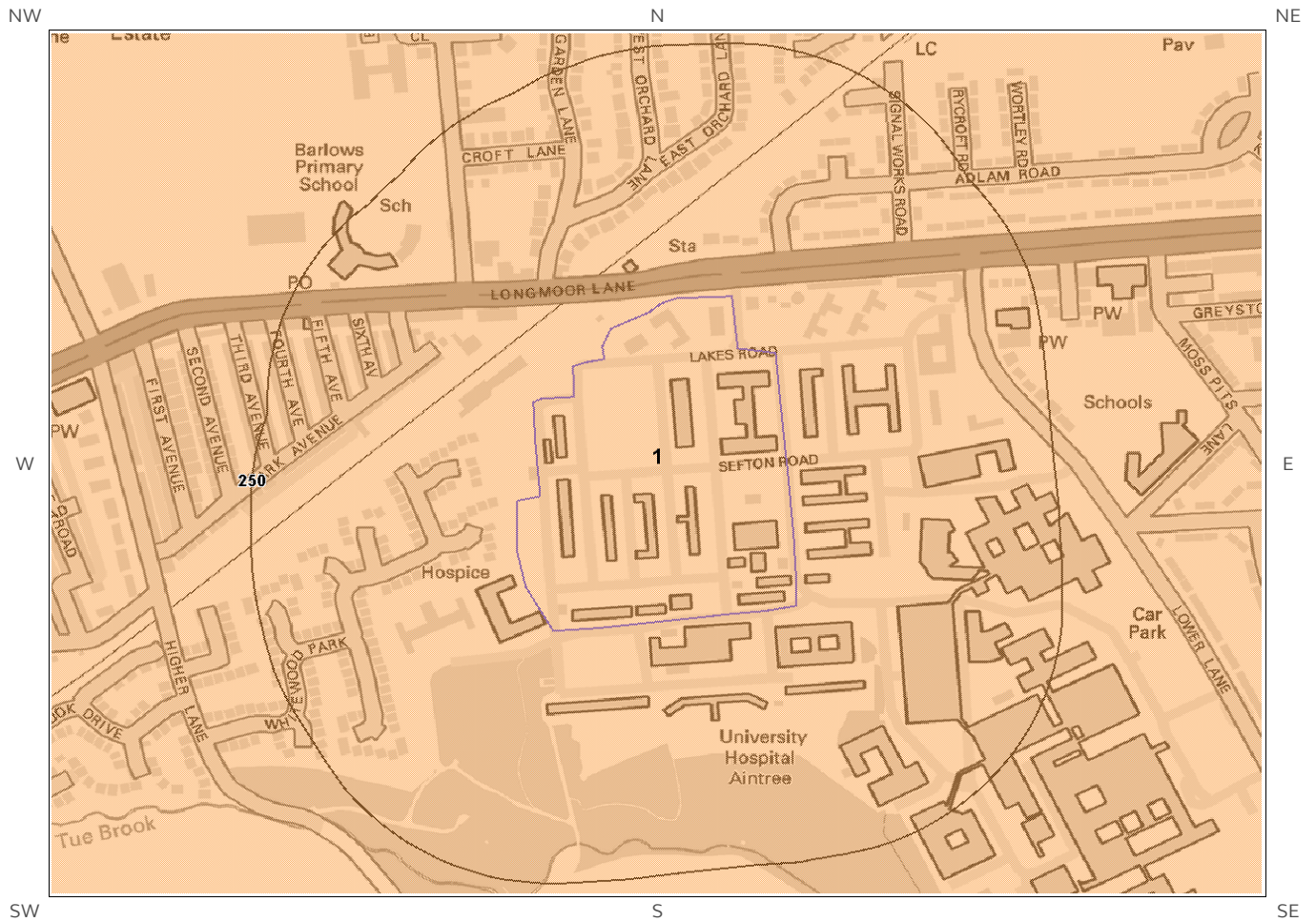
**Collapsible Deposits Legend**

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# 6.6 Running Sand map



Running Sand Legend

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## 6 Natural Ground Subsidence

The National Ground Subsidence rating is obtained through the 6 natural ground stability hazard datasets, which are supplied by the British Geological Survey (BGS).

The following GeoSure data represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

What is the maximum hazard rating of natural subsidence within the study site\*\* boundary? Low

### 6.1 Shrink-Swell Clays

The following Shrink Swell information provided by the British Geological Survey:

| ID | Distance (m) | Direction | Hazard Rating | Details                                                                                                                                                                                                                                                                                              |
|----|--------------|-----------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | 0.0          | On Site   | Negligible    | Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays. |

### 6.2 Landslides

The following Landslides information provided by the British Geological Survey:

| ID | Distance (m) | Direction | Hazard Rating | Details                                                                                                                                                                                                                                                                                 |
|----|--------------|-----------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | 0.0          | On Site   | Very Low      | Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides. |

### 6.3 Ground Dissolution of Soluble Rocks

The following Ground Dissolution information provided by the British Geological Survey:

| ID | Distance (m) | Direction | Hazard Rating | Details                                                                                                                                                                                                                                                                                                                               |
|----|--------------|-----------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | 0.0          | On Site   | Negligible    | Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks. |

\* This includes an automatically generated 50m buffer zone around the site

## 6.4 Compressible Deposits

The following Compressible Deposits information provided by the British Geological Survey:

| ID | Distance (m) | Direction | Hazard Rating | Details                                                                                                                                                                                                                                                                                                    |
|----|--------------|-----------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | 0.0          | On Site   | Negligible    | No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits. |

## 6.5 Collapsible Deposits

The following Collapsible Rocks information provided by the British Geological Survey:

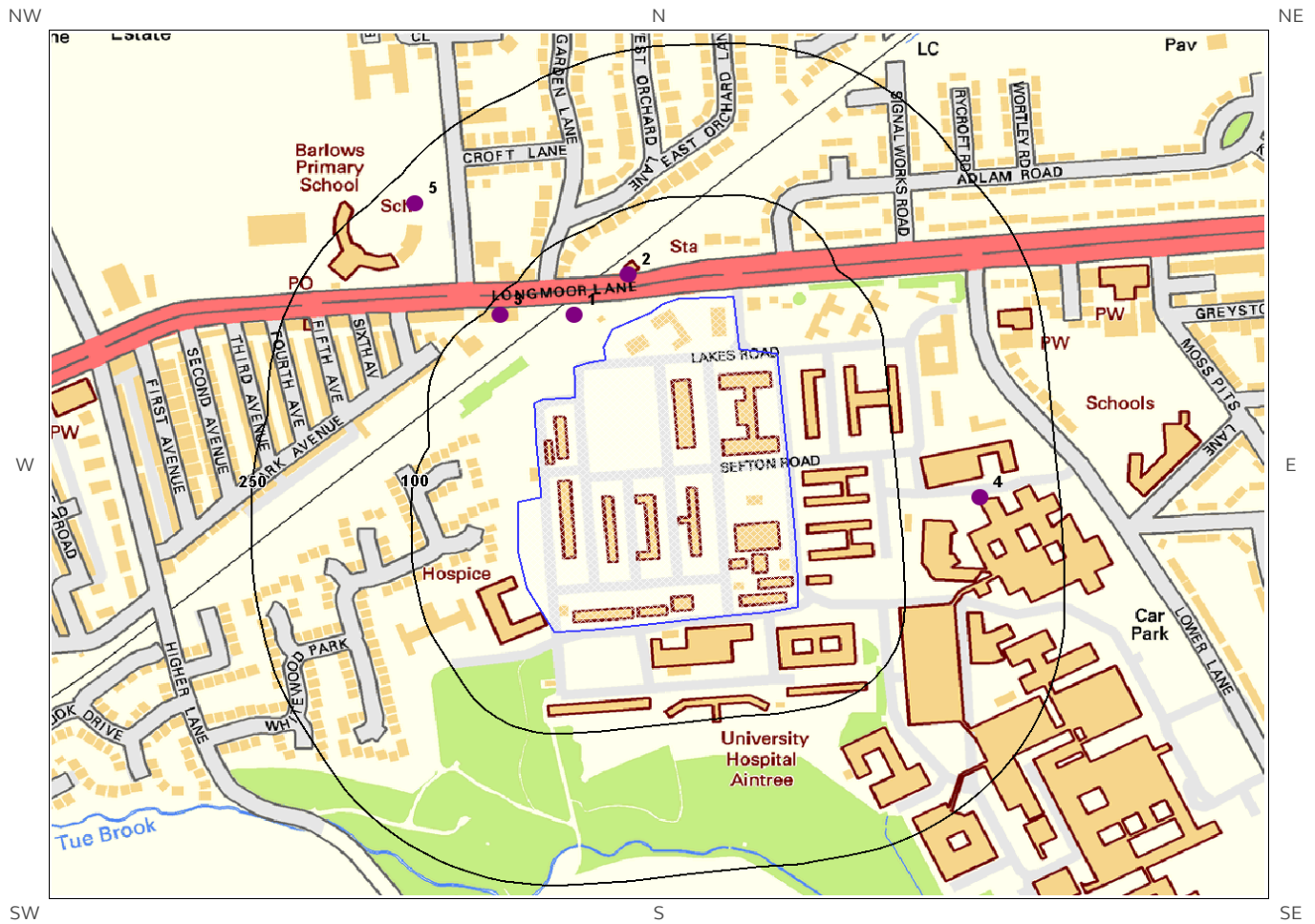
| ID | Distance (m) | Direction | Hazard Rating | Details                                                                                                                                                                                                                                             |
|----|--------------|-----------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | 0.0          | On Site   | Very Low      | Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits. |

## 6.6 Running Sands

The following Running Sands information provided by the British Geological Survey:

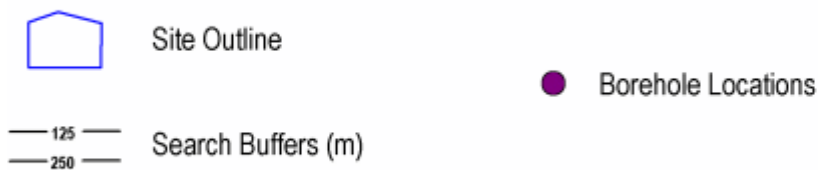
| ID | Distance (m) | Direction | Hazard Rating | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----|--------------|-----------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | 0.0          | On Site   | Low           | Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build - consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property - no significant increase in insurance risk due to running sand problems is likely. |

# 7 Borehole Records map



Borehole Records Legend

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## 7 Borehole Records

The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary:

5

| ID | Distance (m) | Direction | NGR              | BGS Reference | Drilled Length | Borehole Name                       |
|----|--------------|-----------|------------------|---------------|----------------|-------------------------------------|
| 1  | 38.0         | NW        | 337860<br>397270 | SJ39NE88      | 18.89          | FAZAKERLEY BRIDGE<br>LONG MOOR LA 2 |
| 2  | 42.0         | NW        | 337910<br>397310 | SJ39NE87      | 24.99          | FAZAKERLEY BRIDGE<br>LONG MOOR LA 1 |
| 3  | 87.0         | NW        | 337790<br>397270 | SJ39NE89      | 18.28          | FAZAKERLEY BRIDGE<br>LONG MOOR LA 3 |
| 4  | 175.0        | E         | 338240<br>397090 | SJ39NE597     | Not Available  | FAZAKERLEY HOSP<br>L'POOL 2         |
| 5  | 220.0        | NW        | 337710<br>397380 | SJ39NE108     | 5.35           | BARLOW LANE SCHOOL                  |

The borehole records are available using the hyperlinks below: Please note that if the donor of the borehole record has requested the information be held as commercial-in-confidence, the additional data will be held separately by the BGS and a formal request must be made for its release.

#1: [scans.bgs.ac.uk/sobi\\_scans/boreholes/159074](https://scans.bgs.ac.uk/sobi_scans/boreholes/159074)  
 #2: [scans.bgs.ac.uk/sobi\\_scans/boreholes/159073](https://scans.bgs.ac.uk/sobi_scans/boreholes/159073)  
 #3: [scans.bgs.ac.uk/sobi\\_scans/boreholes/159075](https://scans.bgs.ac.uk/sobi_scans/boreholes/159075)  
 #5: [scans.bgs.ac.uk/sobi\\_scans/boreholes/159094](https://scans.bgs.ac.uk/sobi_scans/boreholes/159094)

# 8 Estimated Background Soil Chemistry

Records of background estimated soil chemistry within 250m of the study site boundary:

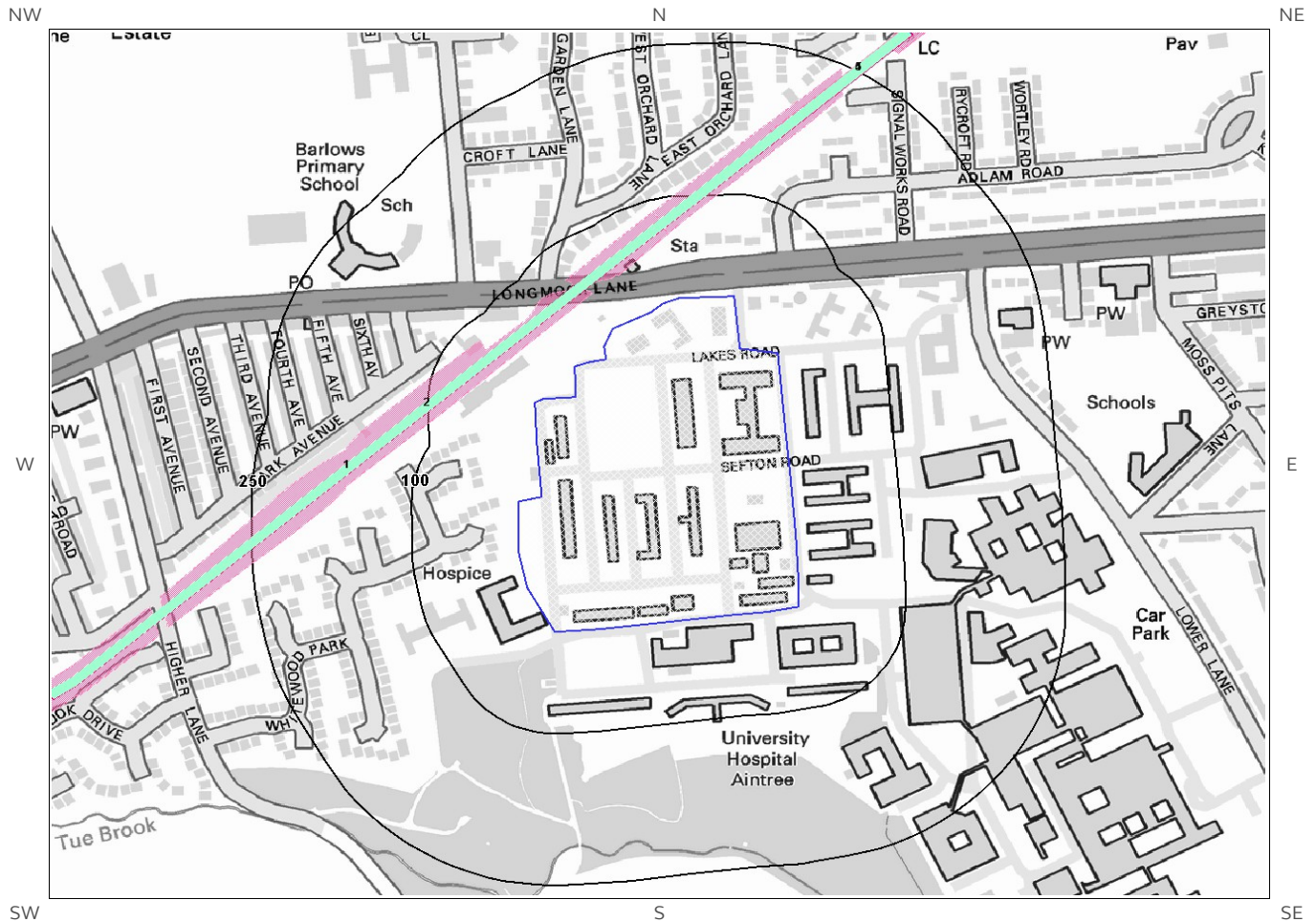
6

For further information on how this data is calculated and limitations upon its use, please see the Groundsure Geo Insight User Guide, available on request.

| Distance (m) | Direction | Sample Type | Arsenic (As)  | Cadmium (Cd) | Chromium (Cr) | Nickel (Ni) | Lead (Pb)       |
|--------------|-----------|-------------|---------------|--------------|---------------|-------------|-----------------|
| 0.0          | On Site   | RuralSoil   | 15 - 25 mg/kg | <1.8 mg/kg   | 60 - 90 mg/kg | <15 mg/kg   | 100 - 200 mg/kg |
| 0.0          | On Site   | RuralSoil   | 15 - 25 mg/kg | <1.8 mg/kg   | 60 - 90 mg/kg | <15 mg/kg   | 200 - 300 mg/kg |
| 0.0          | On Site   | RuralSoil   | 15 - 25 mg/kg | <1.8 mg/kg   | 60 - 90 mg/kg | <15 mg/kg   | 100 - 200 mg/kg |
| 0.0          | On Site   | RuralSoil   | 15 - 25 mg/kg | <1.8 mg/kg   | 60 - 90 mg/kg | <15 mg/kg   | 100 - 200 mg/kg |
| 0.0          | On Site   | RuralSoil   | 15 - 25 mg/kg | <1.8 mg/kg   | 60 - 90 mg/kg | <15 mg/kg   | 100 - 200 mg/kg |
| 0.0          | On Site   | RuralSoil   | 15 - 25 mg/kg | <1.8 mg/kg   | 60 - 90 mg/kg | <15 mg/kg   | 100 - 200 mg/kg |

\*As this data is based upon underlying 1:50,000 scale geological information, a 50m buffer has been added to the search radius.

# 9 Railways and Tunnels map



**Railways and Tunnels Legend**

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|  |                                                              |  |                                     |
|--|--------------------------------------------------------------|--|-------------------------------------|
|  | Underground or Partially Underground Railway / Subway System |  | Railway Track (OpenStreetMap)       |
|  | Railway Tunnel (OS Mapping)                                  |  | High Speed 2                        |
|  | Abandoned or Dismantled Railway (OpenStreetMap)              |  | High Speed 2 Revised Proposed Route |
|  | Railway Track (OS Mapping)                                   |  | Crossrail 1                         |
|  | Railway and/or Tunnel Feature from Historical Mapping        |  |                                     |
|  | Site Outline                                                 |  |                                     |
|  | 250 Search Buffers (m)                                       |  |                                     |
|  | 500 Search Buffers (m)                                       |  |                                     |



# 9 Railways and Tunnels

## 9.1 Tunnels

This data is derived from OpenStreetMap and provides information on the possible locations of underground railway systems in the UK - the London Underground, the Tyne & Wear Metro and the Glasgow Subway.

Have any underground railway lines been identified within the study site boundary? No

Have any underground railway lines been identified within 250m of the study site boundary? Yes

| Distance (m) | Direction | Detail     |
|--------------|-----------|------------|
| 48           | NW        | Merseyrail |

*Any records that have been identified are represented on the Railways and Tunnels map.*

This data is derived from Ordnance Survey mapping and provides information on the possible locations of railway tunnels forming part of the UK overground railway network.

Have any other railway tunnels been identified within the site boundary? No

Have any other railway tunnels been identified within 250m of the site boundary? No

Database searched and no data found.

*Any records that have been identified are represented on the Railways and Tunnels map.*

## 9.2 Historical Railway and Tunnel Features

This data is derived from Groundsure's unique Historical Land-use Database and contains features relating to tunnels, railway tracks or associated works that have been identified from historical Ordnance Survey mapping.

Have any historical railway or tunnel features been identified within the study site boundary? No

Have any historical railway or tunnel features been identified within 250m of the study site boundary? Yes

| ID | Distance (m) | Direction | NGR              | Details         | Date |
|----|--------------|-----------|------------------|-----------------|------|
| 1  | 39           | NW        | n/a              | Railway         | 1908 |
| 2  | 39           | NW        | n/a              | Railway         | 1891 |
| 3  | 160          | N         | 337320<br>397586 | Railway Sidings | 1927 |
| 4  | 162          | N         | 338352<br>397697 | Railway Sidings | 1893 |
| 5  | 162          | N         | 338226<br>397729 | Railway Sidings | 1908 |

*Any records that have been identified are represented on the Railways and Tunnels map.*

---

### 9.3 Historical Railways

This data is derived from OpenStreetMap and provides information on the possible alignments of abandoned or dismantled railway lines in proximity to the study site.

Have any historical railway lines been identified within the study site boundary? No

Have any historical railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

Multiple sections of the same track may be listed in the detail above

*Any records that have been identified are represented on the Railways and Tunnels map.*

---

### 9.4 Active Railways

These datasets are derived from Ordnance Survey mapping and OpenStreetMap and provide information on the possible locations of active railway lines in proximity to the study site.

Have any active railway lines been identified within the study site boundary? No

Have any active railway lines been identified within 250m of the study site boundary? Yes

| Distance (m) | Direction | Name                                   | Type        |
|--------------|-----------|----------------------------------------|-------------|
| 49           | NW        | Merseyrail Northern Line (Up Kirkby)   | rail        |
| 49           | NW        | Merseyrail Northern Line (Up Kirkby)   | rail        |
| 52           | NW        | Not given                              | Multi Track |
| 52           | NW        | Not given                              | Multi Track |
| 53           | NW        | Merseyrail Northern Line (Down Kirkby) | rail        |
| 53           | NW        | Not given                              | Multi Track |
| 53           | NW        | Not given                              | Multi Track |
| 53           | NW        | Merseyrail Northern Line (Down Kirkby) | rail        |
| 60           | NW        | Not given                              | Multi Track |
| 60           | NW        | Not given                              | Multi Track |

Multiple sections of the same track may be listed in the detail above

*Any records that have been identified are represented on the Railways and Tunnels map.*

---

### 9.5 Railway Projects

These datasets provide information on the location of large scale railway projects High Speed 2 and Crossrail 1 .

Is the study site within 5km of the route of the High Speed 2 rail project? No

Is the study site within 500m of the route of the Crossrail 1 rail project? No

*Further information on proximity to these routes, the project construction status and associated works can be obtained through the purchase of a Groundsure HS2 and Crossrail 1 Report.*

---

The route data has been digitised from publicly available maps by Groundsure. The route as provided relates to the Crossrail 1 project only, and does not include any details of the Crossrail 2 project, as final details of the route for Crossrail 2 are still under consultation.

Please note that this assessment takes account of both the original Phase 2b proposed route and the amended route proposed in 2016. As the Phase 2b route is still under consultation, Groundsure are providing information on both options until the final route is formally confirmed. Practitioners should take account of this uncertainty when advising clients.



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---

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<https://www.groundsure.com/terms-and-conditions-feb11-2019>





emapsite

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Farnborough, GU14 0LX

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Report Date

11 Sep 2019

Report Delivery  
Method:

Email - pdf

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If you would like further assistance regarding this report then please contact the emapsite customer services team on 0118 9736883 quoting the above report reference number.

Yours faithfully,

emapsite customer services team

Enc.

Groundsure Enviroinsight

Address: Aintree Hospital,  
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Client: emapsite

NW

N

NE

W

E



SW

S

SE

Aerial Photograph Capture date: 11-Jun-2015  
Grid Reference: 337944,397107  
Site Size: 6.7891ha

Report Reference: EMS-565955\_760429  
Client Reference: EMS\_565955\_760429

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# Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

| Section 1: Historical Industrial Sites                                                                 | On-site | 0-50  | 51-250 | 251-500 |
|--------------------------------------------------------------------------------------------------------|---------|-------|--------|---------|
| 1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping                              | 19      | 18    | 15     | 62      |
| 1.2 Additional Information – Historical Tank Database                                                  | 0       | 5     | 5      | 11      |
| 1.3 Additional Information – Historical Energy Features Database                                       | 0       | 4     | 15     | 19      |
| 1.4 Additional Information – Historical Petrol and Fuel Site Database                                  | 0       | 0     | 0      | 0       |
| 1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database                       | 0       | 0     | 1      | 0       |
| 1.6 Historical military sites                                                                          | 0       | 0     | 0      | 0       |
| 1.7 Potentially Infilled Land                                                                          | 0       | 16    | 4      | 28      |
| Section 2: Environmental Permits, Incidents and Registers                                              | On-site | 0-50m | 51-250 | 251-500 |
| 2.1 Industrial Sites Holding Environmental Permits and/or Authorisations                               |         |       |        |         |
| 2.1.1 Records of historic IPC Authorisations                                                           | 0       | 0     | 0      | 0       |
| 2.1.2 Records of Part A(1) and IPPC Authorised Activities                                              | 0       | 0     | 0      | 0       |
| 2.1.3 Records of Red List Discharge Consents                                                           | 0       | 0     | 0      | 0       |
| 2.1.4 Records of List 1 Dangerous Substances Inventory sites                                           | 0       | 0     | 0      | 0       |
| 2.1.5 Records of List 2 Dangerous Substances Inventory sites                                           | 0       | 0     | 0      | 0       |
| 2.1.6 Records of Part A(2) and Part B Activities and Enforcements                                      | 0       | 0     | 0      | 1       |
| 2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations                                 | 14      | 0     | 0      | 0       |
| 2.1.8 Records of Licensed Discharge Consents                                                           | 0       | 0     | 0      | 0       |
| 2.1.9 Records of Water Industry Referrals                                                              | 0       | 0     | 0      | 0       |
| 2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site | 0       | 0     | 0      | 0       |
| 2.2 Records of COMAH and NIHHS sites                                                                   | 0       | 0     | 0      | 0       |
| 2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents                            |         |       |        |         |
| 2.3.1 National Incidents Recording System, List 2                                                      | 0       | 0     | 0      | 2       |
| 2.3.2 National Incidents Recording System, List 1                                                      | 0       | 0     | 0      | 0       |
| 2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990                                       | 0       | 0     | 0      | 0       |



| Section 3: Landfill and Other Waste Sites                                          | On-site | 0-50m | 51-250 | 251-500 | 501-1000     | 1000-1500    |
|------------------------------------------------------------------------------------|---------|-------|--------|---------|--------------|--------------|
| 3.1 Landfill Sites                                                                 |         |       |        |         |              |              |
| 3.1.1 Environment Agency/Natural Resources Wales Registered Landfill Sites         | 0       | 0     | 0      | 0       | 0            | Not searched |
| 3.1.2 Environment Agency/Natural Resources Wales Historic Landfill Sites           | 0       | 0     | 0      | 0       | 1            | 6            |
| 3.1.3 BGS/DoE Landfill Site Survey                                                 | 0       | 0     | 0      | 0       | 0            | 0            |
| 3.1.4 Records of Landfills in Local Authority and Historical Mapping Records       | 0       | 0     | 0      | 0       | 0            | 0            |
| 3.2 Landfill and Other Waste Sites Findings                                        |         |       |        |         |              |              |
| 3.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites | 0       | 0     | 0      | 1       | Not searched | Not searched |
| 3.2.2 Environment Agency/Natural Resources Wales Licensed Waste Sites              | 0       | 0     | 0      | 0       | 0            | 8            |

| Section 4: Current Land Use                      | On-site | 0-50m | 51-250 | 251-500      |
|--------------------------------------------------|---------|-------|--------|--------------|
| 4.1 Current Industrial Sites Data                | 1       | 4     | 17     | Not searched |
| 4.2 Records of Petrol and Fuel Sites             | 0       | 0     | 0      | 0            |
| 4.3 National Grid Underground Electricity Cables | 0       | 0     | 0      | 0            |
| 4.4 National Grid Gas Transmission Pipelines     | 0       | 0     | 0      | 0            |

| Section 5: Geology                                                                                     |                 |
|--------------------------------------------------------------------------------------------------------|-----------------|
| 5.1 Records of Artificial Ground and Made Ground present beneath the study site                        | None identified |
| 5.2 Records of Superficial Ground and Drift Geology present beneath the study site                     | Identified      |
| 5.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section. |                 |

| Section 6: Hydrogeology and Hydrology                                                         | 0-500m     |       |        |         |              |              |
|-----------------------------------------------------------------------------------------------|------------|-------|--------|---------|--------------|--------------|
| 6.1 Records of Strata Classification in the Superficial Geology within 500m of the study site | Identified |       |        |         |              |              |
| 6.2 Records of Strata Classification in the Bedrock Geology within 500m of the study site     | Identified |       |        |         |              |              |
|                                                                                               | On-site    | 0-50m | 51-250 | 251-500 | 501-1000     | 1000-2000    |
| 6.3 Groundwater Abstraction Licences (within 2000m of the study site)                         | 0          | 0     | 0      | 2       | 1            | 16           |
| 6.4 Surface Water Abstraction Licences (within 2000m of the study site)                       | 0          | 0     | 0      | 0       | 0            | 0            |
| 6.5 Potable Water Abstraction Licences (within 2000m of the study site)                       | 0          | 0     | 0      | 0       | 0            | 3            |
| 6.6 Source Protection Zones (within 500m of the study site)                                   | 1          | 0     | 0      | 0       | Not searched | Not searched |
| 6.7 Source Protection Zones within Confined Aquifer                                           | 0          | 0     | 0      | 0       | Not searched | Not searched |
| 6.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)     | 1          | 0     | 0      | 1       | Not searched | Not searched |

| Section 6: Hydrogeology and Hydrology                                                                      |         | 0-500m |        |              |              |              |
|------------------------------------------------------------------------------------------------------------|---------|--------|--------|--------------|--------------|--------------|
|                                                                                                            | On-site | 0-50m  | 51-250 | 251-500      | 501-1000     | 1000-1500    |
| 6.9 Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site | No      | No     | Yes    | No           | Yes          | Yes          |
| 6.10 Ordnance Survey MasterMap Water Network entries within 500m of the site                               | 0       | 0      | 4      | 16           | Not searched | Not searched |
| 6.11 Surface water features within 250m of the study site                                                  | No      | No     | Yes    | Not searched | Not searched | Not searched |

| Section 7: Flooding                                                                             |                         |
|-------------------------------------------------------------------------------------------------|-------------------------|
| 7.1 Environment Agency Zone 2 floodplains within 250m of the study site                         | Identified              |
| 7.2 Environment Agency/Natural Resources Wales Zone 3 floodplains within 250m of the study site | Identified              |
| 7.3 Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site                 | Very Low                |
| 7.4 Flood Defences within 250m of the study site                                                | None identified         |
| 7.5 Areas benefiting from Flood Defences within 250m of the study site                          | None identified         |
| 7.6 Areas used for Flood Storage within 250m of the study site                                  | None identified         |
| 7.7 Maximum BGS Groundwater Flooding susceptibility within 50m of the study site                | Potential below Surface |
| 7.8 BGS confidence rating for the Groundwater Flooding susceptibility areas                     | Low                     |

| Section 8: Designated Environmentally Sensitive Sites      | On-site | 0-50m | 51-250 | 251-500 | 501-1000 | 1000-2000 |
|------------------------------------------------------------|---------|-------|--------|---------|----------|-----------|
| 8.1 Records of Sites of Special Scientific Interest (SSSI) | 0       | 0     | 0      | 0       | 0        | 0         |
| 8.2 Records of National Nature Reserves (NNR)              | 0       | 0     | 0      | 0       | 0        | 0         |
| 8.3 Records of Special Areas of Conservation (SAC)         | 0       | 0     | 0      | 0       | 0        | 0         |
| 8.4 Records of Special Protection Areas (SPA)              | 0       | 0     | 0      | 0       | 0        | 0         |
| 8.5 Records of Ramsar sites                                | 0       | 0     | 0      | 0       | 0        | 0         |
| 8.6 Records of Ancient Woodlands                           | 0       | 0     | 0      | 0       | 0        | 0         |
| 8.7 Records of Local Nature Reserves (LNR)                 | 0       | 0     | 0      | 0       | 0        | 0         |
| 8.8 Records of World Heritage Sites                        | 0       | 0     | 0      | 0       | 0        | 0         |
| 8.9 Records of Environmentally Sensitive Areas             | 0       | 0     | 0      | 0       | 0        | 0         |

| Section 8: Designated Environmentally Sensitive Sites      | On-site | 0-50m | 51-250 | 251-500 | 501-1000 | 1000-2000 |
|------------------------------------------------------------|---------|-------|--------|---------|----------|-----------|
| 8.10 Records of Areas of Outstanding Natural Beauty (AONB) | 0       | 0     | 0      | 0       | 0        | 0         |
| 8.11 Records of National Parks                             | 0       | 0     | 0      | 0       | 0        | 0         |
| 8.12 Records of Nitrate Sensitive Areas                    | 0       | 0     | 0      | 0       | 0        | 0         |
| 8.13 Records of Nitrate Vulnerable Zones                   | 1       | 0     | 0      | 0       | 0        | 1         |
| 8.14 Records of Green Belt land                            | 0       | 0     | 0      | 1       | 1        | 2         |

| Section 9: Natural Hazards                                                                                                                                                                       |                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| 9.1 Maximum risk of natural ground subsidence                                                                                                                                                    | Low                                                                                                 |
| 9.1.1 Maximum Shrink-Swell hazard rating identified on the study site                                                                                                                            | Negligible                                                                                          |
| 9.1.2 Maximum Landslides hazard rating identified on the study site                                                                                                                              | Very Low                                                                                            |
| 9.1.3 Maximum Soluble Rocks hazard rating identified on the study site                                                                                                                           | Negligible                                                                                          |
| 9.1.4 Maximum Compressible Ground hazard rating identified on the study site                                                                                                                     | Negligible                                                                                          |
| 9.1.5 Maximum Collapsible Rocks hazard rating identified on the study site                                                                                                                       | Very Low                                                                                            |
| 9.1.6 Maximum Running Sand hazard rating identified on the study site                                                                                                                            | Low                                                                                                 |
| 9.2 Radon                                                                                                                                                                                        |                                                                                                     |
| 9.2.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?                                   | The site is not in a Radon Affected Area, as less than 1% of properties are above the Action Level. |
| 9.2.2 Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? | No radon protective measures are necessary.                                                         |

| Section 10: Mining                                               |                 |
|------------------------------------------------------------------|-----------------|
| 10.1 Coal mining areas within 75m of the study site              | None identified |
| 10.2 Non-Coal Mining areas within 50m of the study site boundary | None identified |
| 10.3 Brine affected areas within 75m of the study site           | None identified |



# Using this report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client. The document contains the following sections:

## 1. Historical Industrial Sites

Provides information on past land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. Potentially Infilled Land features are also included. This search is conducted using radii of up to 500m.

## 2. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

## 3. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

## 4. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure gas pipelines and underground electricity transmission lines.

## 5. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

## 6. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licences, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

## 7. Flooding

Provides information on river and coastal flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

## 8. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites and Scheduled Ancient Woodland. These searches are conducted using radii of up to 2000m.

## 9. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence and radon..

## 10. Mining

Provides information on areas of coal and non-coal mining and brine affected areas.

## 11. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, Groundsure provide a free Technical Helpline (08444 159000) for further information and guidance.

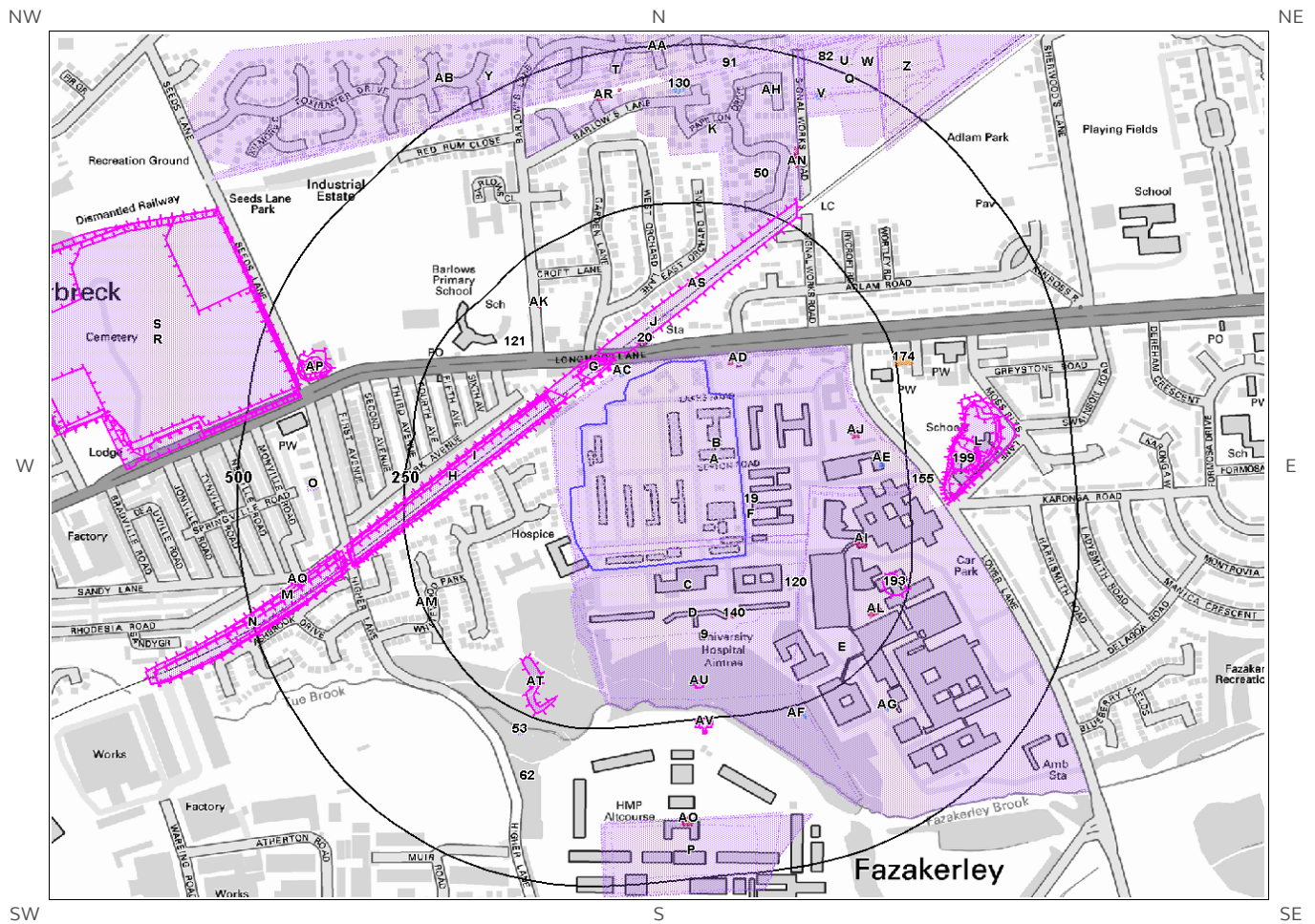
## Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier "A" on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

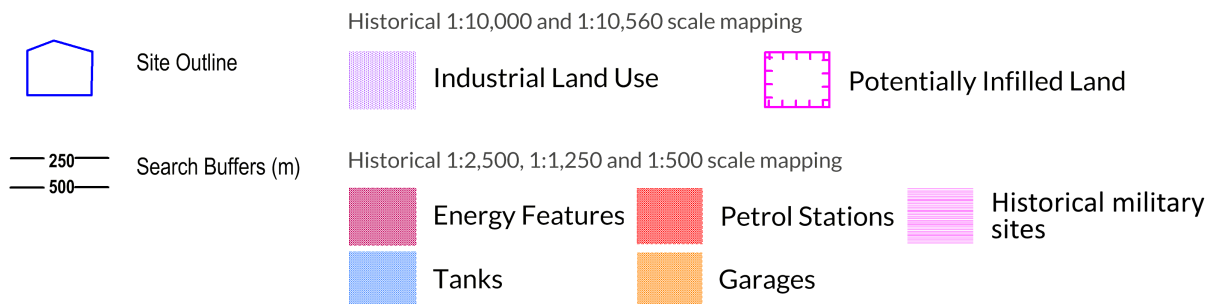
Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as "Not Shown".

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

# 1. Historical Land Use



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# 1. Historical Industrial Sites

## 1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping

The systematic analysis of data extracted from standard 1:10,560 and 1:10,000 scale historical maps provides the following information:

Records of sites with a potentially contaminative past land use within 500m of the search boundary: 114

| ID   | Distance [m] | Direction | Use                | Date |
|------|--------------|-----------|--------------------|------|
| 1A   | 0            | On Site   | Hospital           | 1906 |
| 2A   | 0            | On Site   | Isolation Hospital | 1925 |
| 3B   | 0            | On Site   | Hospital           | 1987 |
| 4B   | 0            | On Site   | Hospital           | 1955 |
| 5B   | 0            | On Site   | Hospital           | 1967 |
| 6B   | 0            | On Site   | Hospital           | 1974 |
| 7C   | 0            | On Site   | Sanatorium         | 1925 |
| 8C   | 0            | On Site   | Sanatorium         | 1938 |
| 9    | 0            | On Site   | Sanatorium         | 1925 |
| 10D  | 0            | On Site   | Sanatorium         | 1955 |
| 11D  | 0            | On Site   | Hospital           | 1967 |
| 12E  | 0            | On Site   | Hospital           | 1987 |
| 13E  | 0            | On Site   | Hospital           | 1974 |
| 14A  | 0            | On Site   | Isolation Hospital | 1925 |
| 15A  | 0            | On Site   | Isolation Hospital | 1938 |
| 16F  | 0            | On Site   | Laundry            | 1925 |
| 17F  | 0            | On Site   | Laundry            | 1938 |
| 18F  | 0            | On Site   | Laundry            | 1925 |
| 19   | 0            | On Site   | Laundry            | 1955 |
| 20   | 36           | N         | Railway Station    | 1987 |
| 21I  | 37           | NW        | Cuttings           | 1851 |
| 22G  | 39           | NW        | Cuttings           | 1938 |
| 23G  | 39           | NW        | Cuttings           | 1891 |
| 24G  | 39           | NW        | Cuttings           | 1925 |
| 25G  | 39           | NW        | Cuttings           | 1925 |
| 26AS | 42           | NW        | Cuttings           | 1851 |
| 27G  | 43           | NW        | Cuttings           | 1955 |
| 28J  | 44           | NW        | Railway Station    | 1925 |
| 29H  | 46           | NW        | Cuttings           | 1925 |
| 30H  | 46           | NW        | Cuttings           | 1925 |
| 31H  | 46           | NW        | Cuttings           | 1906 |
| 32H  | 46           | NW        | Cuttings           | 1938 |
| 33H  | 46           | NW        | Cuttings           | 1891 |
| 34I  | 50           | NW        | Cuttings           | 1955 |



|      |     |    |                             |      |
|------|-----|----|-----------------------------|------|
| 35H  | 50  | NW | Cuttings                    | 1967 |
| 36H  | 50  | NW | Cuttings                    | 1987 |
| 37H  | 50  | NW | Cuttings                    | 1974 |
| 38J  | 55  | N  | Railway Station             | 1938 |
| 39J  | 55  | N  | Railway Station             | 1925 |
| 40J  | 55  | N  | Railway Station             | 1906 |
| 41J  | 59  | N  | Railway Station             | 1967 |
| 42J  | 59  | N  | Railway Station             | 1974 |
| 43J  | 59  | N  | Railway Station             | 1891 |
| 44G  | 63  | NW | Railway Station             | 1851 |
| 45J  | 65  | N  | Railway Station             | 1955 |
| 46AT | 168 | SW | Unspecified Ground Workings | 1891 |
| 47K  | 171 | N  | Unspecified Works           | 1974 |
| 48K  | 171 | N  | Unspecified Works           | 1987 |
| 49AU | 189 | S  | Filter Beds                 | 1906 |
| 50   | 238 | N  | Unspecified Works           | 1967 |
| 51AF | 249 | S  | Unspecified Covered Tank    | 1906 |
| 52AV | 249 | S  | Filter Beds                 | 1906 |
| 53   | 274 | SW | Unspecified Tank            | 1974 |
| 54L  | 301 | E  | Unspecified Pits            | 1891 |
| 55L  | 302 | E  | Unspecified Pits            | 1906 |
| 56L  | 317 | E  | Unspecified Pits            | 1925 |
| 57L  | 328 | E  | Unspecified Pits            | 1925 |
| 58M  | 343 | W  | Cuttings                    | 1974 |
| 59M  | 343 | W  | Cuttings                    | 1967 |
| 60M  | 343 | W  | Cuttings                    | 1987 |
| 61M  | 343 | W  | Cuttings                    | 1955 |
| 62   | 343 | S  | Pump                        | 1851 |
| 63N  | 347 | W  | Cuttings                    | 1925 |
| 64N  | 350 | W  | Cuttings                    | 1938 |
| 65N  | 350 | W  | Cuttings                    | 1906 |
| 66N  | 350 | W  | Cuttings                    | 1925 |
| 67N  | 350 | W  | Cuttings                    | 1891 |
| 68N  | 352 | W  | Cuttings                    | 1851 |
| 69O  | 379 | W  | Police Station              | 1967 |
| 70O  | 379 | W  | Police Station              | 1974 |
| 71P  | 398 | S  | Hospital                    | 1974 |
| 72P  | 398 | S  | Hospital                    | 1967 |
| 73Q  | 399 | NE | Railway Signal Works        | 1938 |
| 74Q  | 399 | NE | Railway Signal Works        | 1925 |
| 75P  | 400 | S  | Hospital                    | 1925 |
| 76P  | 402 | S  | Hospital                    | 1938 |
| 77P  | 402 | S  | Hospital                    | 1925 |
| 78P  | 407 | S  | Hospital                    | 1955 |
| 79Q  | 414 | N  | Unspecified Works           | 1974 |

|       |     |    |                          |      |
|-------|-----|----|--------------------------|------|
| 80Q   | 419 | N  | Unspecified Works        | 1967 |
| 81R   | 423 | W  | Cemetery                 | 1906 |
| 82    | 428 | NE | Railway Sidings          | 1906 |
| 83R   | 429 | W  | Cemetery                 | 1925 |
| 84R   | 430 | W  | Cemetery                 | 1925 |
| 85R   | 430 | W  | Cemetery                 | 1938 |
| 86S   | 430 | W  | Cemetery                 | 1967 |
| 87S   | 430 | W  | Cemetery                 | 1955 |
| 88S   | 430 | W  | Cemetery                 | 1987 |
| 89S   | 430 | W  | Cemetery                 | 1974 |
| 90U   | 438 | N  | Railway Signal Works     | 1925 |
| 91    | 439 | N  | Railway Sidings          | 1925 |
| 92T   | 442 | NE | Railway Sidings          | 1938 |
| 93T   | 442 | NE | Railway Sidings          | 1925 |
| 94W   | 443 | N  | Carriage and Wagon Works | 1906 |
| 95U   | 443 | N  | Railway Signal Works     | 1906 |
| 96V   | 444 | NE | Unspecified Tank         | 1987 |
| 97V   | 444 | NE | Unspecified Tank         | 1974 |
| 98W   | 445 | N  | Unspecified Works        | 1891 |
| 99V   | 446 | N  | Unspecified Tank         | 1967 |
| 100X  | 446 | N  | Railway Sidings          | 1925 |
| 101X  | 448 | N  | Railway Sidings          | 1955 |
| 102Y  | 448 | N  | Railway Sidings          | 1987 |
| 103Y  | 448 | N  | Railway Sidings          | 1967 |
| 104Y  | 448 | N  | Railway Sidings          | 1974 |
| 105   | 452 | NE | Railway Sidings          | 1925 |
| 106U  | 455 | N  | Unspecified Works        | 1955 |
| 107Z  | 459 | NE | Carriage and Wagon Works | 1925 |
| 108Z  | 482 | NE | Carriage and Wagon Works | 1925 |
| 109Z  | 482 | NE | Carriage and Wagon Works | 1938 |
| 110AA | 489 | N  | Railway Building         | 1938 |
| 111AA | 489 | N  | Railway Building         | 1925 |
| 112AB | 490 | NW | Unspecified Depot        | 1967 |
| 113AB | 490 | NW | Unspecified Depot        | 1974 |
| 114AB | 490 | NW | Unspecified Depot        | 1987 |

## 1.2 Additional Information – Historical Tank Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical tanks within 500m of the search boundary:

21

| ID    | Distance (m) | Direction | Use              | Date |
|-------|--------------|-----------|------------------|------|
| 115AC | 13           | NW        | Unspecified Tank | 1975 |
| 116AC | 13           | NW        | Unspecified Tank | 1999 |
| 117AC | 13           | NW        | Unspecified Tank | 1994 |
| 118AD | 45           | E         | Unspecified Tank | 1972 |
| 119AD | 45           | E         | Unspecified Tank | 1998 |
| 120   | 87           | SE        | Unspecified Tank | 1974 |
| 121   | 161          | NW        | Unspecified Tank | 1975 |
| 122AE | 208          | E         | Unspecified Tank | 1998 |
| 123AE | 209          | E         | Tanks            | 1972 |
| 124AE | 209          | E         | Unspecified Tank | 1998 |
| 125AF | 252          | S         | Covered Tank     | 1908 |
| 126AG | 320          | SE        | Unspecified Tank | 1994 |
| 127AG | 320          | SE        | Unspecified Tank | 1996 |
| 128AG | 320          | SE        | Unspecified Tank | 1998 |
| 129AG | 322          | SE        | Unspecified Tank | 1974 |
| 130   | 424          | N         | Unspecified Tank | 1927 |
| 131AH | 431          | N         | Tanks            | 1977 |
| 132AH | 432          | N         | Tanks            | 1977 |
| 133AH | 438          | N         | Unspecified Tank | 1977 |
| 134AH | 439          | N         | Unspecified Tank | 1977 |
| 135V  | 447          | N         | Unspecified Tank | 1977 |

### 1.3 Additional Information – Historical Energy Features Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical energy features within 500m of the search boundary:

38

| ID    | Distance (m) | Direction | Use                    | Date |
|-------|--------------|-----------|------------------------|------|
| 136AD | 33           | E         | Electricity Substation | 1972 |
| 137AD | 33           | E         | Electricity Substation | 1998 |
| 138AD | 45           | E         | Electricity Substation | 1972 |
| 139AD | 45           | E         | Electricity Substation | 1998 |
| 140   | 90           | S         | Electricity Substation | 1998 |
| 141AI | 164          | E         | Electricity Substation | 1998 |
| 142AI | 164          | E         | Electricity Substation | 1998 |
| 143AJ | 170          | E         | Electricity Substation | 1972 |
| 144AJ | 171          | E         | Electricity Substation | 1998 |
| 145AK | 178          | NW        | Electricity Substation | 1975 |



|       |     |    |                         |      |
|-------|-----|----|-------------------------|------|
| 146AK | 179 | NW | Electricity Substation  | 1994 |
| 147AK | 179 | NW | Electricity Substation  | 1999 |
| 148AL | 204 | SE | Electricity Substation  | 1998 |
| 149AL | 209 | SE | Electricity Substation  | 1994 |
| 150AL | 209 | SE | Electricity Substation  | 1996 |
| 151AM | 243 | SW | Electricity Substation  | 1997 |
| 152AM | 243 | SW | Electricity Substation  | 1997 |
| 153AM | 243 | SW | Electricity Substation  | 1999 |
| 154AM | 243 | SW | Electricity Substation  | 1998 |
| 155   | 269 | E  | Gas Governor            | 1998 |
| 156AN | 333 | NE | Electricity Substation  | 1977 |
| 157AN | 334 | NE | Electricity Substation  | 1977 |
| 158AN | 334 | NE | Electricity Substation  | 1996 |
| 159AN | 334 | NE | Electricity Substation  | 1999 |
| 160AN | 348 | NE | Electricity Substation  | 1977 |
| 161AN | 348 | NE | Electricity Substation  | 1977 |
| 162AN | 352 | N  | Electricity Substation  | 1996 |
| 163AN | 352 | N  | Electricity Substation  | 1999 |
| 164AO | 401 | S  | Electricity Substations | 1955 |
| 165AO | 402 | S  | Electricity Substation  | 1954 |
| 166AP | 405 | W  | Electricity Substation  | 1975 |
| 167AP | 405 | W  | Electricity Substation  | 1993 |
| 168AP | 412 | W  | Electricity Substation  | 1975 |
| 169AP | 412 | W  | Electricity Substation  | 1993 |
| 170AQ | 418 | W  | Electricity Substation  | 1967 |
| 171AQ | 418 | W  | Electricity Substation  | 1993 |
| 172AR | 427 | N  | Electricity Substation  | 1997 |
| 173AR | 435 | N  | Electricity Substation  | 1997 |

## 1.4 Additional Information – Historical Petrol and Fuel Site Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical petrol stations and fuel sites within 500m of the search boundary: 0

Database searched and no data found.

## 1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical garage and motor vehicle repair sites within 500m of the search boundary: 1

| ID  | Distance (m) | Direction | Use    | Date |
|-----|--------------|-----------|--------|------|
| 174 | 248          | E         | Garage | 1957 |

## 1.6 Historical military sites

Certain military installations were not noted on historic mapping for security reasons. Whilst not all military land is necessarily of concern, Groundsure has researched and digitised a number of Ordnance Factories and other military industrial features (e.g. Ordnance Depots, Munitions Testing Grounds) which may be of contaminative concern. This research was drawn from a number of different sources, and should not be regarded as a definitive or exhaustive database of potentially contaminative military installations. The boundaries of sites within this database have been estimated from the best evidence available to Groundsure at the time of compilation.

Records of historical military sites within 500m of the search boundary: 0

Database searched and no data found.

## 1.7 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 48

The following Historical Potentially Infilled Features derived from the Historical Mapping information is provided by Groundsure:

| ID    | Distance(m) | Direction | Use                         | Date |
|-------|-------------|-----------|-----------------------------|------|
| 175I  | 37          | NW        | Cuttings                    | 1851 |
| 176G  | 39          | NW        | Cuttings                    | 1925 |
| 177G  | 39          | NW        | Cuttings                    | 1938 |
| 178G  | 39          | NW        | Cuttings                    | 1891 |
| 179G  | 39          | NW        | Cuttings                    | 1925 |
| 180AS | 42          | NW        | Cuttings                    | 1851 |
| 181G  | 43          | NW        | Cuttings                    | 1955 |
| 182H  | 46          | NW        | Cuttings                    | 1925 |
| 183H  | 46          | NW        | Cuttings                    | 1891 |
| 184H  | 46          | NW        | Cuttings                    | 1938 |
| 185H  | 46          | NW        | Cuttings                    | 1906 |
| 186H  | 46          | NW        | Cuttings                    | 1925 |
| 187I  | 50          | NW        | Cuttings                    | 1974 |
| 188I  | 50          | NW        | Cuttings                    | 1987 |
| 189I  | 50          | NW        | Cuttings                    | 1967 |
| 190I  | 50          | NW        | Cuttings                    | 1955 |
| 191AT | 168         | SW        | Unspecified Ground Workings | 1891 |
| 192AU | 189         | S         | Filter Beds                 | 1906 |
| 193   | 209         | E         | Pond                        | 1891 |
| 194AV | 249         | S         | Filter Beds                 | 1906 |
| 195L  | 301         | E         | Unspecified Pits            | 1891 |
| 196L  | 302         | E         | Ponds                       | 1851 |
| 197L  | 302         | E         | Unspecified Pits            | 1906 |

|       |     |   |                  |      |
|-------|-----|---|------------------|------|
| 198L  | 310 | E | Ponds            | 1906 |
| 199   | 316 | E | Pond             | 1925 |
| 200L  | 317 | E | Unspecified Pits | 1925 |
| 201L  | 328 | E | Unspecified Pits | 1925 |
| 202M  | 343 | W | Cuttings         | 1974 |
| 203M  | 343 | W | Cuttings         | 1987 |
| 204M  | 343 | W | Cuttings         | 1955 |
| 205M  | 343 | W | Cuttings         | 1967 |
| 206N  | 347 | W | Cuttings         | 1925 |
| 207N  | 350 | W | Cuttings         | 1925 |
| 208N  | 350 | W | Cuttings         | 1938 |
| 209N  | 350 | W | Cuttings         | 1906 |
| 210N  | 350 | W | Cuttings         | 1891 |
| 211N  | 352 | W | Cuttings         | 1851 |
| 212AP | 385 | W | Pond             | 1851 |
| 213AP | 386 | W | Pond             | 1891 |
| 214AP | 390 | W | Pond             | 1906 |
| 215R  | 423 | W | Cemetery         | 1906 |
| 216R  | 429 | W | Cemetery         | 1925 |
| 217R  | 430 | W | Cemetery         | 1925 |
| 218R  | 430 | W | Cemetery         | 1938 |
| 219S  | 430 | W | Cemetery         | 1974 |
| 220S  | 430 | W | Cemetery         | 1955 |
| 221S  | 430 | W | Cemetery         | 1987 |
| 222S  | 430 | W | Cemetery         | 1967 |



## 2. Environmental Permits, Incidents and Registers Map



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- |                               |                                           |                                                                |
|-------------------------------|-------------------------------------------|----------------------------------------------------------------|
| Site Outline                  | Recorded Pollution Incident               | RAS 3 & 4 Authorisations                                       |
| Dangerous Substances (List 1) | Dangerous Substances (List 2)             | Part A(1) Authorised Processes and Historic IPC Authorisations |
| Water Industry Referrals      | Part A(2) and Part B Authorised Processes | COMAH / NIHHS Sites                                            |
| Licenced Discharge Consents   | Sites Determined as Contaminated Land     | Hazardous Substance Consents and Enforcements                  |
| Red List Discharge Consents   |                                           |                                                                |

## 2. Environmental Permits, Incidents and Registers

### 2.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency/Natural Resources Wales and Local Authorities reveal the following information:

#### 2.1.1 Records of historic IPC Authorisations within 500m of the study site:

0

Database searched and no data found.

---

#### 2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site:

0

Database searched and no data found.

---

#### 2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site:

0

Database searched and no data found.

#### 2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site:

0

Database searched and no data found.

---

#### 2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

0

Database searched and no data found.

---

## 2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

1

The following Part A(2) and Part B Activities are represented as points on the Environmental Permits, Incidents and Registers Map:

| ID | Distance (m) | Direction | NGR              | Details                                                                                                                                                                                                                                                                                                      |
|----|--------------|-----------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3  | 336          | NW        | 337678<br>397513 | Address: Shell Grand National, 21 Barlows Lane, Liverpool 9<br>Process: Unloading of Petrol into Storage at Service Stations<br>Status: Historical Permit<br>Permit Type: Part B<br>Enforcement: No Enforcement Notified<br>Date of Enforcement: No Enforcement Notified<br>Comment: No Enforcement Notified |

## 2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:

14

The following RAS Licence (3 or 4) records are represented as points on the Environmental Permits, Incidents and Registers Map:

| ID  | Distance (m) | Direction | NGR              | Address                                                                                                   | Operator                                                         | Type                                                                           | Permission Number | Dates                                                                                                         | Status                         |
|-----|--------------|-----------|------------------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------|
| 18A | 0            | On Site   | 338000<br>397000 | University Of Liverpool,<br>University Hospital<br>Aintree, Longmoor<br>Lane, Liverpool, L9<br>7AL        | University Of Liverpool                                          | Disposal Of<br>Radioactive<br>Waste (was<br>Rsa60<br>Section 6).               | BR7356            | Date of<br>Approval:24/7<br>/2002<br>Effective<br>from:24/7/20<br>02<br>Last date of<br>update:2015-<br>01-01 | Revoked/c<br>ancelled          |
| 19A | 0            | On Site   | 338000<br>397000 | University Hospital<br>Aintree, Longmoor<br>Lane, Liverpool, L9<br>7AL                                    | Aintree<br>University<br>Hospitals<br>NHS<br>Foundation<br>Trust | Keeping And<br>Use Of<br>Radioactive<br>Materials<br>(was Rsa60<br>Section 1). | CD1339            | Date of<br>Approval:9/1/<br>2009<br>Effective<br>from:22-01-<br>2009<br>Last date of<br>update:2018-<br>11-01 | Issued                         |
| 20A | 0            | On Site   | 338000<br>397000 | University Of Liverpool,<br>University Hospital<br>Aintree, Longmoor<br>Lane, Liverpool, L9<br>7AL        | University Of Liverpool                                          | Keeping And<br>Use Of<br>Radioactive<br>Materials<br>(was Rsa60<br>Section 1). | BR7364            | Date of<br>Approval:24/7<br>/2002<br>Effective<br>from:24/7/20<br>02<br>Last date of<br>update:2015-<br>01-01 | Effective                      |
| 21A | 0            | On Site   | 338000<br>397000 | Aintree Hospitals<br>Nhs Trust,<br>University Hospital<br>Aintree, Longmoor<br>Lane, Liverpool, L9<br>7AL | Aintree<br>Hospitals Nhs<br>Trust                                | Keeping And<br>Use Of<br>Radioactive<br>Materials<br>(was Rsa60<br>Section 1). | AB6691            | Date of<br>Approval:1-4-<br>1992<br>Effective<br>from:1-4-1992<br>Last date of<br>update:2005-<br>01-06       | Supersede<br>d By<br>Variation |

| ID  | Distance (m) | Direction | NGR              | Address                                                                                                                                | Operator                                                         | Type                                                                           | Permission Number | Dates                                                                                                         | Status                         |
|-----|--------------|-----------|------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------|
| 22A | 0            | On Site   | 338000<br>397000 | University Hospital<br>Aintree, Longmoor<br>Lane, Liverpool, L9<br>7AL                                                                 | Aintree<br>University<br>Hospitals<br>NHS<br>Foundation<br>Trust | Disposal Of<br>Radioactive<br>Waste (was<br>Rsa60<br>Section 6).               | CD1312            | Date of<br>Approval:9/1/<br>2009<br>Effective<br>from:19-01-<br>2009<br>Last date of<br>update:2018-<br>11-01 | Issued                         |
| 23A | 0            | On Site   | 338000<br>397000 | Aintree University<br>Hospitals Nhs<br>Foundation Trust,<br>University Hospital<br>Aintree, Longmoor<br>Lane, Liverpool, L9<br>7AL     | Aintree<br>University<br>Hospitals Nhs<br>Foundation<br>Trust    | Keeping And<br>Use Of<br>Radioactive<br>Materials<br>(was Rsa60<br>Section 1). | BH2138            | Date of<br>Approval:14/7<br>/2000<br>Effective<br>from:14/7/20<br>00<br>Last date of<br>update:2015-<br>01-01 | Supersede<br>d By<br>Variation |
| 24B | 0            | On Site   | 338020<br>397200 | Pain Relief<br>Foundation,<br>University Hospital<br>Aintree, lower Lane,<br>Liverpool, L9 7AL                                         | Pain Relief<br>Foundation                                        | Keeping And<br>Use Of<br>Radioactive<br>Materials<br>(was Rsa60<br>Section 1). | BK4073            | Date of<br>Approval:20/4<br>/2001<br>Effective<br>from:20/4/20<br>01<br>Last date of<br>update:2015-<br>01-01 | Revoked/c<br>ancelled          |
| 25B | 0            | On Site   | 338020<br>397200 | Aintree University<br>Hospitals Nhs<br>Foundation Trust,<br>University Hospital<br>Aintree, Lower<br>Lane, Liverpool, L9<br>7AL        | Aintree<br>University<br>Hospitals Nhs<br>Foundation<br>Trust    | Disposal Of<br>Radioactive<br>Waste (was<br>Rsa60<br>Section 6).               | BH1778            | Date of<br>Approval:22/6<br>/2000<br>Effective<br>from:22/6/20<br>00<br>Last date of<br>update:2015-<br>01-01 | Supersede<br>d By<br>Variation |
| 26B | 0            | On Site   | 338020<br>397200 | Aintree University<br>Hospitals Nhs<br>Foundation Trust,<br>University Hospital<br>Aintree, Lower<br>Lane, Liverpool, L9<br>7AL        | Aintree<br>University<br>Hospitals Nhs<br>Foundation<br>Trust    | Disposal Of<br>Radioactive<br>Waste (was<br>Rsa60<br>Section 6).               | BW5616            | Date of<br>Approval:1/12<br>/2003<br>Effective<br>from:1/1/200<br>4<br>Last date of<br>update:2015-<br>01-01  | Supersede<br>d By<br>Variation |
| 27B | 0            | On Site   | 338020<br>397200 | Aintree University<br>Hospitals Nhs<br>Foundation Trust,<br>University Hospital<br>Aintree, Lower<br>Lane, Liverpool, L9<br>7AL        | Aintree<br>University<br>Hospitals Nhs<br>Foundation<br>Trust    | Disposal Of<br>Radioactive<br>Waste (was<br>Rsa60<br>Section 6).               | BZ0734            | Date of<br>Approval:20/6<br>/2005<br>Effective<br>from:20/6/20<br>05<br>Last date of<br>update:2015-<br>01-01 | Supersede<br>d By<br>Variation |
| 28B | 0            | On Site   | 338020<br>397200 | Aintree University<br>Hospitals Nhs<br>Foundation Trust,<br>Fazakerley Hospital,<br>Longmoor Lane,<br>Liverpool,<br>Merseyside, L9 7AL | Aintree<br>University<br>Hospitals Nhs<br>Foundation<br>Trust    | Disposal Of<br>Radioactive<br>Waste (was<br>Rsa60<br>Section 6).               | AC2993            | Date of<br>Approval:31/3<br>/1991<br>Effective<br>from:31/3/19<br>91<br>Last date of<br>update:2015-<br>01-01 | Revoked/c<br>ancelled          |



| ID  | Distance (m) | Direction | NGR           | Address                                                                                                       | Operator                                          | Type                                                 | Permission Number | Dates                                                                                    | Status                  |
|-----|--------------|-----------|---------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------|-------------------|------------------------------------------------------------------------------------------|-------------------------|
| 29B | 0            | On Site   | 338020 397200 | Pain Relief Foundation, University Hospital Aintree, Lower Lane, Liverpool, L9 7AL                            | Pain Relief Foundation                            | Disposal Of Radioactive Waste (was Rsa60 Section 6). | BW5632            | Date of Approval:1/12/2003<br>Effective from:1/1/2004<br>Last date of update:2015-01-01  | Revoked/cancelled       |
| 30B | 0            | On Site   | 338020 397200 | Pain Relief Foundation, University Hospital Aintree, Lower Lane, Liverpool, L9 7AL                            | Pain Relief Foundation                            | Disposal Of Radioactive Waste (was Rsa60 Section 6). | BK4065            | Date of Approval:20/4/2001<br>Effective from:20/4/2001<br>Last date of update:2015-01-01 | Superseded By Variation |
| 31B | 0            | On Site   | 338020 397200 | Aintree University Hospitals Nhs Foundation Trust, University Hospital Aintree, Lower Lane, Liverpool, L9 7AL | Aintree University Hospitals Nhs Foundation Trust | Disposal Of Radioactive Waste (was Rsa60 Section 6). | AT7669            | Date of Approval:15/1/1996<br>Effective from:16/1/1996<br>Last date of update:2015-01-01 | Superseded By Variation |

#### 2.1.8 Records of Licensed Discharge Consents within 500m of the study site:

0

Database searched and no data found.

#### 2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site:

0

Database searched and no data found.

#### 2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site:

0

Database searched and no data found.

## 2.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site:

0

Database searched and no data found.

## 2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents

2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site:

2

The following NIRS List 2 records are represented as points on the Environmental Permits, Incidents and Registers Map:

| ID | Distance (m) | Direction | NGR                  | Details                                                                                                                                                                                                                                                          |
|----|--------------|-----------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | 276          | SW        | 337663.0<br>396746.0 | Incident Date: 04-Mar-2002<br>Incident Identification: 61631.0<br>Pollutant: Contaminated Water<br>Pollutant Description: Minewater<br>Water Impact: Category 3 (Minor)<br>Land Impact: Category 4 (No Impact)<br>Air Impact: Category 4 (No Impact)             |
| 2  | 337          | W         | 337501.0<br>396880.0 | Incident Date: 12-Apr-2002<br>Incident Identification: 71117.0<br>Pollutant: Specific Waste Materials<br>Pollutant Description: Household Waste<br>Water Impact: Category 4 (No Impact)<br>Land Impact: Category 3 (Minor)<br>Air Impact: Category 4 (No Impact) |

2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site:

0

Database searched and no data found.

## 2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

Records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site

0

Database searched and no data found.



# 3. Landfill and Other Waste Sites

## 3.1 Landfill Sites

3.1.1 Records from Environment Agency/Natural Resources Wales landfill data within 1000m of the study site:

0

Database searched and no data found.

3.1.2 Records of Environment Agency/Natural Resources Wales historic landfill sites within 1500m of the study site:

7

The following landfill records are represented as either points or polygons on the Landfill and Other Waste Sites map:

| ID        | Distance (m) | Direction | NGR | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------|--------------|-----------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Not shown | 949          | NW        |     | Site Address: Fir Grove, Off Melling Road, Aintree, Merseyside<br>Waste Licence: -<br>Site Reference: K1/16/121, GDO M121<br>Waste Type: Waste Unknown<br>Environmental Permitting Regulations (Waste) Reference: -<br>Licence Issue:<br>Licence Surrendered:<br>Licence Holder Address: -<br>Operator: -<br>Licence Holder: -<br>First Recorded: -<br>Last Recorded: -                                                                                                                                                           |
| Not shown | 1200         | NE        |     | Site Address: Liverpool Municipal Golf Course, Valley Road, Kirkby, Knowsley<br>Waste Licence: Yes<br>Site Reference: 405/01, GDO 232, 271<br>Waste Type: Inert<br>Environmental Permitting Regulations (Waste) Reference: -<br>Licence Issue: 09-Feb-1993<br>Licence Surrendered:<br>Licence Holder Address: Environmental Services Department, The Mansion House, Calderstones Park, Liverpool<br>Operator: Liverpool City Council<br>Licence Holder: Liverpool City Council<br>First Recorded: 09-Feb-1993<br>Last Recorded: - |
| Not shown | 1390         | E         |     | Site Address: Gillmoss "A", Off Field Lane, Gillmoss, Liverpool, Merseyside<br>Waste Licence: -<br>Site Reference: GDO M218, K1/16/218<br>Waste Type: Waste Unknown<br>Environmental Permitting Regulations (Waste) Reference: -<br>Licence Issue:<br>Licence Surrendered:<br>Licence Holder Address: -<br>Operator: -<br>Licence Holder: -<br>First Recorded: -<br>Last Recorded: -                                                                                                                                              |
| Not shown | 1412         | SW        |     | Site Address: Evered Avenue, Evered Avenue, Liverpool, Merseyside<br>Waste Licence: -<br>Site Reference: GDO M120, K1/16/120<br>Waste Type: -<br>Environmental Permitting Regulations (Waste) Reference: -<br>Licence Issue:<br>Licence Surrendered:<br>Licence Holder Address: -<br>Operator: -<br>Licence Holder: -<br>First Recorded: -<br>Last Recorded: -                                                                                                                                                                    |
| Not       | 1457         | W         |     | Site Address: Aintree Curve Brickworks,<br>Licence Issue:                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |



| ID        | Distance (m) | Direction | NGR | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------|--------------|-----------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| shown     |              |           |     | Off Bridle Way, Aintree, Sefton, Merseyside<br>Waste Licence: -<br>Site Reference: K1/15/208, GDO 208<br>Waste Type: Inert<br>Environmental Permitting Regulations (Waste) Reference: -<br><br>Licence Surrendered:<br>Licence Holder Address: -<br>Operator: -<br>Licence Holder: -<br>First Recorded: 31-Dec-1925<br>Last Recorded: 31-Dec-1956                                                                                                                                                                                                        |
| Not shown | 1464         | W         |     | Site Address: Havelock Works Landfill, Park Lane, Bootle, Merseyside<br>Waste Licence: Yes<br>Site Reference: 082/03, K1/15/031, GDO 031<br>Waste Type: Industrial, Special, Liquid sludge<br>Environmental Permitting Regulations (Waste) Reference: -<br><br>Licence Issue: 20-Feb-1980<br>Licence Surrendered: 15-Apr-1986<br>Licence Holder Address: Havelock Works, Park Lane, Bootle<br>Operator: Braby Group Limited<br>Licence Holder: Braby Works Limited / Braby Group Limited<br>First Recorded: 01-Jan-1980<br>Last Recorded: 01-Apr-1986    |
| Not shown | 1474         | SW        |     | Site Address: Fernhill Road, Fernhill cutting, Langton Branch, Orrell Park, Bootle, Merseyside<br>Waste Licence: Yes<br>Site Reference: GDO M030, 045/03, 146/03, K1/15/030, WD100/328<br>Waste Type: Inert, Industrial, Household<br>Environmental Permitting Regulations (Waste) Reference: -<br><br>Licence Issue: 25-Nov-1977<br>Licence Surrendered:<br>Licence Holder Address: -<br>Operator: -<br>Licence Holder: Sefton Borough Council, transferred to Ruttles Plant Hire 18/10/84<br>First Recorded: 01-Oct-1977<br>Last Recorded: 31-Dec-1986 |

### 3.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site:

0

Database searched and no data found.

### 3.1.4 Records of Landfills from Local Authority and Historical Mapping Records within 1500m of the study site:

0

Database searched and no data found.

## 3.2 Other Waste Sites

### 3.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site:

1

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

| ID | Distance (m) | Direction | NGR              | Details                                                                                                                                                                                             |
|----|--------------|-----------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | 434          | E         | 338528<br>397026 | Type of Site: Landfill Site (Extension)<br>Planning Application Reference: F/2014/0100/F<br>Date: 21/10/2014<br>Further Details: Scheme comprises extension of inert landfill site within Crosshill |

| ID | Distance (m) | Direction | NGR | Details                                                                                                                                                                                                                                                                                                  |
|----|--------------|-----------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |              |           |     | <p>Site Address:<br/>Crosshill Quarry &amp;<br/>Landfill Si, Crosshill<br/>Road, Tureagh,<br/>Larne, Co Antrim,<br/>BT40 3EB</p> <p>Quarry The associated works include sewer systems, landscaping, infrastructure and enabling.<br/>Data Source: Historic Planning Application<br/>Data Type: Point</p> |

### 3.2.2 Records of Environment Agency/Natural Resources Wales licensed waste sites within 1500m of the study site:

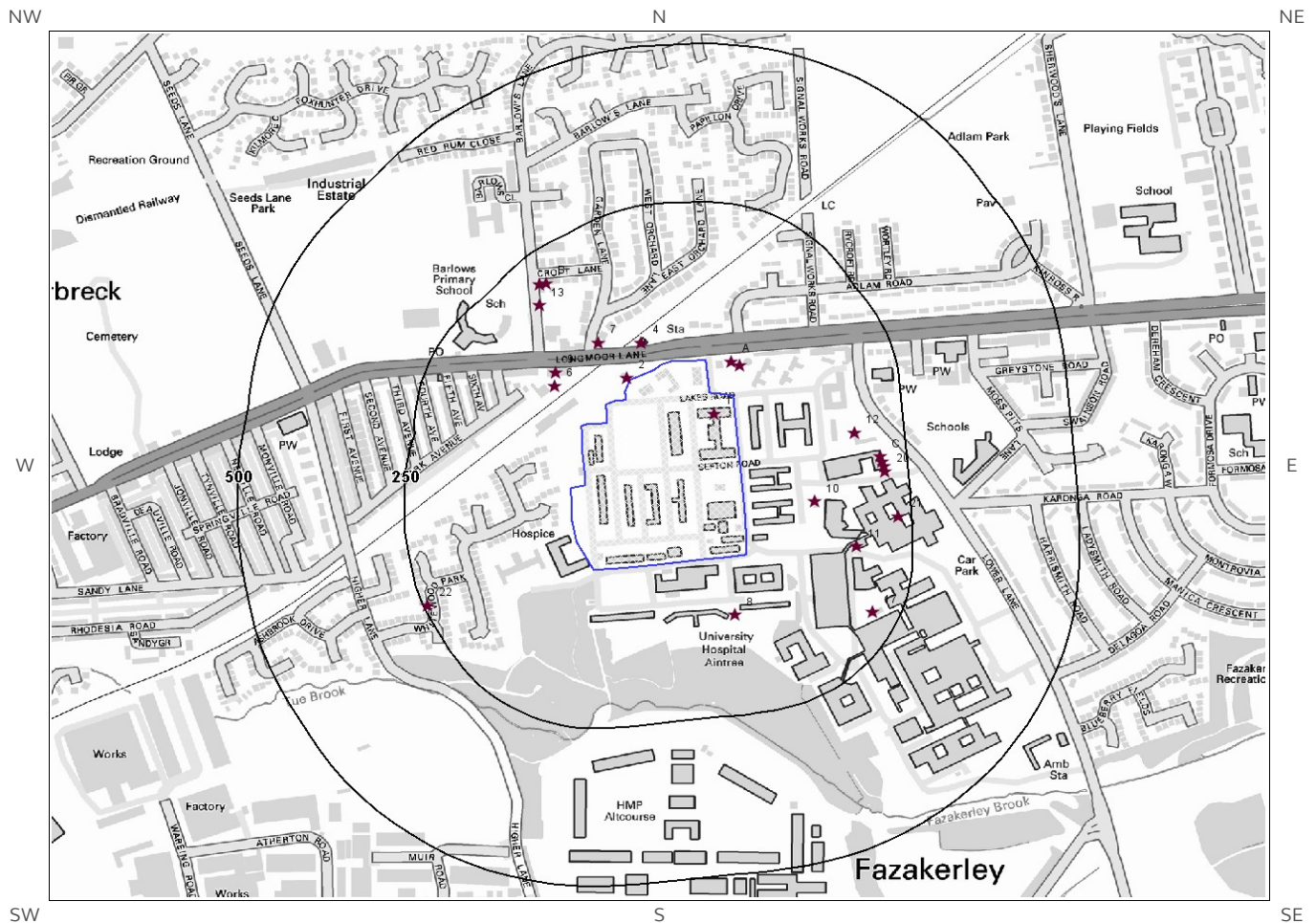
8

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

| ID        | Distance (m) | Direction | NGR              | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------|--------------|-----------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Not shown | 1101         | SW        | 337358<br>395968 | <p>Site Address: Bemrose Industrial Estate,<br/>Long Lane, Aintree, Liverpool, Merseyside,<br/>L9 7BG<br/>Type: Household, Commercial &amp; Industrial<br/>Waste T Stn<br/>Size: &lt; 25000 tonnes<br/>Environmental Permitting Regulations<br/>(Waste) Licence Number: MER007<br/>EPR reference: EA/EPR/SP3693ZL/A001<br/>Operator: Mersey Skips Ltd<br/>Waste Management licence No: 54480<br/>Annual Tonnage: 24999.0</p> <p>Issue Date: 02/04/2007<br/>Effective Date: -<br/>Modified: -<br/>Surrendered Date: -<br/>Expiry Date: -<br/>Cancelled Date: -<br/>Status: Revoked<br/>Site Name: Mersey Skip Ltd<br/>Correspondence Address: -</p>                        |
| Not shown | 1116         | E         | 339086<br>397647 | <p>Site Address: Fazakerley Playing Fields,<br/>Aintree Lane, Fazakerley, Liverpool,<br/>Merseyside, L10 1LT<br/>Type: Deposit of waste to land as a<br/>recovery operation<br/>Size: &lt; 25000 tonnes<br/>Environmental Permitting Regulations<br/>(Waste) Licence Number: COT029<br/>EPR reference: EA/EPR/BB3739RX/A001<br/>Operator: U K Sports Parks Ltd<br/>Waste Management licence No: 103301<br/>Annual Tonnage: 256500.0</p> <p>Issue Date: 21/02/2012<br/>Effective Date: -<br/>Modified: -<br/>Surrendered Date: -<br/>Expiry Date: -<br/>Cancelled Date: -<br/>Status: Revoked<br/>Site Name: Fazakerley Playing Fields<br/>Correspondence Address: -</p>   |
| Not shown | 1271         | SW        | 337355<br>395783 | <p>Site Address: Unit 4 Nelson Business Park,<br/>Long Lane, Walton, Liverpool, Merseyside,<br/>L9 7BN<br/>Type: Material Recycling Treatment<br/>Facility<br/>Size: &gt;= 25000 tonnes &lt; 75000 tonnes<br/>Environmental Permitting Regulations<br/>(Waste) Licence Number: PAL047<br/>EPR reference: EA/EPR/FB3131AZ/V002<br/>Operator: Palm Recycling Ltd<br/>Waste Management licence No: 103897<br/>Annual Tonnage: 40000.0</p> <p>Issue Date: 03/05/2012<br/>Effective Date: -<br/>Modified: 29/08/2012<br/>Surrendered Date: -<br/>Expiry Date: -<br/>Cancelled Date: -<br/>Status: Modified<br/>Site Name: Palm Recycling Ltd<br/>Correspondence Address: -</p> |
| Not shown | 1271         | SW        | 337355<br>395783 | <p>Site Address: Unit 4 Nelson Business Park,<br/>Long Lane, Walton, Liverpool, Merseyside,<br/>L9 7BN<br/>Type: Material Recycling Treatment<br/>Facility<br/>Size: &gt;= 25000 tonnes &lt; 75000 tonnes</p> <p>Issue Date: 03/05/2012<br/>Effective Date: -<br/>Modified: 29/08/2012<br/>Surrendered Date: Aug 8 2018 12:00AM<br/>Expiry Date: -<br/>Cancelled Date: -</p>                                                                                                                                                                                                                                                                                              |

| ID        | Distance (m) | Direction | NGR              | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------|--------------|-----------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |              |           |                  | <p>Environmental Permitting Regulations (Waste) Licence Number: PAL047<br/>EPR reference: EA/EPR/FB3131AZ/S003<br/>Operator: Palm Recycling Limited<br/>Waste Management licence No: 103897<br/>Annual Tonnage: 0.0</p> <p>Status: Surrendered<br/>Site Name: Palm Recycling Ltd<br/>Correspondence Address: -</p>                                                                                                                                                                                                                                                                                                                                              |
| Not shown | 1288         | E         | 339300<br>396600 | <p>Site Address: Fazakerley W W T W, Stonebridge Lane, Fazakerley, Liverpool, Merseyside, L10 5HA<br/>Type: Biological Treatment Facility<br/>Size: &gt;= 25000 tonnes &lt; 75000 tonnes<br/>Environmental Permitting Regulations (Waste) Licence Number: NOR007<br/>EPR reference: EA/EPR/HP3397CR/V004<br/>Operator: Nww Fazakerley<br/>Waste Management licence No: 54269<br/>Annual Tonnage: 74999.0</p> <p>Issue Date: 26/05/1995<br/>Effective Date: -<br/>Modified: 27/07/2016<br/>Surrendered Date: -<br/>Expiry Date: -<br/>Cancelled Date: -<br/>Status: Modified<br/>Site Name: Fazakerley W W T W<br/>Correspondence Address: -</p>                 |
| Not shown | 1288         | E         | 339300<br>396600 | <p>Site Address: Fazakerley W W T W, Stonebridge Lane, Fazakerley, Liverpool, Merseyside, L10 5HA<br/>Type: Biological Treatment Facility<br/>Size: &lt; 25000 tonnes<br/>Environmental Permitting Regulations (Waste) Licence Number: NOR007<br/>EPR reference: EA/EPR/HP3397CR/V002<br/>Operator: United Utilities Water Ltd<br/>Waste Management licence No: 54269<br/>Annual Tonnage: 24999.0</p> <p>Issue Date: 26/05/1995<br/>Effective Date: -<br/>Modified: 16/01/2006<br/>Surrendered Date: -<br/>Expiry Date: -<br/>Cancelled Date: -<br/>Status: Modified<br/>Site Name: Fazakerley W W T W<br/>Correspondence Address: -</p>                        |
| Not shown | 1288         | E         | 339300<br>396600 | <p>Site Address: Fazakerley W W T W, Stonebridge Lane, Fazakerley, Liverpool, Merseyside, L10 5HA<br/>Type: Biological Treatment Facility<br/>Size: &lt; 25000 tonnes<br/>Environmental Permitting Regulations (Waste) Licence Number: NOR007<br/>EPR reference: EA/EPR/HP3397CR/V003<br/>Operator: United Utilities Water Limited<br/>Waste Management licence No: 54269<br/>Annual Tonnage: 24999.0</p> <p>Issue Date: 26/05/1995<br/>Effective Date: -<br/>Modified: 13/01/2015<br/>Surrendered Date: -<br/>Expiry Date: -<br/>Cancelled Date: -<br/>Status: Modified<br/>Site Name: Fazakerley W W T W<br/>Correspondence Address: -</p>                    |
| Not shown | 1288         | E         | 339300<br>396600 | <p>Site Address: Fazakerley W W T W, Stonebridge Lane, Fazakerley, Liverpool, Merseyside, L10 5HA<br/>Type: Biological Treatment Facility<br/>Size: &gt;= 25000 tonnes &lt; 75000 tonnes<br/>Environmental Permitting Regulations (Waste) Licence Number: NOR007<br/>EPR reference: EA/EPR/HP3397CR/V004<br/>Operator: United Utilities Water Limited<br/>Waste Management licence No: 54269<br/>Annual Tonnage: 74999.0</p> <p>Issue Date: 26/05/1995<br/>Effective Date: -<br/>Modified: 27/07/2016<br/>Surrendered Date: -<br/>Expiry Date: -<br/>Cancelled Date: -<br/>Status: Modified<br/>Site Name: Fazakerley W W T W<br/>Correspondence Address: -</p> |

# 4. Current Land Use Map



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Site Outline

★ Current Industrial Sites

— Electricity Transmission Cables

— 250 — Search Buffers (m)  
— 500 —

● Petrol & Fuel Sites

— Gas Transmission Pipelines



## 4. Current Land Uses

### 4.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site:

22

The following records are represented as points on the Current Land Uses map.

| ID  | Distance (m) | Direction | Company                 | NGR              | Address                                           | Activity                                         | Category                                      |
|-----|--------------|-----------|-------------------------|------------------|---------------------------------------------------|--------------------------------------------------|-----------------------------------------------|
| 1   | 0            | On Site   | The Sefton Suite        | 338020<br>397204 | Longmoor Lane, Liverpool, Merseyside, L9 7AL      | Hospitals                                        | Health Practitioners and Establishments       |
| 2   | 8            | NW        | Tank                    | 337890<br>397262 | Merseyside, L9                                    | Tanks (Generic)                                  | Industrial Features                           |
| 3A  | 37           | E         | Electricity Sub Station | 338047<br>397287 | Merseyside, L9                                    | Electrical Features                              | Infrastructure and Facilities                 |
| 4   | 47           | NW        | Fazakerley Rail Station | 337912<br>397317 | Merseyside, L9                                    | Railway Stations, Junctions and Halts            | Public Transport, Stations and Infrastructure |
| 5A  | 49           | E         | Electricity Sub Station | 338060<br>397281 | Merseyside, L9                                    | Electrical Features                              | Infrastructure and Facilities                 |
| 6   | 77           | NW        | Works                   | 337782<br>397249 | Merseyside, L9                                    | Unspecified Works Or Factories                   | Industrial Features                           |
| 7   | 78           | NW        | UK Bannerman            | 337847<br>397317 | 285, Longmoor Lane, Liverpool, Merseyside, L9 9BY | Medals, Trophies, Ceremonial and Religious Goods | Consumer Products                             |
| 8   | 90           | S         | Electricity Sub Station | 338052<br>396887 | Merseyside, L9                                    | Electrical Features                              | Infrastructure and Facilities                 |
| 9   | 92           | NW        | Fazakerley Garage       | 337783<br>397270 | 452, Longmoor Lane, Liverpool, Merseyside, L9 9BY | Vehicle Repair, Testing and Servicing            | Repair and Servicing                          |
| 10  | 106          | E         | Electricity Sub Station | 338172<br>397066 | Merseyside, L9                                    | Electrical Features                              | Infrastructure and Facilities                 |
| 11  | 165          | E         | Electricity Sub Station | 338235<br>396995 | Merseyside, L9                                    | Electrical Features                              | Infrastructure and Facilities                 |
| 12  | 175          | E         | Electricity Sub Station | 338232<br>397175 | Merseyside, L9                                    | Electrical Features                              | Infrastructure and Facilities                 |
| 13  | 181          | NW        | Electricity Sub Station | 337760<br>397376 | Merseyside, L9                                    | Electrical Features                              | Infrastructure and Facilities                 |
| 14B | 200          | NW        | Phoenix Works           | 337769<br>397411 | Merseyside, L9                                    | Unspecified Works Or Factories                   | Industrial Features                           |
| 15B | 205          | NW        | J P Lamb & Co           | 337759<br>397409 | 2, Croft Lane, Liverpool, Merseyside, L9 9DL      | Industrial Engineers                             | Engineering Services                          |
| 16C | 210          | E         | Chimney                 | 338270<br>397137 | Merseyside, L9                                    | Chimneys                                         | Industrial Features                           |
| 17  | 210          | SE        | Electricity Sub Station | 338259<br>396891 | Merseyside, L9                                    | Electrical Features                              | Infrastructure and Facilities                 |
| 18C | 212          | E         | Tank                    | 338273<br>397129 | Merseyside, L9                                    | Tanks (Generic)                                  | Industrial Features                           |
| 19C | 213          | E         | Tank                    | 338275<br>397122 | Merseyside, L9                                    | Tanks (Generic)                                  | Industrial Features                           |

| ID | Distance (m) | Direction | Company                 | NGR              | Address                                   | Activity            | Category                                |
|----|--------------|-----------|-------------------------|------------------|-------------------------------------------|---------------------|-----------------------------------------|
| 20 | 214          | E         | Chimney                 | 338277<br>397114 | Merseyside, L9                            | Chimneys            | Industrial Features                     |
| 21 | 229          | E         | The Walton Centre       | 338296<br>397042 | Lower Lane, Liverpool, Merseyside, L9 7LJ | Hospitals           | Health Practitioners and Establishments |
| 22 | 245          | SW        | Electricity Sub Station | 337591<br>396902 | Merseyside, L9                            | Electrical Features | Infrastructure and Facilities           |

## 4.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site:

0

Database searched and no data found.

## 4.3 National Grid High Voltage Underground Electricity Transmission Cables

This dataset identifies the high voltage electricity transmission lines running between generating power plants and electricity substations. The dataset does not include the electricity distribution network (smaller, lower voltage cables distributing power from substations to the local user network). This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high voltage underground electricity transmission cables within 500m of the study site:

0

Database searched and no data found.

## 4.4 National Grid High Pressure Gas Transmission Pipelines

This dataset identifies high-pressure, large diameter pipelines which carry gas between gas terminals, power stations, compressors and storage facilities. The dataset does not include the Local Transmission System (LTS) which supplies gas directly into homes and businesses. This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high pressure gas transmission pipelines within 500m of the study site:

0

Database searched and no data found.

# 5. Geology

## 5.1 Artificial Ground and Made Ground

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

---

## 5.2 Superficial Ground and Drift Geology

The database has been searched on site, including a 50m buffer.

| Lex Code | Description                  | Rock Type |
|----------|------------------------------|-----------|
| SSA-S    | SHIRDLEY HILL SAND FORMATION | SAND      |

---

## 5.3 Bedrock and Solid Geology

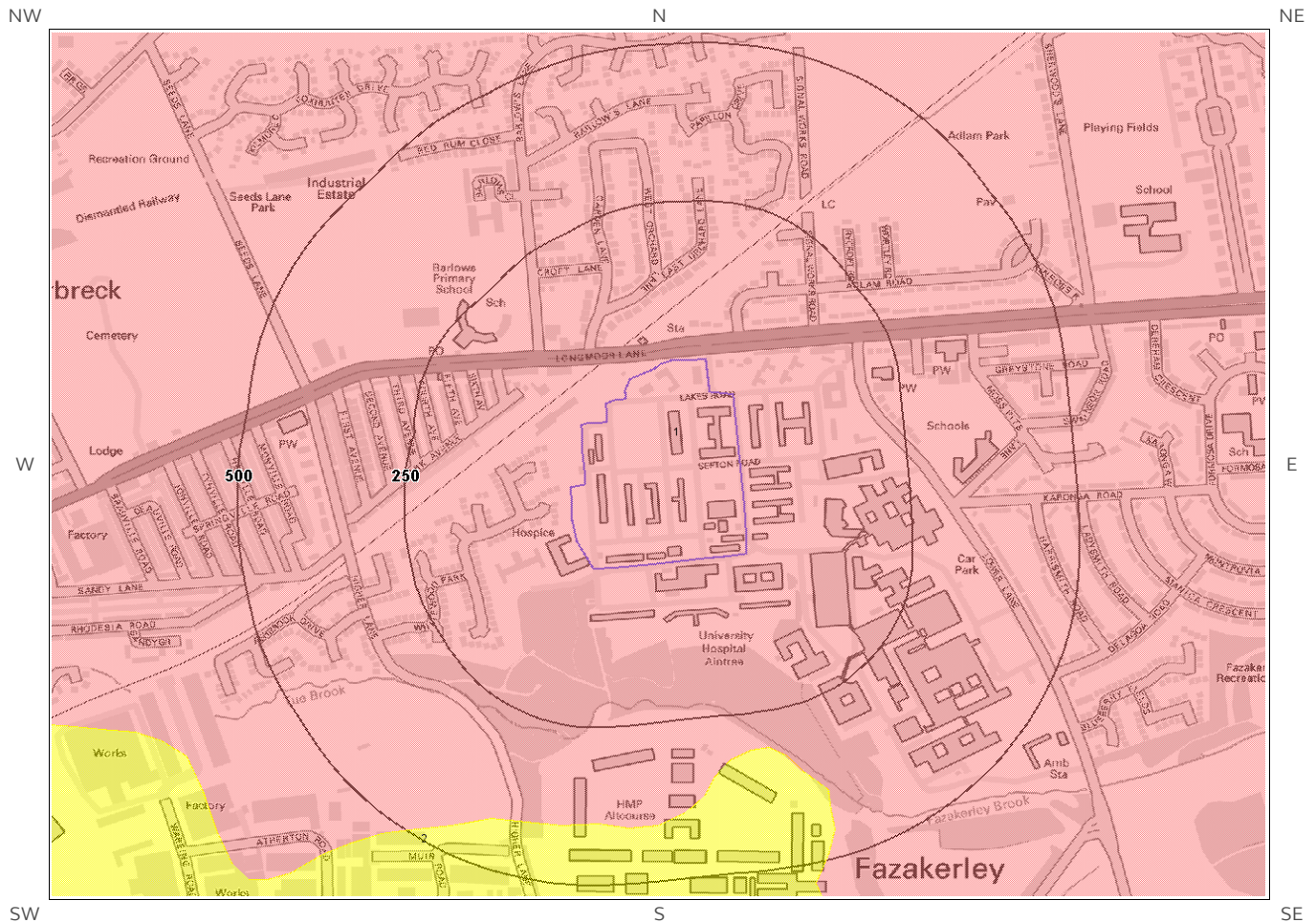
The database has been searched on site, including a 50m buffer.

| Lex Code  | Description                  | Rock Type |
|-----------|------------------------------|-----------|
| WLSF-SDST | WILMSLOW SANDSTONE FORMATION | SANDSTONE |

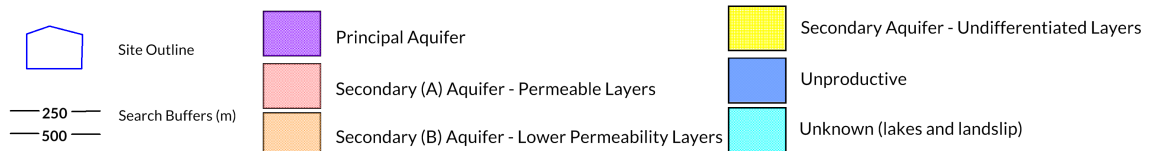
(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

# 6 Hydrogeology and Hydrology

## 6a. Aquifer Within Superficial Geology

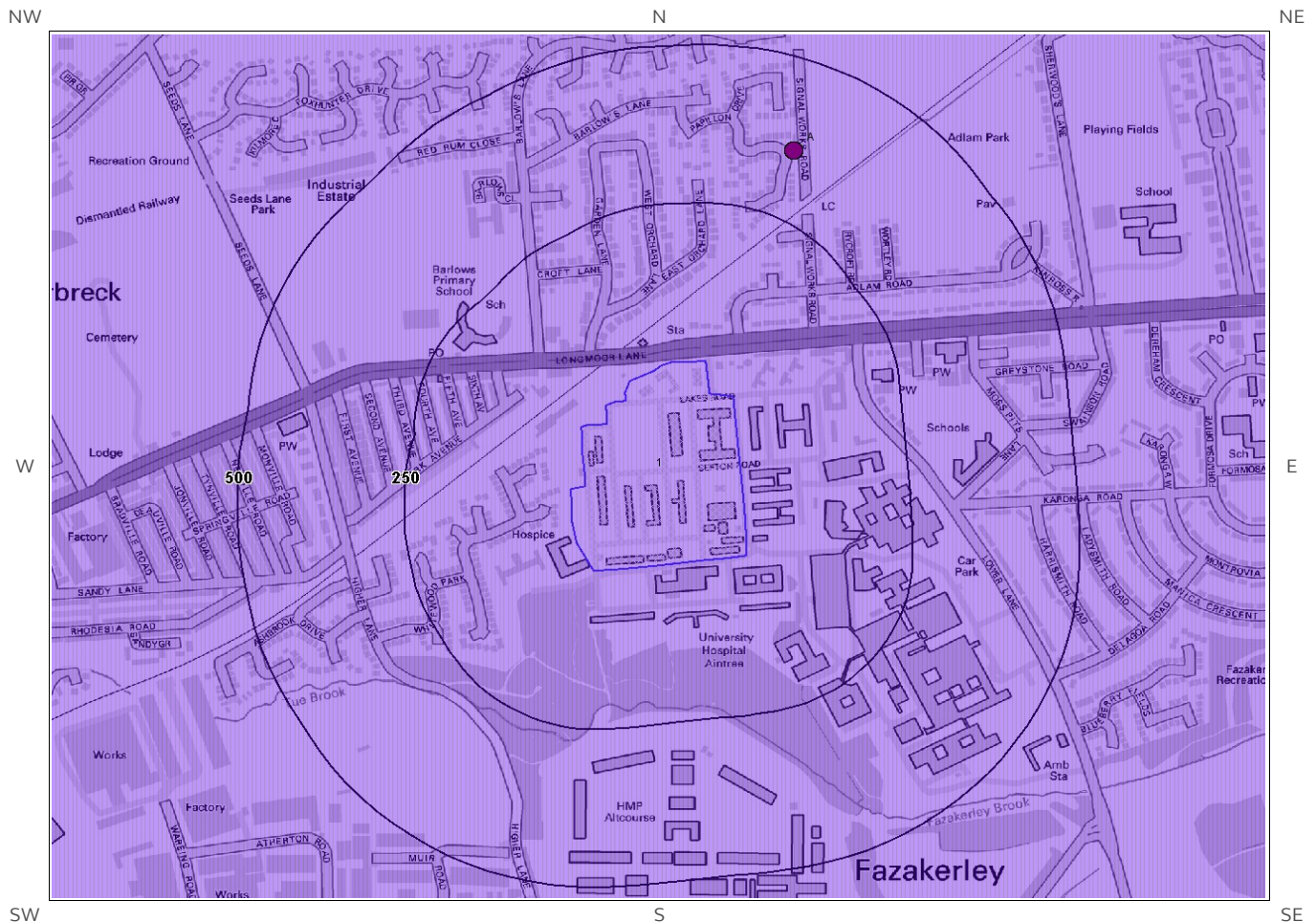


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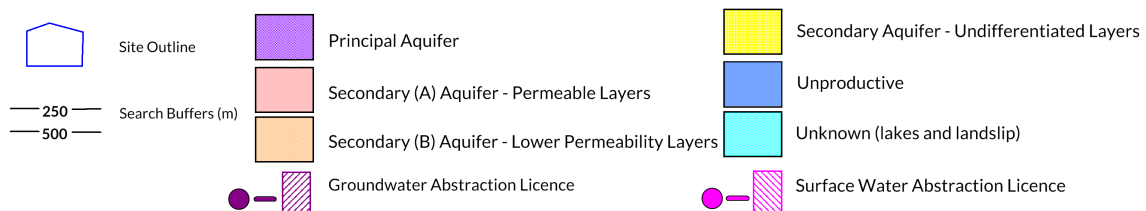




# 6b. Aquifer Within Bedrock Geology and Abstraction Licences



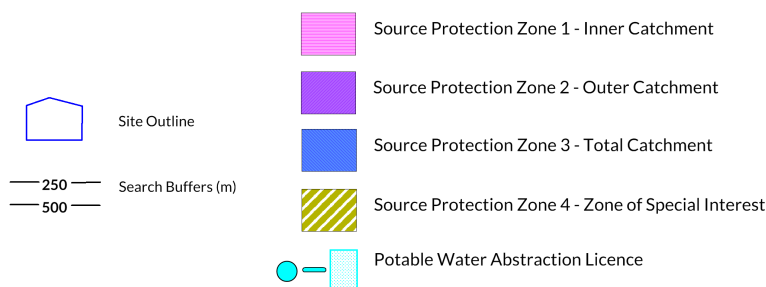
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# 6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licences

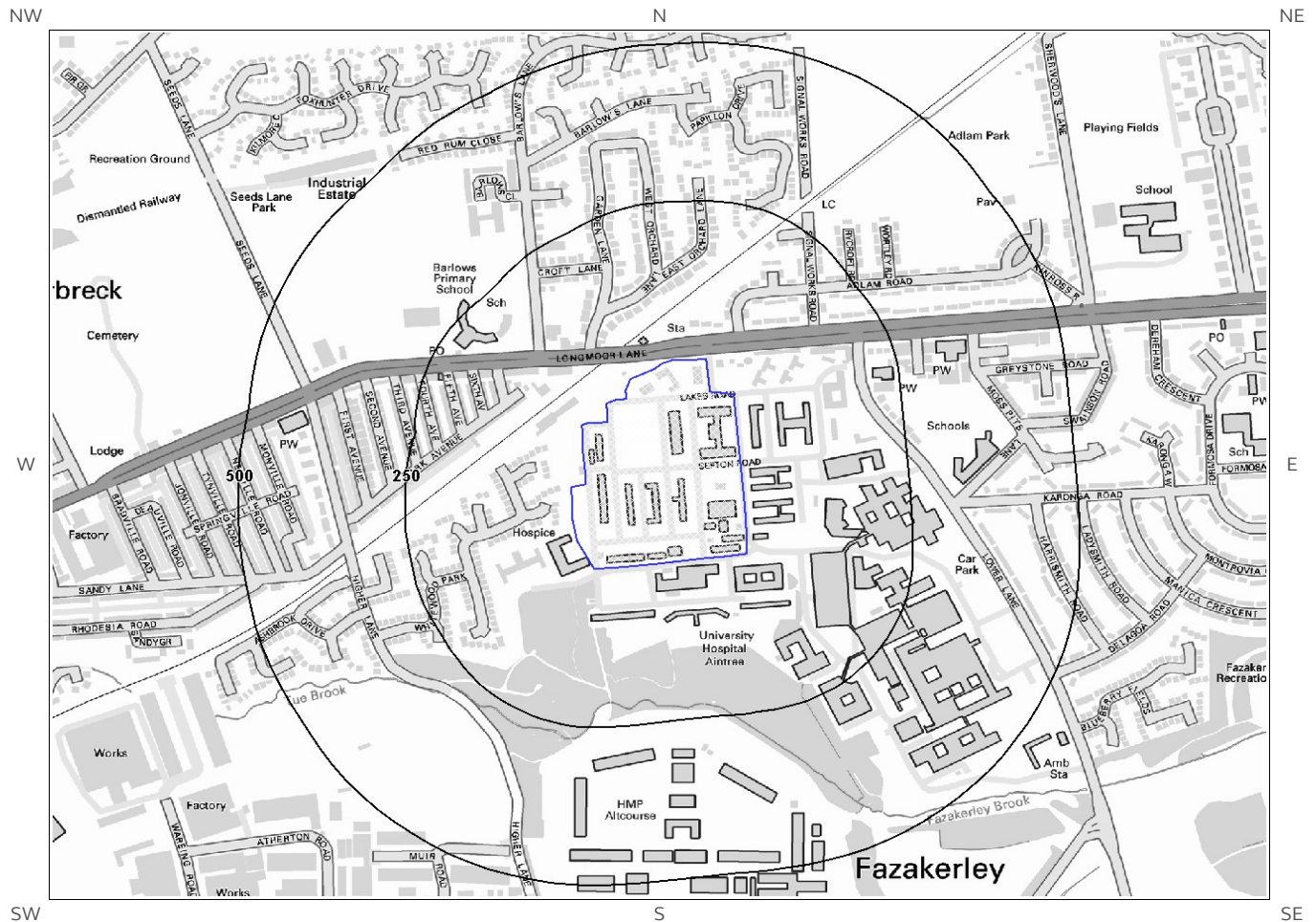


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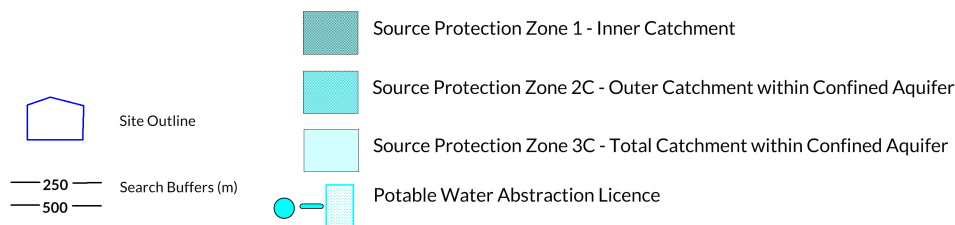




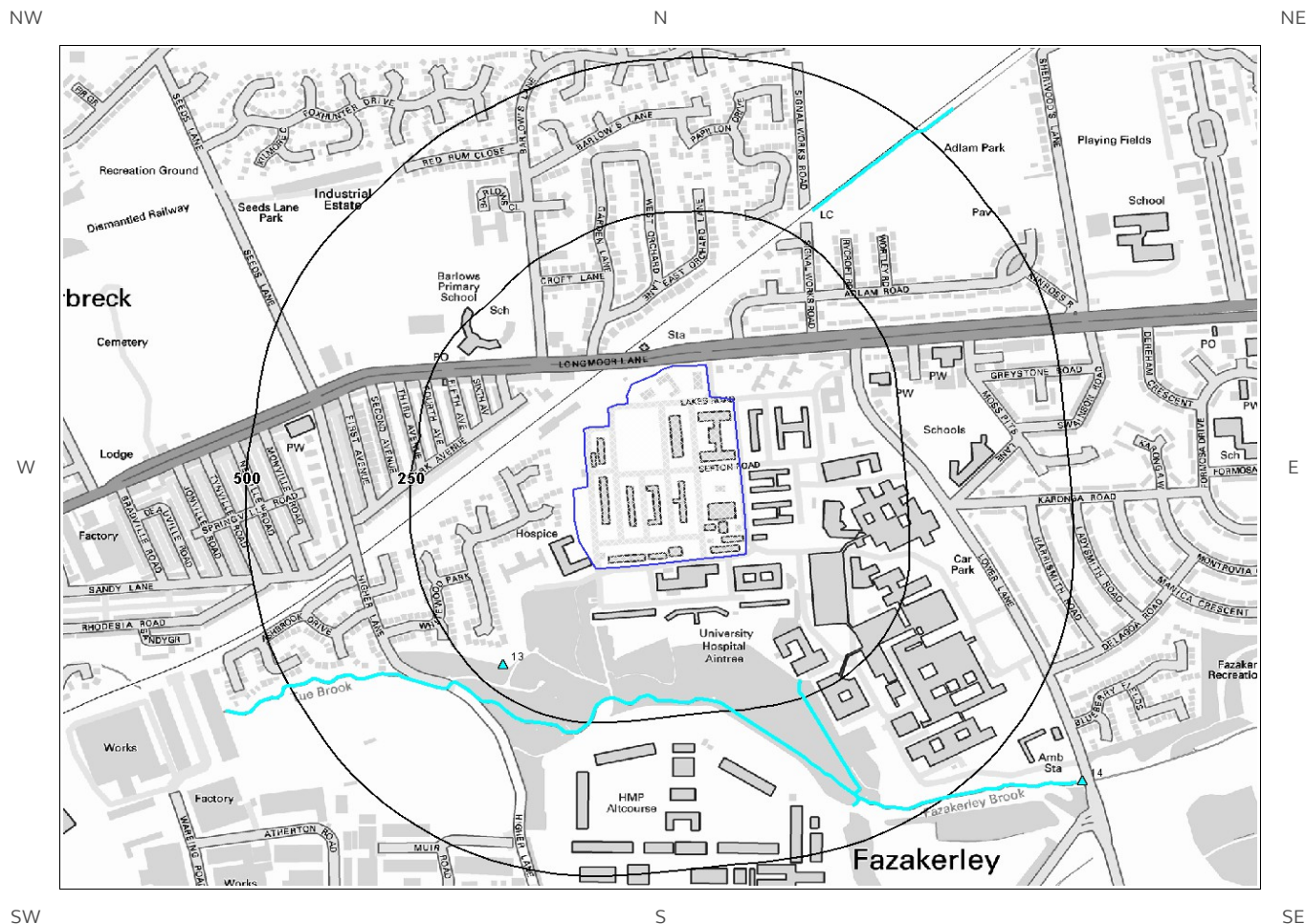
# 6d. Hydrogeology – Source Protection Zones within confined aquifer



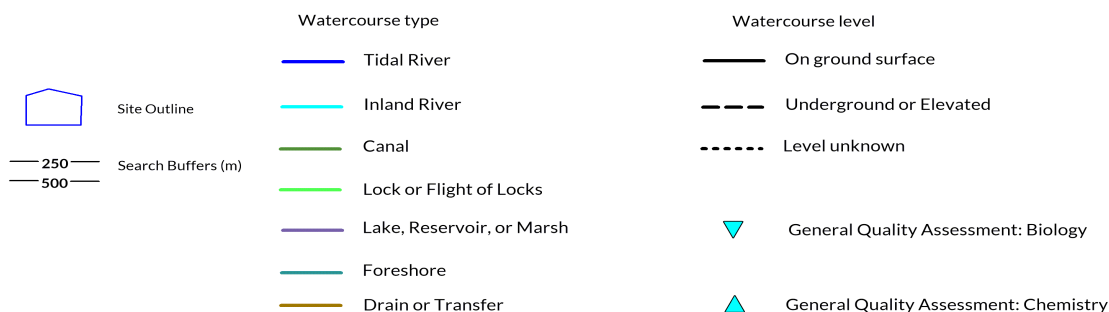
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# 6e. Hydrology – Watercourse Network and River Quality



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# 6. Hydrogeology and Hydrology

## 6.1 Aquifer within Superficial Deposits

Records of strata classification within the superficial geology at or in proximity to the property Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (6a):

| ID | Distance (m) | Direction | Designation                  | Description                                                                                                                                                                                                                                             |
|----|--------------|-----------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | 0            | On Site   | Secondary A                  | 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. These are generally aquifers formerly classified as minor aquifers                  |
| 2  | 307          | S         | Secondary (undifferentiated) | 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 |

## 6.2 Aquifer within Bedrock Deposits

Records of strata classification within the bedrock geology at or in proximity to the property Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (6b):

| ID | Distance (m) | Direction | Designation | Description                                                                                                                                                                                                                                |
|----|--------------|-----------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | 0            | On Site   | Principal   | Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers |

## 6.3 Groundwater Abstraction Licences

Groundwater Abstraction Licences within 2000m of the study site

Identified

The following Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

| ID        | Distance (m) | Direction | NGR              | Details                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                       |
|-----------|--------------|-----------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2A        | 356          | N         | 338140<br>397620 | Status: Historical<br>Licence No: 2569031129<br>Details: Evaporative Cooling<br>Direct Source: Ground Water - North West Region<br>Point: "BOREHOLE AT FAZAKERLEY, LIVERPOOL"<br>Data Type: Point<br>Name: STELLA PRODUCTS LTD                                            | Annual Volume (m³): -<br>Max Daily Volume (m³): -<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 11/11/1998<br>Version End Date:           |
| 3A        | 356          | N         | 338140<br>397620 | Status: Historical<br>Licence No: 2569031129<br>Details: Evaporative Cooling<br>Direct Source: Ground Water - North West Region<br>Point: BOREHOLE AT FAZAKERLEY, LIVERPOOL<br>Data Type: Point<br>Name: STELLA PRODUCTS LTD                                              | Annual Volume (m³): -<br>Max Daily Volume (m³): -<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 11/11/1998<br>Version End Date:           |
| Not shown | 789          | NW        | 337640<br>398010 | Status: Active<br>Licence No: 2569031123<br>Details: Spray Irrigation - Direct<br>Direct Source: Ground Water - North West Region<br>Point: BOREHOLE 'C' AT AINTREE RACECOURSE<br>Data Type: Point<br>Name: AINTREE RACECOURSE CO LTD                                     | Annual Volume (m³): 109,200<br>Max Daily Volume (m³): 1,456<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 26/11/2018<br>Version End Date: |
| Not shown | 1070         | SW        | 337200<br>396100 | Status: Historical<br>Licence No: 2569031140<br>Details: General Use Relating To Secondary Category (Medium Loss)<br>Direct Source: Ground Water - North West Region<br>Point: LAND AT EXPRESS DAIRIES, LONG LANE, AINTREE<br>Data Type: Point<br>Name: EXPRESS LIMITED   | Annual Volume (m³): 450,000<br>Max Daily Volume (m³): 1,500<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 13/03/2003<br>Version End Date: |
| Not shown | 1070         | SW        | 337200<br>396100 | Status: Historical<br>Licence No: 2569031140<br>Details: General use relating to Secondary Category (Medium Loss)<br>Direct Source: Ground Water - North West Region<br>Point: "LAND AT EXPRESS DAIRIES, LONG LANE, AINTREE"<br>Data Type: Point<br>Name: EXPRESS LIMITED | Annual Volume (m³): -<br>Max Daily Volume (m³): -<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 13/03/2003<br>Version End Date:           |
| Not shown | 1098         | NW        | 337000<br>397910 | Status: Historical<br>Licence No: 2569031123<br>Details: Spray Irrigation - Direct<br>Direct Source: Ground Water - North West Region<br>Point: UNDERGROUND STRATA IN AINTREE L/POOL<br>Data Type: Point<br>Name: AINTREE RACECOURSE CO LTD                               | Annual Volume (m³): -<br>Max Daily Volume (m³): -<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 18/10/1996<br>Version End Date:           |

| ID        | Distance (m) | Direction | NGR              | Details                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                       |
|-----------|--------------|-----------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Not shown | 1098         | NW        | 337000<br>397910 | Status: Active<br>Licence No: 2569031123<br>Details: Spray Irrigation - Direct<br>Direct Source: Ground Water - North West Region<br>Point: UNDERGROUND STRATA IN AINTREE LIVERPOOL<br>Data Type: Point<br>Name: AINTREE RACECOURSE CO LTD                                                                                           | Annual Volume (m³): 109,200<br>Max Daily Volume (m³): 1,456<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 26/11/2018<br>Version End Date: |
| Not shown | 1132         | NW        | 336980<br>397940 | Status: Historical<br>Licence No: 2569031123<br>Details: Spray Irrigation - Direct<br>Direct Source: Ground Water - North West Region<br>Point: UNDERGROUND STRATA IN AINTREE L/POOL<br>Data Type: Point<br>Name: AINTREE RACECOURSE CO LTD                                                                                          | Annual Volume (m³): -<br>Max Daily Volume (m³): -<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 18/10/1996<br>Version End Date:           |
| Not shown | 1132         | NW        | 336980<br>397940 | Status: Active<br>Licence No: 2569031123<br>Details: Spray Irrigation - Direct<br>Direct Source: Ground Water - North West Region<br>Point: UNDERGROUND STRATA IN AINTREE LIVERPOOL<br>Data Type: Point<br>Name: AINTREE RACECOURSE CO LTD                                                                                           | Annual Volume (m³): 109,200<br>Max Daily Volume (m³): 1,456<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 26/11/2018<br>Version End Date: |
| Not shown | 1277         | SW        | 337300<br>395800 | Status: Historical<br>Licence No: 2569031004<br>Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services"<br>Direct Source: Ground Water - North West Region<br>Point: "BOREHOLE AT PREMISES, LONG LANE, AINTREE, LIVERPOOL"<br>Data Type: Point<br>Name: ALLIED FOODS LTD             | Annual Volume (m³): -<br>Max Daily Volume (m³): -<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 01/04/1984<br>Version End Date:           |
| Not shown | 1277         | SW        | 337300<br>395800 | Status: Historical<br>Licence No: 2569031004<br>Details: General Cooling (Existing Licences Only) (Low Loss)<br>Direct Source: Ground Water - North West Region<br>Point: "BOREHOLE AT PREMISES, LONG LANE, AINTREE, LIVERPOOL"<br>Data Type: Point<br>Name: ALLIED FOODS LTD                                                        | Annual Volume (m³): -<br>Max Daily Volume (m³): -<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 01/04/1984<br>Version End Date:           |
| Not shown | 1277         | SW        | 337300<br>395800 | Status: Historical<br>Licence No: 2569031004<br>Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services<br>Direct Source: Ground Water - North West Region<br>Point: BOREHOLE AT PREMISES, LONG LANE, AINTREE, LIVERPOOL<br>Data Type: Point<br>Name: CENTAUR PROPERTY INVESTMENTS LTD | Annual Volume (m³): -<br>Max Daily Volume (m³): -<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 01/07/2002<br>Version End Date:           |

| ID        | Distance (m) | Direction | NGR              | Details                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                    |
|-----------|--------------|-----------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Not shown | 1277         | SW        | 337300<br>395800 | Status: Historical<br>Licence No: 2569031004<br>Details: General Cooling (Existing Licences Only) (Low Loss)<br>Direct Source: Ground Water - North West Region<br>Point: BOREHOLE AT PREMISES, LONG LANE, AINTREE, LIVERPOOL<br>Data Type: Point<br>Name: CENTAUR PROPERTY INVESTMENTS LTD                                   | Annual Volume (m³): -<br>Max Daily Volume (m³): -<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 01/07/2002<br>Version End Date:        |
| Not shown | 1277         | SW        | 337300<br>395800 | Status: Active<br>Licence No: 2569031004<br>Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services<br>Direct Source: Ground Water - North West Region<br>Point: BOREHOLE AT PREMISES LONG LANE AINTREE LIVERPOOL<br>Data Type: Point<br>Name: CENTAUR PROPERTY INVESTMENTS LTD | Annual Volume (m³): 32,731<br>Max Daily Volume (m³): 109<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 01/07/2002<br>Version End Date: |
| Not shown | 1277         | SW        | 337300<br>395800 | Status: Active<br>Licence No: 2569031004<br>Details: General Cooling (Existing Licences Only) (Low Loss)<br>Direct Source: Ground Water - North West Region<br>Point: BOREHOLE AT PREMISES LONG LANE AINTREE LIVERPOOL<br>Data Type: Point<br>Name: CENTAUR PROPERTY INVESTMENTS LTD                                          | Annual Volume (m³): 32,731<br>Max Daily Volume (m³): 109<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 01/07/2002<br>Version End Date: |
| Not shown | 1403         | SW        | 336600<br>396300 | Status: Historical<br>Licence No: 2569031109<br>Details: General use relating to Secondary Category (Medium Loss)<br>Direct Source: Ground Water - North West Region<br>Point: "BOREHOLE AT HARTLEY'S VILLAGE, AINTREE, LIVERPOOL"<br>Data Type: Point<br>Name: HANSON QUARRY PRODUCTS EUROPE LTD                             | Annual Volume (m³): -<br>Max Daily Volume (m³): -<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 01/07/2000<br>Version End Date:        |
| Not shown | 1403         | SW        | 336600<br>396300 | Status: Active<br>Licence No: 2569031109<br>Details: General Use Relating To Secondary Category (Medium Loss)<br>Direct Source: Ground Water - North West Region<br>Point: BOREHOLE AT HARTLEY'S VILLAGE, AINTREE, LIVERPOOL<br>Data Type: Point<br>Name: HANSON QUARRY PRODUCTS EUROPE LIMITED                               | Annual Volume (m³): 20,000<br>Max Daily Volume (m³): 90<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 13/08/2012<br>Version End Date:  |
| Not shown | 1842         | NW        | 336702<br>398659 | Status: Active<br>Licence No: NW/069/0031/017<br>Details: Process Water<br>Direct Source: Ground Water - North West Region<br>Point: BOREHOLE AT HEYSHAM ROAD AINTREE<br>Data Type: Point<br>Name: William Rainford Holdings (Ltd)                                                                                            | Annual Volume (m³): 29,100<br>Max Daily Volume (m³): 116<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 05/01/2017<br>Version End Date: |



| ID        | Distance (m) | Direction | NGR              | Details                                                                                                                                                                                                                               |                                                                                                                                                                                                    |
|-----------|--------------|-----------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Not shown | 1842         | NW        | 336702<br>398659 | Status: Active<br>Licence No: NW/069/0031/017<br>Details: Dust Suppression<br>Direct Source: Ground Water - North West Region<br>Point: BOREHOLE AT HEYSHAM ROAD AINTREE<br>Data Type: Point<br>Name: William Rainford Holdings (Ltd) | Annual Volume (m³): 29,100<br>Max Daily Volume (m³): 116<br>Original Application No: -<br>Original Start Date:<br>Expiry Date:<br>Issue No:<br>Version Start Date: 05/01/2017<br>Version End Date: |

## 6.4 Surface Water Abstraction Licences

Surface Water Abstraction Licences within 2000m of the study site

None identified

Database searched and no data found.

## 6.5 Potable Water Abstraction Licences

Potable Water Abstraction Licences within 2000m of the study site

Identified

The following Potable Water Abstraction Licences records are represented as points, lines and regions on the SPZ and Potable Water Abstraction Licences Map (6c):

| ID        | Distance (m) | Direction | NGR              | Details                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                          |
|-----------|--------------|-----------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Not shown | 1277         | SW        | 337300<br>395800 | Status: Historical<br>Licence No: 2569031004<br>Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services"<br>Direct Source: Ground Water - North West Region<br>Point: "BOREHOLE AT PREMISES, LONG LANE, AINTREE, LIVERPOOL"<br>Data Type: Point<br>Name: ALLIED FOODS LTD             | Annual Volume (m³): -<br>Max Daily Volume (m³): -<br>Original Application No: -<br>Original Start Date: 17/02/1966<br>Expiry Date: -<br>Issue No: 100<br>Version Start Date:<br>Version End Date:        |
| Not shown | 1277         | SW        | 337300<br>395800 | Status: Historical<br>Licence No: 2569031004<br>Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services<br>Direct Source: Ground Water - North West Region<br>Point: BOREHOLE AT PREMISES, LONG LANE, AINTREE, LIVERPOOL<br>Data Type: Point<br>Name: CENTAUR PROPERTY INVESTMENTS LTD | Annual Volume (m³): -<br>Max Daily Volume (m³): -<br>Original Application No: -<br>Original Start Date: 17/02/1966<br>Expiry Date: -<br>Issue No: 101<br>Version Start Date:<br>Version End Date:        |
| Not shown | 1277         | SW        | 337300<br>395800 | Status: Active<br>Licence No: 2569031004<br>Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services<br>Direct Source: Ground Water - North West Region<br>Point: BOREHOLE AT PREMISES LONG LANE                                                                                        | Annual Volume (m³): 32,731<br>Max Daily Volume (m³): 109<br>Original Application No: -<br>Original Start Date: 17/02/1966<br>Expiry Date: -<br>Issue No: 101<br>Version Start Date:<br>Version End Date: |

| ID | Distance (m) | Direction | NGR | Details                                                                         |
|----|--------------|-----------|-----|---------------------------------------------------------------------------------|
|    |              |           |     | AINTREE LIVERPOOL<br>Data Type: Point<br>Name: CENTAUR PROPERTY INVESTMENTS LTD |

## 6.6 Source Protection Zones

Source Protection Zones within 500m of the study site

Identified

The following Source Protection Zones records are represented on the SPZ and Potable Water Abstraction Map (6c):

| ID | Distance (m) | Direction | Zone | Description     |
|----|--------------|-----------|------|-----------------|
| 1  | 0            | On Site   | 3    | Total catchment |

## 6.7 Source Protection Zones within Confined Aquifer

Source Protection Zones within the Confined Aquifer within 500m of the study site

None identified

Historically, Source Protection Zone maps have been focused on regulation of activities which occur at or near the ground surface, such as prevention of point source pollution and bacterial contamination of water supplies. Sources in confined aquifers were often considered to be protected from these surface pressures due to the presence of a low permeability confining layer (e.g. glacial till, clay). The increased interest in subsurface activities such as onshore oil and gas exploration, ground source heating and cooling requires protection zones for confined sources to be marked on SPZ maps where this has not already been done.

Database searched and no data found.

## 6.8 Groundwater Vulnerability and Soil Leaching Potential

Environment Agency/Natural Resources Wales information on groundwater vulnerability and soil leaching potential within 500m of the study site Identified

| Distance (m) | Direction | Classification                        | Soil Vulnerability Category | Description                                                                                                                                                           |
|--------------|-----------|---------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0            | On Site   | Minor Aquifer/High Leaching Potential | HU                          | Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information. |
| 290          | S         | Major Aquifer/High Leaching Potential | HU                          | Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information. |

## 6.9 River Quality

Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site Identified

### 6.9.1 Biological Quality:

Biological Quality data describes water quality in terms of 83 groups of macroinvertebrates, some of which are pollution sensitive. The results are graded from A ('Very Good') to F ('Bad').

The following Biological Quality records are shown on the Hydrology Map (6e):

| ID        | Distance (m) | Direction | NGR              | River Quality Grade                                                                                           | Biological Quality Grade |      |      |      |      |
|-----------|--------------|-----------|------------------|---------------------------------------------------------------------------------------------------------------|--------------------------|------|------|------|------|
|           |              |           |                  |                                                                                                               | 2005                     | 2006 | 2007 | 2008 | 2009 |
| Not shown | 1262         | E         | 339300<br>396700 | River Name: Alt<br>Reach: Liverpool North Stw To M57<br>End/Start of Stretch: Start of Stretch NGR            | E                        | E    | E    | E    | E    |
| Not shown | 1262         | E         | 339300<br>396700 | River Name: Alt<br>Reach: Stockbridge Lane To Liverpool North Stw<br>End/Start of Stretch: End of Stretch NGR | E                        | E    | E    | E    | D    |

Chemical quality data is based on the General Quality Assessment Headline Indicators scheme (GQAHl). In England, each chemical sample is measured for ammonia and dissolved oxygen. In Wales, the samples are measured for biological oxygen demand (BOD), ammonia and dissolved oxygen. The results are graded from A ('Very Good') to F ('Bad').

The following Chemical Quality records are shown on the Hydrology Map (6e):

| ID        | Distance (m) | Direction | NGR              | River Quality Grade                                                                                                 | Chemical Quality Grade |      |      |      |      |
|-----------|--------------|-----------|------------------|---------------------------------------------------------------------------------------------------------------------|------------------------|------|------|------|------|
|           |              |           |                  |                                                                                                                     | 2005                   | 2006 | 2007 | 2008 | 2009 |
| 13        | 211          | SW        | 337700<br>396800 | River Name: Fazakerley Bk<br>Reach: Qsl At Higher Lane To Alt<br>End/Start of Stretch: Start of Stretch<br>NGR      | D                      | D    | D    | C    | C    |
| 14        | 633          | SE        | 338583<br>396611 | River Name: Fazakerley Bk<br>Reach: Qsl At Higher Lane To Alt<br>End/Start of Stretch: Sample Point NGR             | D                      | D    | D    | C    | C    |
| Not shown | 1244         | E         | 339300<br>396800 | River Name: Fazakerley Bk<br>Reach: Qsl At Higher Lane To Alt<br>End/Start of Stretch: End of Stretch<br>NGR        | D                      | D    | D    | C    | C    |
| Not shown | 1262         | E         | 339300<br>396700 | River Name: Alt<br>Reach: Stockbridge Lane To Liverpool<br>North Stw<br>End/Start of Stretch: End of Stretch<br>NGR | D                      | D    | D    | D    | C    |
| Not shown | 1262         | E         | 339300<br>396700 | River Name: Alt<br>Reach: Liverpool North Stw To M57<br>End/Start of Stretch: Start of Stretch<br>NGR               | B                      | B    | C    | C    | C    |

## 6.10 Ordnance Survey MasterMap Water Network

Ordnance Survey MasterMap Water Network entries within 500m of the study site

This watercourse information is provided by Ordnance Survey MasterMap Water Network. The data provides a detailed centre line following the curve of the waterway precisely, so all distances provided in the report should be understood as measurements to the centreline rather than a measurement to the nearest point of the watercourse. Underground watercourses are inferred from entry and exit points so caution is advised in using these to indicate precise locations of underground watercourses when planning site investigation and development.

The following Ordnance Survey MasterMap Water Network records are represented on the Hydrology Map (6e):

| ID | Distance/Direction | Name             | Type of Watercourse                                 | Additional Details                                                                                                                                                                                  |
|----|--------------------|------------------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | 211<br>S           | Fazakerley Brook | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): 1.3 |
| 21 | 211                | Fazakerley Brook | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface                                                                                                                              |



| ID        | Distance/<br>Direction | Name             | Type of Watercourse                                 | Additional Details                                                                                                                                                                                           |
|-----------|------------------------|------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | S                      |                  |                                                     | Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): 1.3                                                                                    |
| 2         | 222<br>S               | -                | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): Not Provided |
| 22        | 222<br>S               | -                | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): Not Provided |
| 3         | 298<br>NE              | -                | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): Not Provided |
| 23        | 298<br>NE              | -                | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): Not Provided |
| 4         | 414<br>SE              | -                | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: Underground<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): Not Provided       |
| Not shown | 414<br>SE              | -                | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: Underground<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): Not Provided       |
| 5         | 416<br>SE              | -                | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): Not Provided |
| Not shown | 416<br>SE              | -                | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): Not Provided |
| 6         | 420<br>SE              | -                | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): 1.1          |
| Not shown | 420<br>SE              | -                | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): 1.1          |
| 7         | 425<br>SE              | Fazakerley Brook | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): 1.3          |
| Not shown | 425<br>SE              | Fazakerley Brook | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)                                                           |

| ID        | Distance/<br>Direction | Name             | Type of Watercourse                                 | Additional Details                                                                                                                                                                                           |
|-----------|------------------------|------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |                        |                  |                                                     | Average Width in Watercourse Section (m): 1.3                                                                                                                                                                |
| 8         | 433<br>SE              | Fazakerley Brook | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): 1.2          |
| 9         | 433<br>SE              | -                | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): Not Provided |
| Not shown | 433<br>SE              | Fazakerley Brook | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): 1.2          |
| Not shown | 433<br>SE              | -                | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): Not Provided |
| 10        | 474<br>NE              | -                | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): 1.2          |
| Not shown | 474<br>NE              | -                | Inland river not influenced by normal tidal action. | Catchment Area: Alt<br>Relationship to Ground Level: On ground surface<br>Permanence: Watercourse contains water year round (in normal conditions)<br>Average Width in Watercourse Section (m): 1.2          |

## 6.11 Surface Water Features

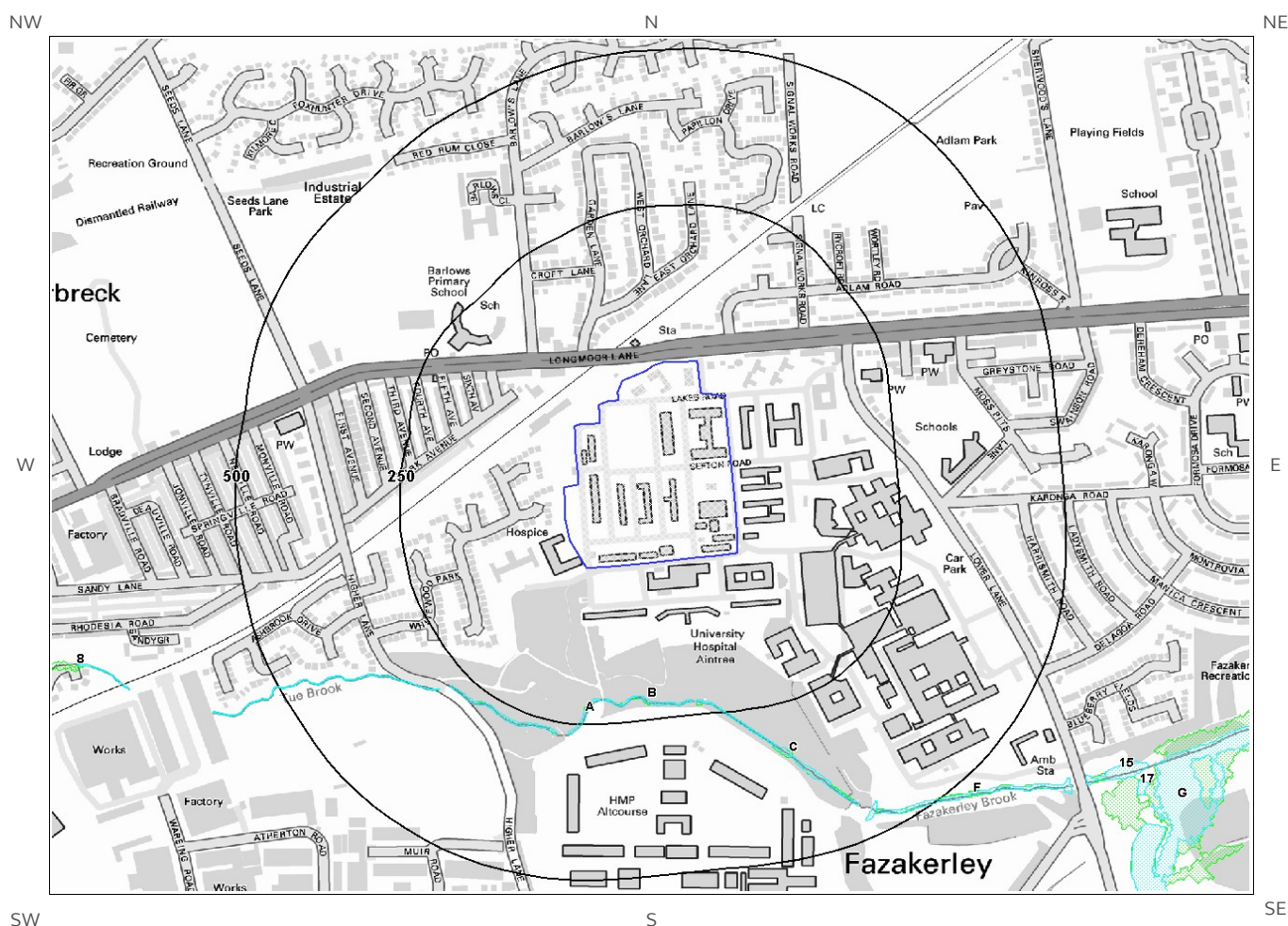
Surface water features within 250m of the study site

Identified

The following surface water records are not represented on mapping:

| Distance (m) | Direction |
|--------------|-----------|
| 210          | S         |
| 210          | S         |
| 227          | S         |
| 232          | S         |

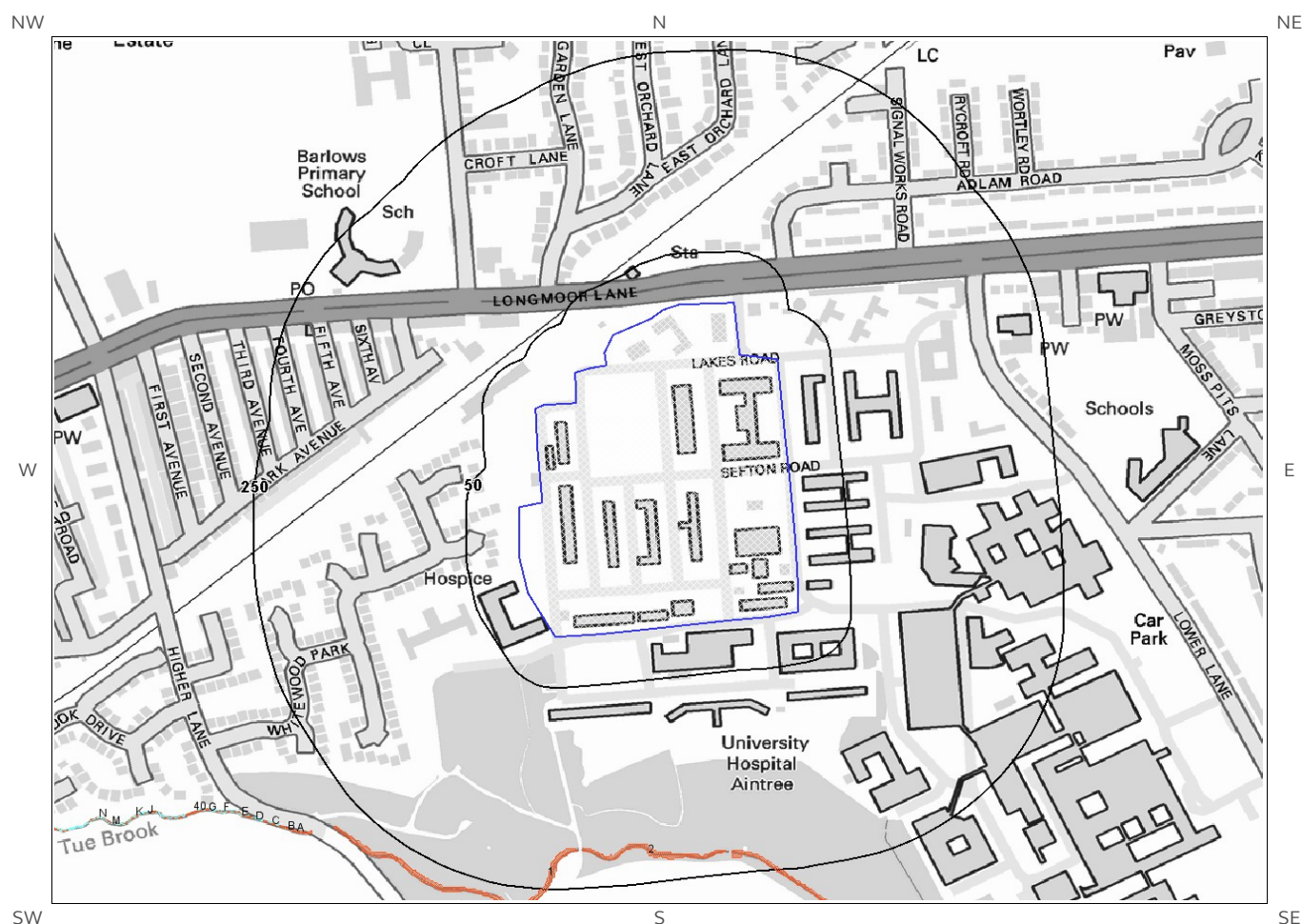
# 7a. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)



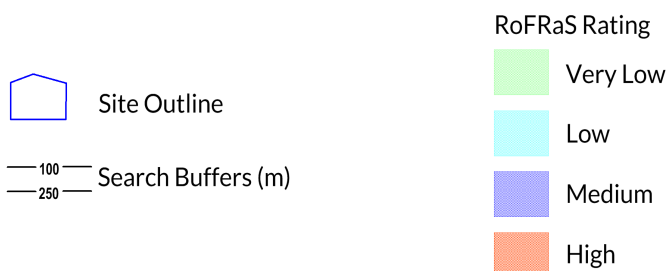
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# 7b. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) Map



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# 7 Flooding

## 7.1 River and Coastal Zone 2 Flooding

Environment Agency/Natural Resources Wales Zone 2 floodplain within 250m

Identified

Environment Agency/Natural Resources Wales Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 7a – Flood Map for Planning:

| ID | Distance (m) | Direction | Update      | Type                             |
|----|--------------|-----------|-------------|----------------------------------|
| 1A | 209          | S         | 09-Sep-2019 | Zone 2 - (Fluvial /Tidal Models) |
| 2B | 209          | S         | 09-Sep-2019 | Zone 2 - (Fluvial /Tidal Models) |
| 3C | 226          | S         | 09-Sep-2019 | Zone 2 - (Fluvial /Tidal Models) |

## 7.2 River and Coastal Zone 3 Flooding

Environment Agency/Natural Resources Wales Zone 3 floodplain within 250m

Identified

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 7a – Flood Map for Planning.

| ID | Distance (m) | Direction | Update      | Type                      |
|----|--------------|-----------|-------------|---------------------------|
| 1A | 209          | S         | 09-Sep-2019 | Zone 3 - (Fluvial Models) |
| 2B | 209          | S         | 09-Sep-2019 | Zone 3 - (Fluvial Models) |
| 3C | 226          | S         | 09-Sep-2019 | Zone 3 - (Fluvial Models) |

### 7.3 Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating

Highest risk of flooding onsite

Very Low

The Environment Agency/Natural Resources Wales RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a Very Low (less than 1 in 1000) chance of flooding in any given year.

---

### 7.4 Flood Defences

Flood Defences within 250m of the study site

None identified

Database searched and no data found.

---

### 7.5 Areas benefiting from Flood Defences

Areas benefiting from Flood Defences within 250m of the study site

None identified

---

### 7.6 Areas benefiting from Flood Storage

Areas used for Flood Storage within 250m of the study site

None identified

---

### 7.7 Groundwater Flooding Susceptibility Areas

7.7.1 British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site

Identified

Clearwater Flooding or Superficial Deposits Flooding

Clearwater Flooding

Notes: Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

---

7.7.2 Highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions

Potential below Surface

Where potential for groundwater flooding of property situated below ground level is indicated, this means that given the geological conditions there may be a groundwater flooding hazard to basements and other below surface infrastructure. Unless other relevant information, e.g. records of previous flooding, suggests groundwater flooding has occurred before in this area you need take no further action in relation to groundwater flooding hazard. If there are records of previous incidences of groundwater flooding, then is recommended that other information e.g. rainfall history, property type, and land drainage information in addition to previous records of flooding be investigated in order to establish relative, but not absolute, risk of groundwater flooding.

## 7.8 Groundwater Flooding Confidence Areas

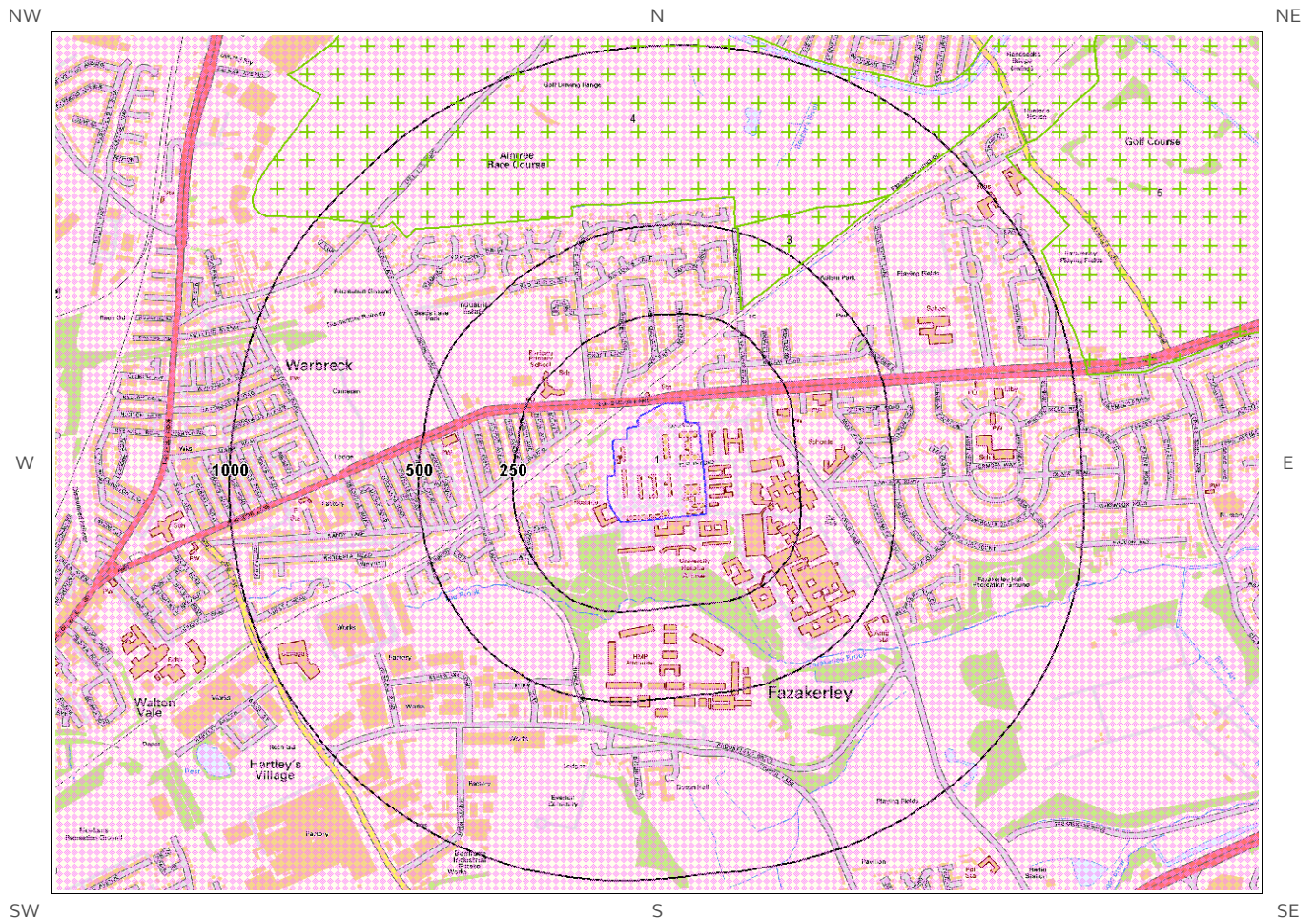
British Geological Survey confidence rating in this result

Low

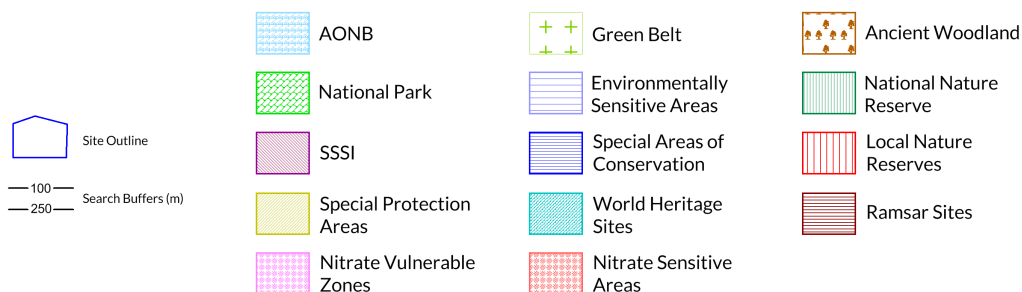
Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

# 8. Designated Environmentally Sensitive Sites Map



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## 8. Designated Environmentally Sensitive Sites

Designated Environmentally Sensitive Sites within 2000m of the study site

Identified

---

### 8.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:

0

Database searched and no data found.

---

### 8.2 Records of National Nature Reserves (NNR) within 2000m of the study site:

0

Database searched and no data found.

---

### 8.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:

0

Database searched and no data found.

---

### 8.4 Records of Special Protection Areas (SPA) within 2000m of the study site:

0

Database searched and no data found.

---

### 8.5 Records of Ramsar sites within 2000m of the study site:

0

Database searched and no data found.

---

#### 8.6 Records of Ancient Woodland within 2000m of the study site:

Database searched and no data found.

0

---

#### 8.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:

Database searched and no data found.

0

---

#### 8.8 Records of World Heritage Sites within 2000m of the study site:

Database searched and no data found.

0

---

#### 8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

Database searched and no data found.

0

---

#### 8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

Database searched and no data found.

0

---

#### 8.11 Records of National Parks (NP) within 2000m of the study site:

Database searched and no data found.

0

---

#### 8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

Database searched and no data found.

0

### 8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

2

The following Nitrate Vulnerable Zone records produced by DEFRA are represented as polygons on the Designated Environmentally Sensitive Sites Map:

| ID        | Distance (m) | Direction | NVZ Name | Data Source |
|-----------|--------------|-----------|----------|-------------|
| 1         | 0            | On Site   | Existing | DEFRA       |
| Not shown | 1930         | E         | Existing | DEFRA       |

### 8.14 Records of Green Belt land within 2000m of the study site:

4

Green Belt data contains Ordnance Survey data © Crown copyright and database right [2015].

| ID        | Distance | Direction | Green Belt Name                                    | Local Authority Name   |
|-----------|----------|-----------|----------------------------------------------------|------------------------|
| 3         | 304      | NE        | Liverpool, Manchester and West Yorks Greenbelt     | Liverpool District (B) |
| 4         | 512      | N         | Liverpool, Manchester and West Yorkshire Green Bel | Sefton                 |
| 5         | 1020     | E         | Liverpool, Manchester and West Yorks Greenbelt     | Knowsley               |
| Not shown | 1958     | E         | Liverpool, Manchester and West Yorks Greenbelt     | Knowsley               |

# 9. Natural Hazards Findings

## 9.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a **Groundsure Geo Insight**, available from our **website**. The following information has been found:

### 9.1.1 Shrink Swell

Maximum Shrink-Swell\*\* hazard rating identified on the study site Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

| Hazard                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays. |

### 9.1.2 Landslides

Maximum Landslide\* hazard rating identified on the study site Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

| Hazard                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides. |

### 9.1.3 Soluble Rocks

Maximum Soluble Rocks\* hazard rating identified on the study site Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

| Hazard                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks. |

\* This indicates an automatically generated 50m buffer and site.



#### 9.1.4 Compressible Ground

Maximum Compressible Ground\* hazard rating identified on the study site

Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

| Hazard                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits. |

#### 9.1.5 Collapsible Rocks

Maximum Collapsible Rocks\* hazard rating identified on the study site

Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

| Hazard                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits. |

#### 9.1.6 Running Sand

Maximum Running Sand\*\* hazard rating identified on the study site

Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

| Hazard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property no significant increase in insurance risk due to running sand problems is likely. |

\* This indicates an automatically generated 50m buffer and site.

### 9.2.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The site is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

The radon data in this report is supplied by the BGS/Public Health England and is the definitive map of Radon Affected Areas in Great Britain and Northern Ireland. The dataset was created using long-term radon measurements in over 479,000 homes across Great Britain and 23,000 homes across Northern Ireland, combined with geological data. The dataset is considered accurate to 50m to allow for the margin of error in geological lines, and the findings of this report supercede any answer given in the less accurate Indicative Atlas of Radon in Great Britain, which simplifies the data to give the highest risk within any given 1km grid square. As such, the radon atlas is considered indicative, whereas the data given in this report is considered definitive.

---

### 9.2.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? No radon protective measures are necessary.

# 10. Mining

## 10.1 Coal Mining

Coal mining areas within 75m of the study site

None identified

Database searched and no data found.

---

## 10.2 Non-Coal Mining

Non-Coal Mining areas within 50m of the study site boundary

None identified

Database searched and no data found.

---

## 10.3 Brine Affected Areas

Brine affected areas within 75m of the study site

None identified

Guidance: No Guidance Required.

---

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# A P P E N D I X H

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# Preliminary Unexploded Ordnance (UXO) Risk Assessment

|                   |                                                |
|-------------------|------------------------------------------------|
| Project Name      | Aintree University Hospital, Liverpool         |
| Client            | GRM Development Solutions Ltd                  |
| Site Address      | Aintree University Hospital, Liverpool, L9 7LN |
| Report Reference  | PA9796b-00                                     |
| Date              | 7 <sup>th</sup> November 2024                  |
| Author            | JA                                             |
| Quality Assurance | AT                                             |

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## 1<sup>ST</sup> LINE DEFENCE





## Assessment Objective

This preliminary unexploded ordnance (UXO) risk assessment is a qualitative screening exercise to assess the likely potential of encountering UXO at the Aintree University Hospital, Liverpool site. The assessment involves the consideration of the basic factors that affect the potential for UXO to be present at a site as outlined in Stage One of the UXO risk management process.

## Background

This assessment uses the sources of information available in-house to 1st Line Defence Ltd to enable the placement of a development site in context with events that may have led to the presence of German air-delivered or Allied military UXO. The report will identify any immediate necessity for risk mitigation or additional research in the form of a Detailed UXO Risk Assessment. It makes use of 1st Line Defence's extensive historical archives, library and unique geo-databases, as well as internet resources, and is researched and compiled by UXO specialists and graduate researchers.

The assessment directly follows CIRIA C681 guidelines "Unexploded Ordnance, a Guide for the Construction Industry". The document will therefore assess the following factors:

- Basic Site Data
- Previous Military Use
- Indicators of potential aerial delivered UXO threat
- Consideration of any Mitigating Factors
- Extent of Proposed Intrusive Works
- Any requirement for Further Work

It should be noted that the vast majority of construction sites in the UK will have a low or negligible risk of encountering UXO and should be able to be screened out at this preliminary stage. The report is meant as a common sense 'first step' in the UXO risk management process. The content of the report and conclusions drawn are based on basic, preliminary research using the information available to 1st Line Defence at the time this report was produced. It should be noted that the only way to entirely negate risk from UXO to a project would be to support the works proposed with appropriate UXO risk mitigation measures. It is rarely possible to state that there is absolutely 'no' risk from UXO to a project.

## Site Boundary



| Risk Assessment Considerations                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Site location and description/current use                                              | <p>The site is located in Fazakerley, approximately 6km north-east of the centre of Liverpool.</p> <p>Recent aerial imagery suggests that the site is located within Aintree University Hospital, and currently comprises three large structures, as well as Sixth, Seventh, Eight, Ninth and Tenth Avenue and an area of car park in the west. Sefton Road and Woodlands Road run along the northern and southern boundaries of the site respectively. Further hospital infrastructure borders the site to the east and south, while an additional area of car parking is situated to the north and residential housing is located to the west.</p> <p>The site is approximately centred on the OS grid reference: <b>SJ 37899 97065</b>.</p> |
| Are there any indicators of current/historical military activity on/close to the site? | <p>In-house records do not indicate that the site footprint had any former military use. No features such as WWII defensive positions, encampments or firing ranges are recorded to have been located at or in the immediate vicinity of the site. In addition, no information of ordnance being stored, produced, or disposed of within the proposed site boundary could be found.</p> <p>The closest recorded Heavy Anti-Aircraft (HAA) battery was situated approximately 2.2km south-west of the site. The range of a fired projectile can be up to 15km. The risk from Anti-Aircraft projectiles is homogenous to the risk from German aerial delivered ordnance (see below).</p>                                                         |
| What was the pre- and post-WWII history of the site?                                   | <p>During WWII, the site was part of Fazakerley Isolation Hospital. Pre-war OS mapping dated 1938 shows the site to comprise three large hospital buildings and a number of smaller buildings in the west. Further hospital structures border the site to the north, east and south, while open land is situated to the west.</p> <p>Post-war OS mapping dated 1955 shows the majority of the site to have remained the same, however two structures are no longer present in the south-west of the site. Hospital infrastructure continues to border to the north, east and south.</p>                                                                                                                                                        |
| Was the area subject to bombing during WWII?                                           | <p>During WWII, the site was located within the County Borough of Liverpool. According to official Home Office bombing statistics, this borough was subject to an overall moderate-high density of bombing, with an average of 91.5 items of ordnance recorded per 1,000 acres. This consisted of 2,332 high explosive bombs, 117 parachute mines and 50 oil bombs, totalling 2,499 incidents across 27,321 acres.</p> <p>Anecdotal accounts reference Fazakerley Hospital being subject to bombing throughout the war, including a landmine falling within the grounds on the hospital.<sup>1</sup> Written records will need to be consulted in an attempt to acquire additional information regarding the location of this bombing.</p>     |
| Is there any evidence of bomb damage on/close to the site?                             | <p>Anecdotal evidence suggests that bombing at Fazakerley Hospital resulted in "devastation", with the interiors of buildings "completely gutted" by blasts. Given the fact that two structures previously located in the south-west of the site do not appear in post-war mapping, the possibility cannot be excluded that this damage occurred on site.</p>                                                                                                                                                                                                                                                                                                                                                                                  |
| To what degree would the site have been subject to access?                             | <p>Following damage sustained by the hospital, it is likely that any affected buildings would have been subject to evacuations or temporary closures. This would reduce the access to and observation of these areas. Evidence of UXO is more likely to go unnoticed within areas of infrequent access.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                    |

<sup>1</sup> <https://www.bbc.co.uk/history/ww2peopleswar/stories/83/a3083483.shtml>

|                                                                |                                                                                                                                                                     |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| To what degree has the site been developed post-WWII?          | Since WWII, the three large hospital buildings remain on site, however all other structures have been removed, with the west of the site now comprising a car park. |
| What is the nature and extent of the intrusive works proposed? | The nature and extent of proposed works are not known at this stage.                                                                                                |

### Summary and Conclusions

During WWII, the site was located within the County Borough of Liverpool. According to official Home Office bombing statistics, this borough was subject to an overall moderate-high density of bombing, with an average of 91.5 items of ordnance recorded per 1,000 acres. Anecdotal accounts reference Fazakerley Hospital being subject to bombing throughout the war, including a landmine falling within the grounds on the hospital.

One account suggests that bombing at Fazakerley Hospital resulted in “devastation”, with the interiors of buildings “completely gutted” by blasts. Given the fact that two structures previously located in the south-west of the site do not appear in post-war mapping, the possibility cannot be excluded that this damage occurred on site.

Following damage sustained by the hospital, it is likely that any affected buildings would have been subject to evacuations or temporary closures. This would reduce the access to and observation of these areas. Evidence of UXO is more likely to go unnoticed within areas of infrequent access.

### Recommendations

Given the findings of this preliminary report, it is recommended that **further research** is undertaken in the form of a **Detailed UXO Risk Assessment**. This is recommended in order to better assess the wartime conditions within the proposed area of works and to better determine the locations and effects of bombing incidents across the site’s locality. This would allow for a more comprehensive analysis of the risk of UXO on site. Further research would involve the attempted acquisition of any available written local bombing records, WWII-era aerial photography and other archival material.

**Prior to or in lieu of a Detailed Assessment, it is recommended that appropriate UXO Risk Mitigation Measures are provided for intrusive works proposed.**

If the client has any anecdotal or empirical evidence of UXO risk on site, please contact 1st Line Defence.

This report has been prepared by 1st Line Defence Limited with all reasonable care and skill. The report contains historical data and information from third party sources. 1st Line Defence Limited has sought to verify the accuracy and comprehensiveness of this information where possible but cannot be held accountable for any inherent errors. Furthermore, whilst every reasonable effort has been made to locate and access all relevant historical information, 1st Line Defence cannot be held responsible for any changes to risk level or mitigation recommendations resulting from documentation or other information which may come to light at a later date.

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**1ST LINE DEFENCE**



# Detailed Unexploded Ordnance (UXO) Risk Assessment

|                   |                                                |
|-------------------|------------------------------------------------|
| Project Name      | Aintree University Hospital, Liverpool         |
| Client            | GRM Development Solutions Ltd                  |
| Site Address      | Aintree University Hospital, Liverpool, L9 7LN |
| Report Reference  | DA9796b-00                                     |
| Date              | 21 <sup>st</sup> November 2024                 |
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## Executive Summary

### Site Location and Description

The site is located in Fazakerley, approximately 6km north-east of the centre of Liverpool.

Recent aerial imagery dating from 2023 suggests that the Aintree University Hospital structures previously situated on site have recently been demolished. The site currently comprises areas of vacant open ground, as well as Sixth, Seventh, Eighth, Ninth and Tenth Avenue and an area of car park in the west. Sefton Road and Woodlands Road run along the northern and southern boundaries of the site respectively.

Hospital infrastructure borders the site to the east and south, while an area of car parking is situated to the north and residential housing is located to the west.

The site is approximately centred on the OS grid reference: **SJ 3789997065**.

### Proposed Works

The nature and extent of proposed works are not known at this stage.

### Geology and Bomb Penetration Depth

The British Geological Survey (BGS) map shows the site to be underlain by Wilmslow Sandstone Formation, of the Triassic period. Superficial deposits include Shirdley Hill Sand Formation, of the Quaternary period.

Site-specific geotechnical information was not available to 1st Line Defence at the time of the production of this report. An assessment of maximum bomb penetration depth can be made once such data becomes available, or by a UXO specialist during on-site support.

It should be noted that the maximum depth that a bomb could reach may vary across a site and will be largely dependent on the specific underlying geological strata and its density.

### UXO Risk Assessment

1<sup>st</sup> Line Defence has assessed that there is an overall **Low Risk** from German and anti-aircraft unexploded ordnance at the site of proposed works. There is an assessed **Negligible Risk** from Allied unexploded ordnance.

#### The Risk from German Air-Delivered UXO

- During WWII, the site was located within the County Borough of Liverpool. According to official Home Office bombing statistics, this borough sustained an overall moderate-high density of bombing, with an average of 91.5 items of ordnance recorded per 1,000 acres. Luftwaffe Target Mapping highlights several targets across the city, including Fazakerley Hospital and Sanatorium, within which the site was located.
- Local written records highlight two bombing incidents at the hospital. The first, in September 1940, affected the Nurses' Home, which is believed to have been situated immediately south of the site. The second, a parachute mine falling on the west wing of Fazakerley Sanatorium, occurred in October 1940. Neither of these bomb strikes are anticipated to have affected the site boundary.
- Following the bombing incidents mentioned above, both the Nurses' Home and the west wing of Fazakerley Sanatorium are noted as sustaining damage, with the latter of the two being described as 'demolished'. This is visible in 1946 aerial imagery and wartime ground level imagery. However, no damage is recorded to any of the buildings within the site, which all appear intact and undamaged in post-war imagery.
- Due to the site's mixed composition, the ground cover is not anticipated to have been homogenous across the site. Generally, evidence of UXO is likely to have been spotted, reported and dealt with in areas of the site comprising hospital buildings. Areas of the site comprising undeveloped, soft and vegetated ground are anticipated to have been less conducive to spotting evidence of UXO, such as bomb entry holes which could be as small as 20cm in diameter.
- Owing to the fact that the site comprised a number of hospital buildings within the grounds of Fazakerley Hospital, access and observation of the site are anticipated to have been relatively frequent, with the site likely to have been subject to specific post-raid checks.

- No positive evidence has been found to suggest that the site was subject to any bombing during WWII. Given the site's undamaged appearance in post-war aerial imagery, it is anticipated that access across the site would have remained frequent throughout the war. As such, it is not considered likely that any evidence of UXBs would have gone unnoticed and unrecorded. As such, the site has been assessed to hold an overall **Low Risk** from UXO contamination.

#### The Risk from Allied UXO

- No evidence could be found to indicate that the site formerly had any military occupation or usage that could have led to contamination with items of Allied ordnance, such as LSA and SAA.
- The conditions in which HAA or LAA projectiles may have fallen unnoticed within the site boundary are however analogous to those regarding air delivered ordnance.

#### Post-WWII Redevelopment

- Since WWII, all hospital structures have been removed, with the west of the site now comprising a car park. The risk of UXO remaining is considered to be mitigated at the location of and down to the depth of any post-war redevelopment on site.

### Recommended Risk Mitigation Measures

The following risk mitigation measures are recommended to support the proposed works at the Aintree University Hospital, Liverpool site:

| Activity  | Recommended Risk Mitigation Measure                                                                                                                                        |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All Works | <ul style="list-style-type: none"> <li>• UXO Risk Management Plan</li> <li>• Site Specific UXO Awareness Briefings to all personnel conducting intrusive works.</li> </ul> |



## Glossary

| Abbreviation | Definition                                                  |
|--------------|-------------------------------------------------------------|
| AA           | Anti-Aircraft                                               |
| AFS          | Auxiliary Fire Service                                      |
| AP           | Anti-Personnel                                              |
| ARP          | Air Raid Precautions                                        |
| DA           | Delay-action                                                |
| EOC          | Explosive Ordnance Clearance                                |
| EOD          | Explosive Ordnance Disposal                                 |
| FP           | Fire Pot                                                    |
| GM           | G Mine (Parachute mine)                                     |
| HAA          | Heavy Anti-Aircraft                                         |
| HE           | High Explosive                                              |
| IB           | Incendiary Bomb                                             |
| JSEODOC      | Joint Services Explosive Ordnance Disposal Operation Centre |
| LAA          | Light Anti-Aircraft                                         |
| LCC          | London County Council                                       |
| LRRB         | Long Range Rocket Bomb (V-2)                                |
| LSA          | Land Service Ammunition                                     |
| NFF          | National Filling Factory                                    |
| OB           | Oil Bomb                                                    |
| PAC          | Pilotless Aircraft (V-1)                                    |
| PB           | Phosphorous Bomb                                            |
| PM           | Parachute Mine                                              |
| POW          | Prisoner Of War                                             |
| RAF          | Royal Air Force                                             |
| RCAF         | Royal Canadian Air Force                                    |
| RFC          | Royal Flying Corps                                          |
| RNAS         | Royal Naval Air Service                                     |
| ROF          | Royal Ordnance Factory                                      |
| SA           | Small Arms                                                  |
| SAA          | Small Arms Ammunition                                       |
| SD2          | Anti-personnel "Butterfly Bomb"                             |
| SIP          | Self-Igniting Phosphorous                                   |
| U/C          | Unclassified bomb                                           |
| UP           | Unrotated Projectile (rocket)                               |
| USAAF        | United States Army Air Force                                |
| UX           | Unexploded                                                  |
| UXAA         | Unexploded Anti-Aircraft                                    |
| UXB          | Unexploded Bomb                                             |
| UXO          | Unexploded Ordnance                                         |
| V-1          | Flying Bomb (Doodlebug)                                     |
| V-2          | Long Range Rocket                                           |
| WAAF         | Women's Auxiliary Air Force                                 |
| X            | Exploded                                                    |



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# 1<sup>st</sup> Line Defence Limited®

## Detailed Unexploded Ordnance (UXO) Risk Assessment

Site: Aintree University Hospital, Liverpool

Client: GRM Development Solutions Ltd

### 1. Introduction

#### 1.1. Background

1st Line Defence has been commissioned by GRM Development Solutions Ltd to conduct a Detailed Unexploded Ordnance (UXO) Risk Assessment for the works proposed at Aintree University Hospital, Liverpool.

Buried UXO can present a significant risk to construction works and development projects. The discovery of a suspect device during works can cause considerable disruption to operations as well as cause unwanted delays and expense.

UXO in the UK can originate from three principal sources:

1. Munitions resulting from wartime activities including German bombing in WWI and WWII, long range shelling, and defensive activities.
2. Munitions deposited as a result of military training and exercises.
3. Munitions lost, burnt, buried or otherwise discarded either deliberately, accidentally, or ineffectively.

This report will assess the potential factors that may contribute to the risk of UXO contamination. If an elevated risk is identified at the site, this report will recommend appropriate mitigation measures, in order to reduce the risk to as low as is reasonably practicable. Detailed analysis and evidence will be provided to ensure an understanding of the basis for the assessed risk level and any recommendations.

This report complies with the guidelines outlined in CIRIA C681, 'Unexploded Ordnance (UXO) A Guide for the Construction Industry.'



## **2. Method Statement**

### **2.1. Report Objectives**

The aim of this report is to conduct a comprehensive assessment of the potential risk from UXO at Aintree University Hospital, Liverpool. The report will also recommend appropriate site and work-specific risk mitigation measures to reduce the risk from explosive ordnance during the envisaged works to a level that is as low as reasonably practicable.

### **2.2. Risk Assessment Process**

1st Line Defence has undertaken a five-step process for assessing the risk of UXO contamination:

1. The likelihood that the site was contaminated with UXO.
2. The likelihood that UXO remains on the site.
3. The likelihood that UXO may be encountered during the proposed works.
4. The likelihood that UXO may be initiated.
5. The consequences of initiating or encountering UXO.

In order to address the above, 1st Line Defence has taken into consideration the following factors:

- Evidence of WWI and WWII German air delivered bombing as well as the legacy of Allied occupation.
- The nature and conditions of the site during WWII.
- The extent of post-war development and UXO clearance operations on site.
- The scope and nature of the proposed works and the maximum assessed bomb penetration depth.
- The nature of ordnance that may have contaminated the proposed site area.

### **2.3. Sources of Information**

Every reasonable effort has been made to ensure that relevant evidence has been consulted and presented in order to produce a thorough and comprehensible report for the client. To achieve this the following, which includes military records and archive material held in the public domain, have been accessed:

- The National Archives and Liverpool Record Office.
- Historical mapping datasets.
- Historic England National Monuments Record.
- Relevant information supplied by GRM Development Solutions Ltd.
- Available material from 33 Engineer Regiment (EOD) Archive (part of 29 Explosive Ordnance and Disposal and Search Group).
- 1st Line Defence's extensive historical archives, library and UXO geo-datasets.
- Open sources such as published books and internet resources.

### **3. Background to Bombing Records**

#### **3.1. General Considerations of Historical Research**

This desktop assessment is based largely upon analysis of historical evidence. Every reasonable effort has been made to locate and present significant and pertinent information. 1st Line Defence cannot be held accountable for any changes to the assessed risk level or risk mitigation measures, based on documentation or other data that may come to light at a later date, or which was not available to 1st Line Defence during the production of this report.

It is often problematic and sometimes impossible to verify the completeness and accuracy of WWII-era records. As a consequence, conclusions as to the exact location and nature of a UXO risk can rarely be quantified and are, to a degree, subjective. To counter this, a range of sources have been consulted, presented and analysed. The same methodology is applied to each report during the risk assessment process. 1st Line Defence cannot be held responsible for any inaccuracies or the incompleteness in available historical information.

#### **3.2. German Bombing Records**

During WWII, bombing records were generally gathered locally by the police, Air Raid Precaution (ARP) wardens and military personnel. These records typically contained information such as the date, the location, the amount of damage caused and the types of bombs that had fallen during an air raid. This information was made either through direct observation or post-raid surveys. The Ministry of Home Security Bomb Census Organisation would then receive this information, which was plotted onto maps, charts, and tracing sheets by regional technical officers. The collective record set (regional bomb census mapping and locally gathered incidents records) would then be processed and summarised into reports by the Ministry of Home Security Research and Experiments Branch. The latter were tasked with providing the government 'a complete picture of air raid patterns, types of weapons used and damage caused- in particular to strategic services and installations such as railways, shipyards, factories and public utilities.'

The quality, detail and nature of record keeping could vary considerably between provincial towns, boroughs and cities. No two areas identically collated or recorded data. While some local authorities maintained records with a methodical approach, sources in certain areas can be considerably more vague, dispersed, and narrower in scope. In addition, the immediate priority was mostly focused on assisting casualties and minimising damage at the time. As a result, some records can be incomplete and contradictory. Furthermore, many records were even damaged or destroyed in subsequent air raids. Records of raids that took place on sparsely or uninhabited areas were often based upon third party or hearsay information and are therefore not always reliable. Whereas records of attacks on military or strategic targets were often maintained separately and have not always survived.

#### **3.3. Allied Records**

During WWII, considerable areas of land were requisitioned by the War Office for the purpose of defence, training, munitions production and the construction of airfields. Records relating to military features vary and some may remain censored. Within urban environments datasets will be consulted detailing the location of munition production as well as wartime air and land defences. In rural locations it may be possible to obtain plans of military establishments, such as airfields, as well as training logs, record books, plans and personal memoirs. As with bombing records, every reasonable effort will be made to access records of, and ascertain any evidence of, military land use. However, there are occasions where such evidence is not available, as records may not be accessible, have been lost/destroyed, or simply were not kept in the first place.

## **4. UK Regulatory Environment and Guidelines**

### **4.1. General**

There is no formal obligation requiring a UXO risk assessment to be undertaken for construction projects in the UK, nor is there any specific legislation stipulating the management or mitigation of UXO risk. However, it is implicit in the legislation outlined below that those responsible for intrusive works (archaeology, site investigation, drilling, piling, excavation etc.) should undertake a comprehensive and robust assessment of the potential risks to employees and that mitigation measures are implemented to address any identified hazards.

### **4.2. CDM Regulations 2015**

The Construction (Design and Management) Regulations 2015 (CDM 2015) define the responsibilities of parties involved in the construction of temporary or permanent structures.

The CDM 2015 establishes a duty of care extending from clients, principle designers, and contractors to those working on, or affected by, a project. Those responsible for construction projects may therefore be accountable for the personal or proprietary loss of third parties, if correct health and safety procedure has not been applied.

Although the CDM does not specifically reference UXO, the risk presented by such items is both within the scope and purpose of the legislation. It is therefore implied that there is an obligation for parties to:

- Provide an appropriate assessment of potential UXO risks at the site (or ensure such an assessment is completed by others).
- Put in place appropriate risk mitigation measures if necessary.
- Supply all parties with information relevant to the risks presented by the project.
- Ensure the preparation of a suitably robust emergency response plan.

### **4.3. The 1974 Health and Safety at Work etc. Act**

All employers have a responsibility under the Health and Safety at Work etc. Act 1974 and the Management of Health and Safety at Work Regulations 1999, to ensure the health and safety of their employees and third parties, so far as is reasonably practicable and conduct suitable and sufficient risk assessments.

### **4.4. CIRIA C681**

In 2009, the Construction Industry Research and Information Association (CIRIA) produced a guide to the risk posed by UXO to the UK construction industry (CIRIA C681). CIRIA is a neutral, independent and not-for-profit body, linking organisations with common interests and facilitating a range of collaborative activities that help improve the industry.

The publication provides the UK construction industry with a defined process for the management of risks associated with UXO from WWI and WWII air bombardment. It is also broadly applicable to the risks from other forms of UXO that might be encountered. It focuses on construction professionals' needs, particularly if there is a suspected item of UXO on site, and covers issues such as what to expect from a UXO specialist. The guidance also helps clients to fulfil their legal duty under CDM 2015 to provide designers and contractors with project specific health and safety information needed to identify hazards and risks associated with the design and construction work. This report conforms to this CIRIA guidance and to the various recommendations for good practice referenced therein. It is recommended that this document is acquired and studied where possible to allow a better understanding of the background to both the risk assessment process and the UXO issue in the UK in general.

### **4.5. Additional Legislation**

In the event of a casualty resulting from the failure of an employer/client to address the risks relating to UXO, the organisation may be criminally liable under the Corporate Manslaughter and Corporate Homicide Act 2007.

## **5. The Role of Commercial UXO Contractors and The Authorities**

### **5.1. Commercial UXO Specialists**

The role of a UXO Specialist (often referred to as UXO Consultant or UXO Contractor) such as 1st Line Defence, is defined in CIRIA C681 as the provision of expert knowledge and guidance to the client on the most appropriate and cost-effective approach to UXO risk management at a site.

The principal role of UXO Specialists is to provide the client with an appropriate assessment of the risk posed by UXO for a specific project, and identify and carry out suitable methodology for the mitigation of any identified risks to reduce them to an acceptable level.

The requirement for a UXO Specialist should ideally be identified in the initial stages of a project, and it is recommended that this occur prior to the start of any detailed design. This will enable the client to budget for expenditure that may be required to address the risks from UXO, and may enable the project team to identify appropriate techniques to eliminate or reduce potential risks through considered design, without the need for UXO specific mitigation measures. The UXO Specialist should have suitable qualifications, levels of competency and insurances.

Please note 1st Line Defence has the capability to provide a complete range of required UXO risk mitigation services, in order to reduce a risk to as low as reasonably practicable. This can involve the provision of both ground investigation, and where appropriate, UXO clearance services.

### **5.2. The Authorities**

The police have a responsibility to co-ordinate the emergency services in the event of an ordnance-related incident at a construction site. Upon inspection they may impose a safety cordon, order an evacuation, and call the military authorities Joint Services Explosive Ordnance Disposal Operation Centre (JSEODOC) to arrange for investigation and/or disposal. Within the Metropolitan Police Operational Area, SO15 EOD will be tasked to any discovery of suspected UXO. The request for Explosive Officer (Expo) support is well understood and practiced by all Metropolitan Boroughs. The requirement for any additional assets will then be coordinated by the Expo if required.

In the absence of a UXO specialist, police officers will usually employ such precautionary safety measures, thereby causing works to cease, and possibly requiring the evacuation of neighbouring businesses and properties.

The priority given to the police request will depend on the EOD teams' judgement of the nature of the UXO risk, the location, people and assets at risk, as well as the availability of resources. The speed of response varies; authorities may respond immediately or in some cases it may take several days for the item of ordnance to be dealt with. Depending on the on-site risk assessment the item of ordnance may be removed from the site and/or destroyed by a controlled explosion.

Following the removal of an item of UXO, the military authorities will only undertake further investigations or clearances in high-risk situations. If there are regular UXO finds on a site the JSEODOC may not treat each occurrence as an emergency and will recommend the construction company puts in place alternative procedures, such as the appointment of a commercial contractor to manage the situation.



## 6. The Site

### 6.1. Site Location

The site is located in Fazakerley, approximately 6km north-east of the centre of Liverpool. Hospital infrastructure borders the site to the east and south, while an area of car parking is situated to the north and residential housing is located to the west.

The site is approximately centred on the OS grid reference: **SJ 3789997065**.

Site location maps are presented in **Annex A**.

### 6.2. Site Description

Recent aerial imagery dating from 2023 suggests that the Aintree University Hospital structures previously situated on site have recently been demolished. The site currently comprises areas of vacant open ground, as well as Sixth, Seventh, Eighth, Ninth and Tenth Avenue and an area of car park in the west. Sefton Road and Woodlands Road run along the northern and southern boundaries of the site respectively.

A recent aerial photograph and site plan are presented in **Annex B** and **Annex C** respectively.

## 7. Scope of the Proposed Works

### 7.1. General

The nature and extent of proposed works are not known at this stage.

## 8. Ground Conditions

### 8.1. General Geology

The British Geological Survey (BGS) map shows the site to be underlain by Wilmslow Sandstone Formation, of the Triassic period. Superficial deposits include Shirdley Hill Sand Formation, of the Quaternary period.

### 8.2. Site-Specific Geology

Site-specific geotechnical data was not provided by the client during the production of this report.

## 9. Site History

### 9.1. Introduction

The purpose of this section is to identify the composition of the site pre and post-WWII. It is important to establish the historical use of the site, as this may indicate the site's relation to potential sources of UXO as well as help with determining factors such as the land use, groundcover, likely frequency of access and signs of bomb damage.

## 9.2. Summary of the Historical Background of the Site

The site is located within the grounds of Aintree University Hospital. This facility initially opened in 1906 as City Hospital North, Fazakerley, and specialised in treating infectious diseases.<sup>1</sup> The hospital comprised nine wards and four isolation blocks for around 350 patients, including 25 beds for patients with TB, as well as an administration block, kitchen block, nurses home, laundry, dispensary, mortuary, doctors house and porters lodge.

During WWI, the hospital was renamed 1<sup>st</sup> Western General, and treated wounded soldiers. In 1920, the Fazakerley Sanatorium was opened following a delay due to the war. The Sanatorium, to the south of the original City Hospital, housed 245 pulmonary TB patients across several wards and pavilions.<sup>2</sup> In WWII the hospital again treated injured soldiers under the name 1<sup>st</sup> Western General.

In the two decades following WWII, the Sanatorium became Aintree Hospital, and the original City Hospital became Fazakerley Infectious Hospital in 1947, Fazakerley Hospital in 1968, and Fazakerley District General Hospital in 1974.<sup>3</sup> More recently, the two have combined to form Aintree University Hospital.

## 9.3. Ordnance Survey Historical Maps

Relevant historical maps were obtained for this report and are presented in **Annex D**. See below for a summary of the site history shown on acquired mapping.

| Pre-WWII |         |                                                                                                                                                                                                                                 |
|----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date     | Scale   | Description                                                                                                                                                                                                                     |
| 1927     | 1:2,500 | This map shows the site to comprise three large hospital buildings and a smaller building in the north-west. Further hospital structures border the site to the north, east and south, while open land is situated to the west. |

| Post-WWII |         |                                                                                                                                                                                                                                                                                       |
|-----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date      | Scale   | Description                                                                                                                                                                                                                                                                           |
| 1955-59   | 1:2,500 | This map shows the majority of the site to have remained the same, however the smaller structure in the north-west has now been expanded and further small buildings have been developed in the south-west. Hospital infrastructure continues to border to the north, east and south. |

## 9.4. Pre-WWII Photography of the Site

Pre-WWII aerial photography has been obtained from the Aerofilms collection available from Britain From Above. This imagery provides a view of the site in 1935 (see **Annex E**). See below for a description:

| Pre-WWII Aerial Photography |                                                                                                                                                                                                                                        |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date                        | Description                                                                                                                                                                                                                            |
| 1935                        | This image, taken in 1935, shows the site to comprise three large buildings and two smaller structures within the grounds of Fakazerley Hospital. Additional hospital buildings are situated to the north, east and south of the site. |

<sup>1</sup> <https://lostliverpool.blogspot.com/2008/02/history-of-university-hospital-aintree.html>

<sup>2</sup> <https://historicengland.org.uk/services-skills/education/educational-images/fazakerley-sanatorium-and-isolation-hospital-liverpool-11976>

<sup>3</sup> Bob Edwards' Liverpool Picture Book Project, *Fazakerley Hospital*

## 10. Introduction to German Air Delivered Ordnance

### 10.1. General

During WWI and WWII, the UK was subjected to bombing which often resulted in extensive damage to city centres, docks, rail infrastructure and industrial areas. The poor accuracy of WWII targeting technology and the nature of bombing techniques often resulted in neighbouring areas to targets sustaining collateral damage.

In addition to raids which concentrated on specific targets, indiscriminate bombing of large areas also took place. This occurred most prominently in the London 'Blitz', though affected many other towns and cities. As discussed in the following sections, a proportion of the bombs dropped on the UK did not detonate as designed. Although extensive efforts were made to locate and deal with these UXBs at the time, many still remain buried and can present a potential risk to construction projects.

The main focus of research for this section of the report will concern German air delivered ordnance dropped during WWII, although WWI bombing will also be considered.

### 10.2. Generic Types of WWII German Air Delivered Ordnance

To provide an informed assessment of the hazards posed by any items of unexploded ordnance that may remain in situ on site, the table below provides information on the types of German air delivered ordnance most commonly used by the Luftwaffe during WWII. Images and brief summaries of the characteristics of these items of ordnance are listed in **Appendices i-iii**.

| Generic Types of WWII German Air Delivered Ordnance |                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type                                                | Frequency                                                                                                                    | Likelihood of Detection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| High Explosive (HE) bombs                           | In terms of weight of ordnance dropped, HE bombs were the most frequently deployed by the Luftwaffe during WWII.             | Although efforts were made to identify the presence of unexploded ordnance following an air raid, often the damage and destruction caused by detonated bombs made observation of UXB entry holes impossible. The entry hole of an unexploded bomb can be as little as 20cm in diameter and was easily overlooked in certain ground conditions (see <b>Annex F</b> ). Furthermore, ARP documents describe the danger of assuming that damage, actually caused by a large UXB, was due to an exploded smaller bomb. UXBs therefore present the greatest risk to present-day intrusive works. |
| 1kg Incendiary bombs (IB)                           | In terms of the number of weapons dropped, small IBs were the most numerous. Millions of these were dropped throughout WWII. | IBs had very limited penetration capability and in urban areas would often have been located in post-raid surveys. If they failed to initiate and fell in water, on soft vegetated ground, or bombed rubble, they could easily go unnoticed.                                                                                                                                                                                                                                                                                                                                               |
| Large Incendiary bombs (IB)                         | These were not as common as the 1kg IBs, although they were more frequently deployed than PMs and AP bomblets.               | If large IBs did penetrate the ground, complete combustion did not always occur and in such cases they could remain a risk to intrusive works.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Aerial or Parachute mines (PM)                      | These were deployed less frequently than HE and IBs due to size, cost and the difficulty of deployment.                      | If functioning correctly, PMs would generally have had a slow rate of descent and were very unlikely to have penetrated the ground. Where the parachute failed, mines would have simply shattered on impact if the main charge failed to explode. There have been extreme cases when these items have been found unexploded. However, in these scenarios, the ground was either extremely soft or the munition fell into water.                                                                                                                                                            |
| Anti-personnel (AP) bomblets                        | These were not commonly used and are generally considered to pose a low risk to most works in the UK.                        | SD2 bomblets were packed into containers holding between 6 and 108 submunitions. They had little ground penetration ability and should have been located by the post-raid survey unless they fell into water, dense vegetation or bomb rubble.                                                                                                                                                                                                                                                                                                                                             |

### 10.3. Failure Rate of German Air Delivered Ordnance

It has been estimated that 10% of WWII German air delivered HE bombs failed to explode as designed. Reasons for why such weapons might have failed to function as designed include:

- Malfunction of the fuze or gain mechanism (manufacturing fault, sabotage by forced labour or faulty installation).
- Many were fitted with a clockwork mechanism that could become immobilised on impact.
- Failure of the bomber aircraft to arm the bombs due to human error or an equipment defect.
- Jettisoning the bomb before it was armed or from a very low altitude. This most likely occurred if the bomber aircraft was under attack or crashing.

From 1940 to 1945, bomb disposal teams reportedly dealt with a total of 50,000 explosive items of 50kg, over 7,000 anti-aircraft projectiles and 300,000 beach mines. Unexploded ordnance is still regularly encountered across the UK, see press articles in **Annex G**.

### 10.4. UXB Ground Penetration

An important consideration when assessing the risk from a UXB is the likely maximum depth of burial. There are several factors which determine the depth that an unexploded bomb will penetrate:

- Mass and shape of bomb.
- Height of release.
- Velocity and angle of bomb.
- Nature of the ground cover.
- Underlying geology.

Geology is perhaps the most important variable. If the ground is soft, there is a greater potential of deeper penetration. For example, peat and alluvium are easier to penetrate than gravel and sand, whereas layers of hard strata will significantly retard and may stop the trajectory of a UXB.

#### 10.4.1. The J-Curve Principle

J-curve is the term used to describe the characteristic curve commonly followed by an air delivered bomb dropped from height after it penetrates the ground. Typically, as the bomb is slowed by its passage through underlying soils, its trajectory curves towards the surface. Many UXBs are found with their nose cone pointing upwards as a result of this effect. More importantly, however, is the resulting horizontal offset from the point of entry. This is typically a distance of about one third of the bomb's penetration depth, but can be higher in certain conditions (see **Annex F**).

#### 10.4.2. WWII UXB Ground Penetration Studies

During WWII the Ministry of Home Security undertook a major study on actual bomb penetration depths, carrying out statistical analysis on the measured depths of 1,328 bombs as reported by bomb disposal (BD) teams. Conclusions were drawn predicting the likely average and maximum depths of penetration of different sized bombs in different geological strata.

For example, the largest common German bomb (500kg) had a likely concluded penetration depth of 6m in sand or gravel but 11m in clay. The maximum observed depth for a 500kg bomb was 11.4m and for a 1,000kg bomb 12.8m. Theoretical calculations suggested that significantly greater penetration depths were probable.



#### 10.4.3. Site Specific Bomb Penetration Considerations

When considering an assessment of the bomb penetration at the site of proposed works the following parameters should be used:

- WWII geology – Wilmslow Sandstone Formation
- Impact angle and velocity – 10-15° from vertical and 270 metres per second.
- Bomb mass and configuration – The 500kg SC HE bomb, without retarder units or armour piercing nose (this was the largest of the common bombs used against Britain).

It has not been possible to determine maximum bomb penetration capabilities at this stage due to the limitations of site-specific geotechnical information provided for the purpose of this report. An assessment can be made once further information becomes available or by an UXO Specialist on-site.

#### 10.5. V-Weapons

Hitler's 'V-weapon' campaign began from mid-1944. It used newly developed unmanned cruise missiles and rockets. The V-1, known as the flying bomb or pilotless aircraft, and the V-2, a long range rocket, were launched from bases in Germany and occupied Europe. A total of 9,251 V-1s and 1,115 V-2s were recorded in the United Kingdom.

Although these weapons caused considerable damage, their range was limited by their position of deployment across Europe and as a result the vast majority of V-weapon strikes were directed against targets in the south-east of England, predominantly in the London Boroughs and Home Counties. This limitation of capability meant targets in north-west England were generally too far to be considered for V-weapon strikes by the Luftwaffe. The risk from V-weapons is therefore considered negligible and will not be further addressed in this report.

## 11. The Likelihood of Contamination from German Air Delivered UXBs

### 11.1. World War I

During WWI Britain was targeted and bombed by Zeppelin Airships as well as Gotha and Giant fixed-wing aircraft. The objective of these raids was to unnerve the British public, to destroy strategic targets and to ultimately attempt to coerce Britain's capitulation from the war. A WWI map of air raids and naval bombardments across the UK was consulted, see **Annex H**. This source does not record any bombing incidents in Liverpool.

WWI bombs were generally smaller and dropped from a lower altitude than those used in WWII. This resulted in limited UXB penetration depths. Aerial bombing was often such a novelty at the time that it attracted public interest and even spectators to watch the raids in progress. For these reasons there is a limited risk that UXBs passed undiscovered in the urban environment. When combined with the relative infrequency of attacks and an overall low bombing density, the risk from WWI UXBs is considered low and will not be further addressed in this report.

### 11.2. World War II Bombing of the County Borough of Liverpool

The Luftwaffe's main objective for the attacks on Britain was to inhibit the country's economic and military capability. To achieve this they targeted airfields, depots, docks, warehouses, wharves, railway lines, factories, and power stations. As the war progressed the Luftwaffe bombing campaign expanded to include the indiscriminate bombing of civilian areas in an attempt to subvert public morale.

During WWII the site was located within the County Borough of Liverpool, which sustained an overall moderate-high density of bombing, as represented by bomb density data figures below. Liverpool was the UK's largest west-coast port, with said port being a key location for Allied imports into Britain. Luftwaffe Target Mapping highlights several other non-port targets, including Fazakerley Hospital and Sanatorium, within which the site was located (see **Annex I**).

Records of bombing incidents in the civilian areas of the district were typically collected by Air Raid Precautions wardens and collated by Civil Defence personnel. Some other organisations, such as port and railway authorities, maintained separate records. Records would be in the form of typed or hand written incident notes, maps and statistics. Bombing data was carefully analysed, not only due to the requirement to identify those parts of the country most needing assistance, but also in an attempt to find patterns in the Germans' bombing strategy in order to predict where future raids might take place.

Records of bombing incidents are presented in the following sections.

### 11.3. WWII Home Office Bombing Statistics

The following table summarises the quantity of German air delivered bombs (excluding 1kg incendiaries and anti-personnel bombs) dropped on the County Borough of Liverpool between 1940 and 1945.

| Record of German Ordnance Dropped on the County Borough of Liverpool |                                  |        |
|----------------------------------------------------------------------|----------------------------------|--------|
| Area Acreage                                                         |                                  | 27,321 |
| Weapons                                                              | High Explosive bombs (all types) | 2,332  |
|                                                                      | Parachute mines                  | 117    |
|                                                                      | Oil bombs                        | 50     |
|                                                                      | Phosphorus bombs                 | 0      |
|                                                                      | Fire pots                        | 0      |
|                                                                      | Pilotless aircraft (V-1)         | 0      |
|                                                                      | Long range rocket bombs (V-2)    | 0      |
| Total                                                                |                                  | 2,499  |
| Number of Items per 1,000 acres                                      |                                  | 91.5   |
| Source: Home Office Statistics                                       |                                  |        |
| This table does not include UXO found during or after WWII.          |                                  |        |

Detailed records of the quantity and locations of the 1kg incendiary and anti-personnel bombs were not routinely maintained by the authorities as they were frequently too numerous to record. Although the risk relating to IBs is lesser than that relating to larger HE bombs, they were similarly designed to inflict damage and injury. Anti-personnel bombs were used in much smaller quantities and are rarely found today but are potentially more dangerous. Although Home Office statistics did not record these types of ordnance, both should not be overlooked when assessing the general risk to personnel and equipment.

### 11.4. Liverpool Bomb Census Tracings

Several tracings of bomb strikes were obtained from The National Archives for the Liverpool Docklands and their surroundings. These tracings show buildings that were hit by bombing, and were likely traced from historical OS maps of the time. As they were traced, they do not show buildings that were not affected and the scale of approximate quality. The tracings were analysed, and those that affected the site area are presented in **Annex J** and described below.

| Liverpool Bomb Census Tracings                   |                                                                                                                                                         |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date Range                                       | Comments                                                                                                                                                |
| 21 <sup>st</sup> -22 <sup>nd</sup> December 1940 | No bombs are recorded within or directly bordering the site. Two 50kg bombs, one of which unexploded, are recorded approximately 300m west of the site. |

### 11.5. Hand Drawn Map of Bomb Damage in Liverpool

A hand drawn map with areas of damage plotted within the city of Liverpool was obtained from the Liverpool Record Office. It is believed to be an enlarged photograph of a pin-board map from the period. The map covers the entire County Borough of Liverpool, and it is thus difficult to exactly pinpoint areas of damage when magnified. The section showing the area of the site is presented in **Annex K**.

| Hand Drawn Map of Bomb Damage in Liverpool |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date Range                                 | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Presumed 1940-45                           | The site has been placed as accurately as possible on this map, although the small scale of the map means the exact site boundary is difficult to place. It suggests that the site area itself was not subject to any direct areas of damage. However, serious damage is recorded to the north of the site, along Longmoor Lane, and to the east of the site within the grounds of Fazakerley Isolation Hospital. Both of these are recorded approximately 200m from the site. |

### 11.6. Summary of Air Raid Incidents

A summary of air raid incidents across Liverpool was available from the Liverpool Record Office. This record gives a brief list of air raid incidents to have occurred between 1940-41. Relevant sections of this record are presented in **Annex L** and transcribed below.

| Summary of Air Raid Incidents                     |                                                                               |
|---------------------------------------------------|-------------------------------------------------------------------------------|
| Date                                              | Comments                                                                      |
| 18 <sup>th</sup> -19 <sup>th</sup> September 1940 | Heavy damage through whole of Liverpool....Nurses' Home, Fazakerley, damaged. |
| 17 <sup>th</sup> -18 <sup>th</sup> October 1940   | West wing Fazakerley Sanatorium demolished, and one patient killed.           |

### 11.7. Merseyside at War – Day-by-Day Diary

A day-by-day account regarding bombing incidents in Merseyside was obtained from Merseyside at War by Rodney Whitworth.<sup>4</sup> It provided the date and time and time of bombing raids, as well as the types of bomb used and the damage caused; relevant damage is highlighted in bold. A summary of the relevant written records is presented in the table below.

| Merseyside at War             |                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date                          | Comments                                                                                                                                                                                                                                                                                                                                |
| 17 <sup>th</sup> October 1940 | In a brief raid on the 17 <sup>th</sup> of October, extensive damage was caused to a hospital, two schools and private houses in the West Derby area. <b>The west wing of Fazakerley Sanatorium was demolished</b> , killing a patient; and in the Smithdown Road area an unexploded bomb was found in the yard of the Morrison School. |

<sup>4</sup> Whitworth, R., *Merseyside at War: A Day-to-Day Diary of the 1940-1941 Bombing* (1st ed.). Scouse Press, 1988



### 11.8. Fazakerley Hospital Online History

An account of the history of Fazakerley Hospital and Sanatorium was consulted from an online source.<sup>5</sup> This provides significant detail on the operations of the hospital, but also includes a reference to bombing sustained by the hospital in 1940. This section is transcribed below.

| Fazakerley Hospital Online History |                                                                                                                                             |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Date                               | Comments                                                                                                                                    |
| 17 <sup>th</sup> October 1940      | The Male Pavilion, known as West Block, was hit by a 750lbs demolition bomb which exploded on impact. There were two casualties, one fatal. |

### 11.9. WWII-Era Photography

WWII-era aerial photography for the site area was obtained from the National Monuments Record Office (Historic England). As well as this, ground level photography was obtained from an online source.<sup>6</sup> This photography provides a record of the potential composition of the site and surroundings during the war, as well as its condition immediately following the war (see **Annex M-N**).

| WWII-Era Photography                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date/Title                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 1 <sup>st</sup> April 1946<br><b>Annex M</b>                           | <p>This image, taken in 1946, shows the composition of the site after the end of WWII. The site can be seen to comprise a number of hospital buildings within the grounds of Fazakerley Hospital.</p> <p>No obvious signs of damage can be seen within or bordering the site. Approximately 100m south, significant damage can be seen to the Male Pavilion West Block, which was subject to bombing in October 1940.</p> <p>Based on available information, it is believed that the Nurses Home, referred to as damaged within written records, was located immediately south of the site. This building does not appear to be damaged, however if the damage was not severe, it is likely to have been repaired in the time between the incident and this image being taken.</p> |
| Ground Level<br>Image of Male<br>Pavilion West Block<br><b>Annex N</b> | This image provides a more detailed look at the damage sustained by the Male Pavilion West Block, observable in the previous image. A section of the building is destroyed, leaving a large gap in the middle of the structure.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

<sup>5</sup> <https://fazakerleyhistory.blogspot.com/>

<sup>6</sup> <https://fazakerleyhistory.blogspot.com/>

**11.10. Abandoned Bombs**

A post air-raid survey of buildings, facilities, and installations would have included a search for evidence of bomb entry holes. If evidence of an entry hole was encountered, Bomb Disposal Officer Teams would normally have been requested to attempt to locate, render safe, and dispose of the bomb. Occasionally, evidence of UXBs was discovered but due to a relatively benign position, access problems, or a shortage of resources the UXB could not be exposed and rendered safe. Such an incident may have been recorded and noted as an 'abandoned bomb'.

Given the inaccuracy of WWII records, and the fact that these bombs were 'abandoned', their locations cannot be considered definitive or the lists exhaustive. The MoD states that 'action to make the devices safe would be taken only if it was thought they were unstable'. It should be noted that other than the 'officially' abandoned bombs, there will inevitably be UXBs that were never recorded.

1st Line Defence holds no records of officially registered abandoned bombs at or near the site of the proposed works.

**11.11. Bomb Disposal Tasks**

The information service from the Explosive Ordnance Disposal (EOD) Archive Information Office at 33 Engineer Regiment (now part of 29 EOD & Search Group) no longer processes commercial requests for information. It has therefore not been possible to include any updated official information regarding bomb disposal/clearance tasks with regards to this site. A database of known disposal/clearance tasks has been referred to which does not make reference to such instances occurring within the site of proposed works.

If any relevant information is received at a later date, GRM Development Solutions Ltd will be advised.

## 11.12. Evaluation of German Air Delivered UXO Records

| German Air Delivered UXO Records Summary                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Factors                                                                                                                                                                                                                                                | Conclusion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Density of Bombing</b><br><i>It is important to consider the bombing density when assessing the possibility that UXBs remain in an area. High bombing density could allow for error in record keeping due to extreme damage caused to the area.</i> | <p>During WWII, the site was located within the County Borough of Liverpool. According to official Home Office bombing statistics, this borough sustained an overall moderate-high density of bombing, with an average of 91.5 items of ordnance recorded per 1,000 acres. Luftwaffe Target Mapping highlights several targets across the city, including Fazakerley Hospital and Sanatorium, within which the site was located.</p> <p>Local written records highlight two bombing incidents at the hospital. The first, in September 1940, affected the Nurses' Home, which is believed to have been situated immediately south of the site. The second, a parachute mine falling on the west wing of Fazakerley Sanatorium, occurred in October 1940. Neither of these bomb strikes are anticipated to have affected the site boundary.</p> |
| <b>Damage</b><br><i>If buildings or structures on a site sustained bomb or fire damage, any resulting rubble and debris could have obscured the entry holes of unexploded bombs dropped during the same or later raids.</i>                            | <p>Following the bombing incidents mentioned above, both the Nurses' Home and the west wing of Fazakerley Sanatorium are noted as sustaining damage, with the latter of the two being described as 'demolished'. This is visible in 1946 aerial imagery and wartime ground level imagery. However, no damage is recorded to any of the buildings within the site, which all appear intact and undamaged in post-war imagery.</p>                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Ground Cover</b><br><i>The nature of the ground cover present during WWII would have a substantial influence on any visual indication that may indicate UXO being present.</i>                                                                      | <p>Due to the site's mixed composition, the ground cover is not anticipated to have been homogenous across the site. Generally, evidence of UXO is likely to have been spotted, reported and dealt with in areas of the site comprising hospital buildings. Areas of the site comprising undeveloped, soft and vegetated ground are anticipated to have been less conducive to spotting evidence of UXO, such as bomb entry holes which could be as small as 20cm in diameter.</p>                                                                                                                                                                                                                                                                                                                                                             |
| <b>Access Frequency</b><br><i>UXO in locations where access was irregular would have a greater chance of passing unnoticed than at those that were regularly occupied.</i>                                                                             | <p>Owing to the fact that the site comprised a number of hospital buildings within the grounds of Fazakerley Hospital, access and observation of the site are anticipated to have been relatively frequent, with the site likely to have been subject to specific post-raid checks.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Bomb Failure Rate</b>                                                                                                                                                                                                                               | <p>There is no evidence to suggest that the bomb failure rate in the locality of the site would have been dissimilar to the 10% normally used.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Abandoned Bombs</b>                                                                                                                                                                                                                                 | <p>1<sup>st</sup> Line Defence holds no records of abandoned bombs at or within the site vicinity.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Bombing Decoy sites</b>                                                                                                                                                                                                                             | <p>1<sup>st</sup> Line Defence could find no evidence of bombing decoy sites within the site vicinity.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Bomb Disposal Tasks</b>                                                                                                                                                                                                                             | <p>1<sup>st</sup> Line Defence could find no evidence of bomb disposal tasks within the site boundary and immediate area.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## 12. Introduction to Allied Ordnance

### 12.1. General

Many areas across the UK may be at risk from Allied UXO because of both wartime and peacetime military use. Typical military activities and uses that may have led to a legacy of military UXO at a site include former minefields, home guard positions, anti-aircraft emplacements, training and firing ranges, military camps, as well as weapons manufacture and storage areas.

Although land formerly used by the military was usually subject to clearance before returned to civilian use, items of UXO are sometimes discovered and can present a potential risk to construction projects.

It should be highlighted that there is no evidence that the site formerly had any military occupation or usage that could have led to contamination with such items of Allied ordnance. Despite this, urban areas, such as the location of the site, can be at risk from buried unexploded anti-aircraft projectiles fired during WWII – as addressed below.

### 12.2. Defending the UK From Aerial Attack

During WWII the War Office employed a number of defence tactics against the Luftwaffe from bombing major towns, cities, manufacturing areas, ports and airfields. These can be divided into passive and active defences (examples are provided in the table below).

| Active Defences                                                                                                                                                                                                               | Passive Defences                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Anti-aircraft gun emplacements to engage enemy aircraft.</li> <li>• Fighter aircraft to act as interceptors.</li> <li>• Rockets and missiles were used later during WWII.</li> </ul> | <ul style="list-style-type: none"> <li>• Blackouts and camouflaging to hinder the identification of Luftwaffe targets.</li> <li>• Decoy sites were located away from targets and used dummy buildings and lighting to replicate urban, military, or industrial areas.</li> <li>• Barrage balloons forced enemy aircraft to greater altitudes.</li> <li>• Searchlights were often used to track and divert adversary bomber crews during night raids.</li> </ul> |

Active defences such as anti-aircraft artillery present a greater risk of UXO contamination than passive defences. Unexploded ordnance resulting from dogfights and fighter interceptors is rarely encountered and difficult to accurately qualify.



### 12.3. Anti-Aircraft Artillery (AAA)

During WWII three main types of gun sites existed: heavy anti-aircraft (HAA), light anti-aircraft (LAA) and 'Z' batteries (ZAA). If the projectiles and rockets fired from these guns failed to explode or strike an aircraft they would descend back to land. The table below provides further information on the operation and ordnance associated with these type of weapons.

| Anti-Aircraft Artillery              |                                                                                                                                                                                                                                                                                                                                                                                                                                               |         |              |                  |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------------|------------------|
| Item                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |              |                  |
| HAA                                  | These large calibre guns such as the 3.7" QF (Quick Firing) were used to engage high flying enemy bombers. They often fired large HE projectiles, which were usually initiated by integral fuzes, triggered by impact, area, time delay or a combination of aforementioned mechanisms.                                                                                                                                                        |         |              |                  |
| LAA                                  | These mobile guns were intended to engage fast, low flying aircraft. They were typically rotated between locations on the perimeters of towns and strategically important industrial works. As they could be moved to new positions with relative ease when required, records of their locations are limited. The most numerous of these were the 40mm Bofors gun which could fire up to 120 x 40mm HE projectiles per minute to over 1,800m. |         |              |                  |
| Variations in HAA and LAA Ammunition | Gun type                                                                                                                                                                                                                                                                                                                                                                                                                                      | Calibre | Shell Weight | Shell Dimensions |
|                                      | 3.0 Inch                                                                                                                                                                                                                                                                                                                                                                                                                                      | 76mm    | 7.3kg        | 76mm x 356mm     |
|                                      | 3.7 Inch                                                                                                                                                                                                                                                                                                                                                                                                                                      | 94mm    | 12.7kg       | 94mm x 438mm     |
|                                      | 4.5 Inch                                                                                                                                                                                                                                                                                                                                                                                                                                      | 114mm   | 24.7kg       | 114mm x 578mm    |
|                                      | 40mm                                                                                                                                                                                                                                                                                                                                                                                                                                          | 40mm    | 0.9kg        | 40mm x 311mm     |
| Z-AA                                 | Rockets were commonly designed to destroy heavily armoured military vehicles (anti-tank weapon). The device contains an explosive head (warhead) that can be accelerated using internal propellants to an intended target. Anti-aircraft rocket batteries were also utilised as part of air defence measures.                                                                                                                                 |         |              |                  |

The conditions in which anti-aircraft projectiles may have fallen unnoticed within a site area are analogous to those regarding air delivered ordnance. Unexploded anti-aircraft projectiles could essentially have fallen indiscriminately anywhere within range of the guns. The chance of such items being observed, reported and removed during the war depends on factors such as land use, ground cover, damage and frequency of access – the same factors that govern whether evidence of a UXB is likely to have been noted. More information about these factors with regards to this particular site can be found in the German Air Delivered Ordnance section of this report.

Illustrations of Anti-Aircraft artillery, projectiles and rockets are presented at **Appendix iv**.

### 13. The Likelihood of Contamination from Allied Ordnance

#### 13.1. Introduction

There are several factors that may serve to either affirm, increase, or decrease the level of risk within a site with a history of military usage. Such factors are typically dependent upon the proximity of the proposed area of works to training activities, munition productions and storage, as well as its function across the years.

This section will examine the history of the proposed site and assess to what degree, if any, the site could have become contaminated as a result of the military use of the surrounding area.

#### 13.2. Evaluation of Contamination Risk from Allied UXO

1st Line Defence has considered the following potential sources of Allied ordnance contamination:

| Allied UXO Records Summary                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sources of Allied UXO Contamination                                                                                                                                                       | Conclusion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Military Camps</b>                                                                                                                                                                     | 1 <sup>st</sup> Line Defence could find no evidence of a military camp within the site.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Anti-Aircraft Defences</b><br><i>Anti-Aircraft defences were employed across the country. Proximity to anti-aircraft defences increases the chance of encountering AA projectiles.</i> | <p>1<sup>st</sup> Line Defence could find no evidence of Anti-Aircraft defences such as a HAA or LAA gun emplacement occupying or bordering the site. The closest HAA was located approximately 2.2km south-west of the site. Despite this distance the maximum effective range of an AA projectile can be up to 15km.</p> <p>The conditions in which HAA or LAA projectiles may have fallen unnoticed within a site footprint are generally analogous to those regarding German air delivered ordnance.</p> |
| <b>Home Guard Activity</b><br><i>The Home Guard regularly undertook training and ordnance practice in open areas, as well as burying ordnance as part of anti-invasion defences.</i>      | Evidence of Home Guard activity is often difficult to locate, owing to the ad-hoc nature of Home Guard activity within each local area. Such training was often conducted on a small scale at the discretion of individual commanders and as such was seldom recorded officially. As such, no positive evidence could be found to confirm the presence of HG units within proximity to the site.                                                                                                             |
| <b>Defensive Positions</b><br><i>Defensive positions suggest the presence of military activity, which is often indicative of ordnance storage, usage or disposal.</i>                     | There is no evidence of any pillbox, emplacement or other defensive features formerly located on or bordering the site footprint.                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Training or firing ranges</b>                                                                                                                                                          | No evidence of training or firing ranges could be found within the site or surrounding area.                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Defensive Minefields</b>                                                                                                                                                               | There is no evidence of defensive minefields affecting the site.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Ordnance Manufacture</b>                                                                                                                                                               | No information of ordnance being stored, produced, or disposed of within the proposed site could be found.                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Military Related Airfields</b>                                                                                                                                                         | The site was not situated within the perimeters or vicinity of a military airfield.                                                                                                                                                                                                                                                                                                                                                                                                                          |

## 14. The Likelihood of UXO Contamination Summary

The following table assesses the likelihood that the site was contaminated by items of German air delivered and Allied ordnance. Factors such as the risk of UXO initiation, remaining, and encountering will be discussed later in the report.

| UXO Contamination Summary        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Quality of the Historical Record | <p>The research has evaluated pre- and post-WWII Ordnance Survey maps, Luftwaffe reconnaissance imagery, official Home Office bombing statistics, Bomb Census tracings, a hand drawn bomb damage map, a summary of air raid incidents, anecdotal and published accounts, and WWII-era aerial and ground level photography of the site.</p> <p>The record set is of generally adequate quality. Although no comprehensive record set covering Liverpool is known to have survived the war intact, the fact that the site was situated within Fazakerley Hospital means that this report was able to consult histories of the facility, making up for the shortcomings of the official record set.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| German Air-Delivered Ordnance    | <ul style="list-style-type: none"> <li>During WWII, the site was located within the County Borough of Liverpool. According to official Home Office bombing statistics, this borough sustained an overall moderate-high density of bombing, with an average of 91.5 items of ordnance recorded per 1,000 acres. Luftwaffe Target Mapping highlights several targets across the city, including Fazakerley Hospital and Sanatorium, within which the site was located.</li> <li>Local written records highlight two bombing incidents at the hospital. The first, in September 1940, affected the Nurses' Home, which is believed to have been situated immediately south of the site. The second, a parachute mine falling on the west wing of Fazakerley Sanatorium, occurred in October 1940. Neither of these bomb strikes are anticipated to have affected the site boundary.</li> <li>Following the bombing incidents mentioned above, both the Nurses' Home and the west wing of Fazakerley Sanatorium are noted as sustaining damage, with the latter of the two being described as 'demolished'. This is visible in 1946 aerial imagery and wartime ground level imagery. However, no damage is recorded to any of the buildings within the site, which all appear intact and undamaged in post-war imagery.</li> <li>Due to the site's mixed composition, the ground cover is not anticipated to have been homogenous across the site. Generally, evidence of UXO is likely to have been spotted, reported and dealt with in areas of the site comprising hospital buildings. Areas of the site comprising undeveloped, soft and vegetated ground are anticipated to have been less conducive to spotting evidence of UXO, such as bomb entry holes which could be as small as 20cm in diameter.</li> <li>Owing to the fact that the site comprised a number of hospital buildings within the grounds of Fazakerley Hospital, access and observation of the site are anticipated to have been relatively frequent, with the site likely to have been subject to specific post-raid checks.</li> <li>No positive evidence has been found to suggest that the site was subject to any bombing during WWII. Given the site's undamaged appearance in post-war aerial imagery, it is anticipated that access across the site would have remained frequent throughout the war. As such, it is not considered likely that any evidence of UXBs would have gone unnoticed and unrecorded. As such, the site has been assessed to hold an overall <b>Low Risk</b> from UXO contamination.</li> </ul> |
| Allied Ordnance                  | <ul style="list-style-type: none"> <li>No evidence could be found to indicate that the site formerly had any military occupation or usage that could have led to contamination with items of Allied ordnance, such as LSA and SAA.</li> <li>The conditions in which HAA or LAA projectiles may have fallen unnoticed within the site boundary are however analogous to those regarding air delivered ordnance.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## **15. The Likelihood that UXO Remains**

### **15.1. Introduction**

It is important to consider the extent to which any explosive ordnance clearance (EOC) activities or extensive ground works have occurred on site. This may indicate previous ordnance contamination or reduce the risk that ordnance remains undiscovered.

### **15.2. UXO Clearance**

1st Line Defence has found no evidence in the public domain or within internal records that any official ordnance clearance operations have taken place on site. Note however that we have not received confirmation of this fact from the 33 EOD Regiment Archive (now part of 29 EOD & Search Group). It should also be noted that in addition to 29 EOD & Search Group archival information, 1st Line Defence also do not currently have access to data that may be relevant including 5131(BD)SQN Archive, SD Training Technical Advisory Section (TAS) and MACA Records (bomb disposal callouts).

If such information is available at a later date, it is recommended that it be reviewed as it will assist with understanding both levels and types of contamination likely to be present, and may indicate risk reduction in certain areas.

### **15.3. Post-War Redevelopment**

Since WWII, all hospital structures have been removed, with the west of the site now comprising a car park.

The risk of UXO remaining is considered to be mitigated at the location of and down to the depth of any post-war redevelopment on site. For example, the risk from deep buried UXO will only have been mitigated within the volumes of any post-war pile foundations or deep excavations for basement levels. The risk will however remain within virgin geology below and amongst these post-war works, down to the maximum bomb penetration depth.



## **16. The Likelihood of UXO Encounter**

### **16.1. Introduction**

For UXO to pose a risk at a site, there should be a means by which any potential UXO might be encountered on that site.

The likelihood of encountering UXO on the site of proposed works would depend on various factors, such as the type of UXO that might be present and the intrusive works planned on site. In most cases, UXO is more likely to be present below surface (buried) than on surface.

In general, the greater the extent and depth of intrusive works, the greater the risk of encountering. The most likely scenarios under which items of UXO could be encountered during construction works is during piling, drilling operations or bulk excavations for basement levels. The overall risk will depend on the extent of the works, such as the numbers of boreholes/piles (if required) and the volume of the excavations.

Generally speaking, the risk of encountering any type of UXO will be minimal for any works planned within the footprint and down to the depth of post-war foundations and excavations.

### **16.2. Encountering Air Delivered Ordnance**

Since an air delivered bomb may come to rest at any depth between just below ground level and its maximum penetration depth, there is a chance that such an item (if present) could be encountered during shallow excavations (for services or site investigations) into the original WWII ground level as well as at depth.

## 17. The Likelihood of UXO Initiation

### 17.1. Introduction

UXO does not spontaneously explode. Older UXO devices will require an external event/energy to create the conditions for detonation to occur. The likelihood that a device will function can depend on a number of factors including the type of weaponry, its age and the amount of energy it is struck with.

### 17.2. Initiating Air Delivered Ordnance

Unexploded bombs do not spontaneously explode. All high explosive filling requires significant energy to create the conditions for detonation to occur.

In recent decades, there have been a number of incidents in Europe where Allied UXBs have detonated, and incidents where fatalities have resulted. There have been several hypotheses as to the reason why the issue is more prevalent in mainland Europe – reasons could include the significantly greater number of bombs dropped by the Allied forces on occupied Europe, the preferred use by the Allies of mechanical rather than electrical fuzes, and perhaps just good fortune. The risk from UXO in the UK is also being treated very seriously in many sectors of the construction industry, and proactive risk mitigation efforts will also have affected the lack of detonations in the UK.

There are certain construction activities which make initiation more likely, and several potential initiation mechanisms must be considered:

| UXB Initiation                |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Direct Impact</b>          | Unless the fuze or fuze pocket is struck, there needs to be a significant impact e.g. from piling or large and violent mechanical excavation, onto the main body of the weapon to initiate a buried iron bomb. Such violent action can cause the bomb to detonate.                                                                                                                                                                             |
| <b>Re- starting the Clock</b> | A small proportion of German WWII bombs employed clockwork fuzes. It is probable that significant corrosion would have taken place within the fuze mechanism over the last 70+ years that would prevent clockwork mechanisms from functioning. Nevertheless, it was reported that the clockwork fuze in a UXB dealt with by 33 EOD Regiment in Surrey in 2002 did re-start.                                                                    |
| <b>Friction Impact</b>        | The most likely scenario resulting in the detonation of a UXB is friction impact initiating the shock-sensitive fuze explosive. The combined effects of seasonal changes in temperature and general degradation over time can cause explosive compounds to crystallise and extrude out from the main body of the bomb. It may only require a limited amount of energy to initiate the extruded explosive which could detonate the main charge. |

## **18. Consequences of Initiation/Encounter**

### **18.1. Introduction**

The repercussions of the inadvertent detonation of UXO during intrusive ground works, or if an item or ordnance is interfered with or disturbed, are potentially profound, both in terms of human and financial cost. A serious risk to life and limb, damage to plant and total site shutdown during follow-up investigations are potential outcomes. However, if appropriate risk mitigation measures are put in place, the chances of initiating an item of UXO during ground works is comparatively low.

The consequences of encountering UXO can be particularly notable in the case of high-profile sites (such as airports and train stations) where it is necessary to evacuate the public from the surrounding area. A site may be closed for anything from a few hours to a week with potentially significant cost in lost time. It should be noted that even the discovery of suspected or possible item of UXO during intrusive works (if handled solely through the authorities), may also involve significant loss of production.

### **18.2. Consequences of Detonation**

When considering the potential consequences of a detonation, it is necessary to identify the significant receptors that may be affected. The receptors that may potentially be at risk from a UXO detonation on a construction site will vary depending on the site specific conditions but can be summarised as follows:

- People – site workers, local residents and general public.
- Plant and equipment – construction plant on site.
- Services – subsurface gas, electricity, telecommunications.
- Structures – not only visible damage to above ground buildings, but potentially damage to foundations and the weakening of support structures.
- Environment – introduction of potentially contaminating materials.

## 19. 1st Line Defence Risk Assessment

### 19.1. Risk Assessment Stages

Taking into account the quality of the historical evidence, the assessment of the overall risk from unexploded ordnance is based on the following five considerations:

1. That the site was contaminated with unexploded ordnance.
2. That unexploded ordnance remains on site.
3. That such items will be encountered during the proposed works.
4. That ordnance may be initiated by the works operations.
5. The consequences of encountering or initiating ordnance.

### 19.2. Assessed Risk Level

1st Line Defence has assessed that there is an overall **Low Risk** from German and anti-aircraft unexploded ordnance at the site of proposed works. There is an assessed **Negligible Risk** from Allied unexploded ordnance.

| Ordnance Type                                 | Risk Level |     |        |      |
|-----------------------------------------------|------------|-----|--------|------|
|                                               | Negligible | Low | Medium | High |
| German Unexploded HE Bombs                    |            | ✓   |        |      |
| German 1kg Incendiary Bombs                   |            | ✓   |        |      |
| Anti-Aircraft Artillery Projectiles           |            | ✓   |        |      |
| Allied Land Service and Small Arms Ammunition | ✓          |     |        |      |

Please note – although the risk from unexploded ordnance on this site has been assessed as 'Low', this does not mean there is 'no' risk of encountering UXO. This report has been undertaken with due diligence, and all reasonable care has been taken to access and analyse relevant historical information. By necessity, when dealing historical evidence, and when making assessments of UXO risk, various assumptions have to be made which we have discussed and justified throughout this report. Our reports take a common-sense and practical approach to the assessment of risk, and we strive to be reasonable and pragmatic in our conclusions.

It should however be stressed that if any suspect items are encountered during the proposed works, 1st Line Defence should be contacted for advice/assistance, and to re-assess the risk where necessary. The mitigation measures outlined in the next section are recommended as a minimum precaution to alert ground personnel to the history of the site, what to look out for, and what measures to take in the event that a suspect item is encountered. It should also be noted that the conclusions of this report are based on the scope of works outlined in the 'Proposed Works' section of this report. Should the scope of works change or additional works be proposed, 1st Line Defence should be contacted to re-evaluate the risk.



## 20. Proposed Risk Mitigation Methodology

### 20.1. General

The following risk mitigation measures are recommended to support the proposed works at Aintree University Hospital, Liverpool:

| Recommended Risk Mitigation Measures |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Activity                             | Recommended Risk Mitigation Measure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| All Works                            | <ul style="list-style-type: none"> <li> <b>UXO Risk Management Plan</b><br/> It is recommended that a site-specific plan for the management of UXO risk be written for this site. This plan should be kept on site and be referred to in the event that a suspect item of UXO is encountered at any stage of the project. It should detail the steps to be taken in the event of such a discovery, considering elements such as communication, raising the alarm, nominated responsible persons etc. Contact 1<sup>st</sup> Line Defence for help/more information. </li> <li> <b>Site Specific UXO Awareness Briefings to all personnel conducting intrusive works.</b><br/> As a minimum precaution, all personnel working on the site should be briefed on the basic identification of UXO and what to do in the event of encountering a suspect item. This should in the first instance be undertaken by a UXO Specialist. Posters and information on the risk of UXO can be held in the site office for reference. </li> </ul> |

In making this assessment and recommending these risk mitigation measures, if known, the works outlined in the 'Scope of the Proposed Works' section were considered. Should the planned works be modified or additional intrusive engineering works be considered, 1st Line Defence should be consulted to see if a re-assessment of the risk or mitigation recommendations is necessary.

**1<sup>st</sup> Line Defence Limited**

**21<sup>st</sup> November 2024**

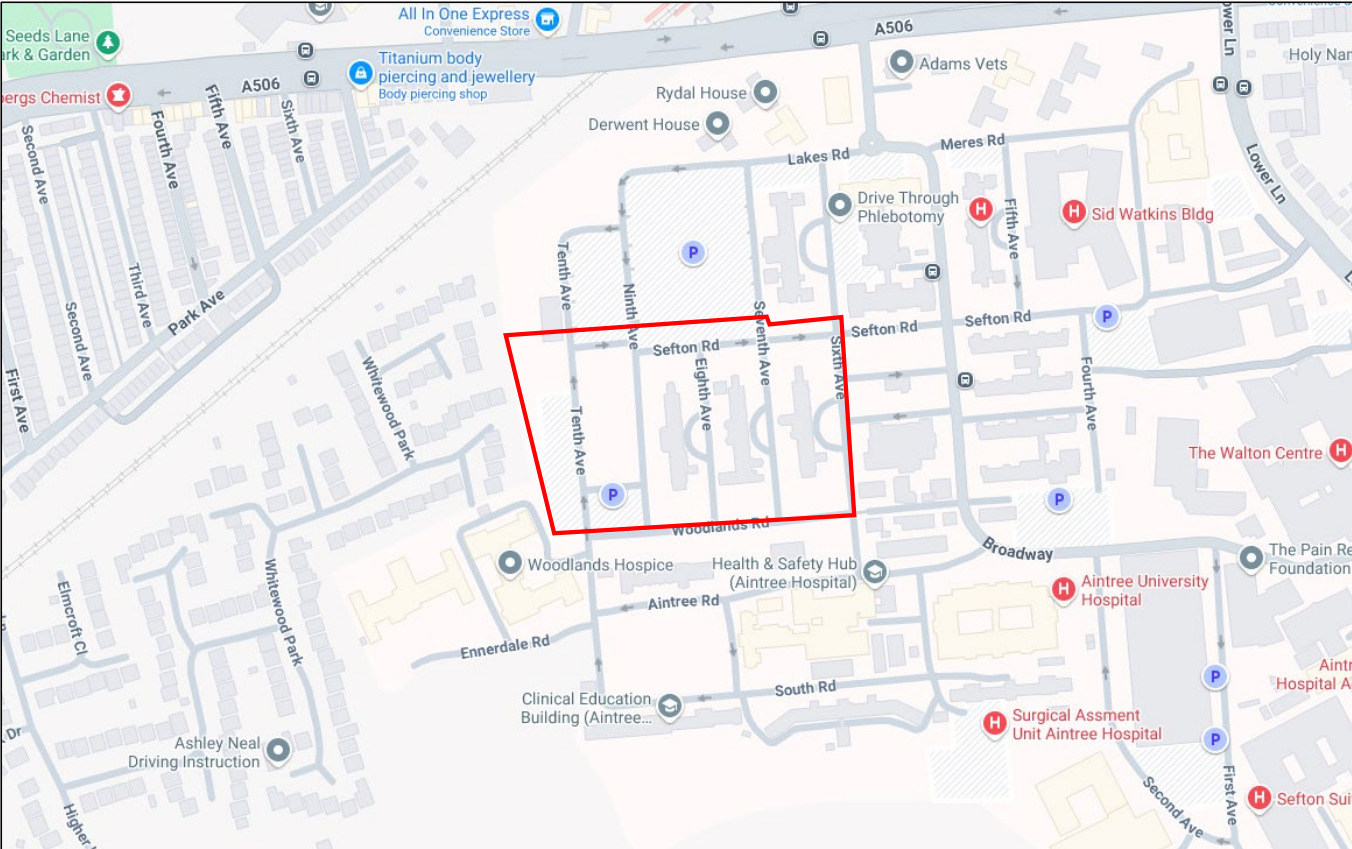
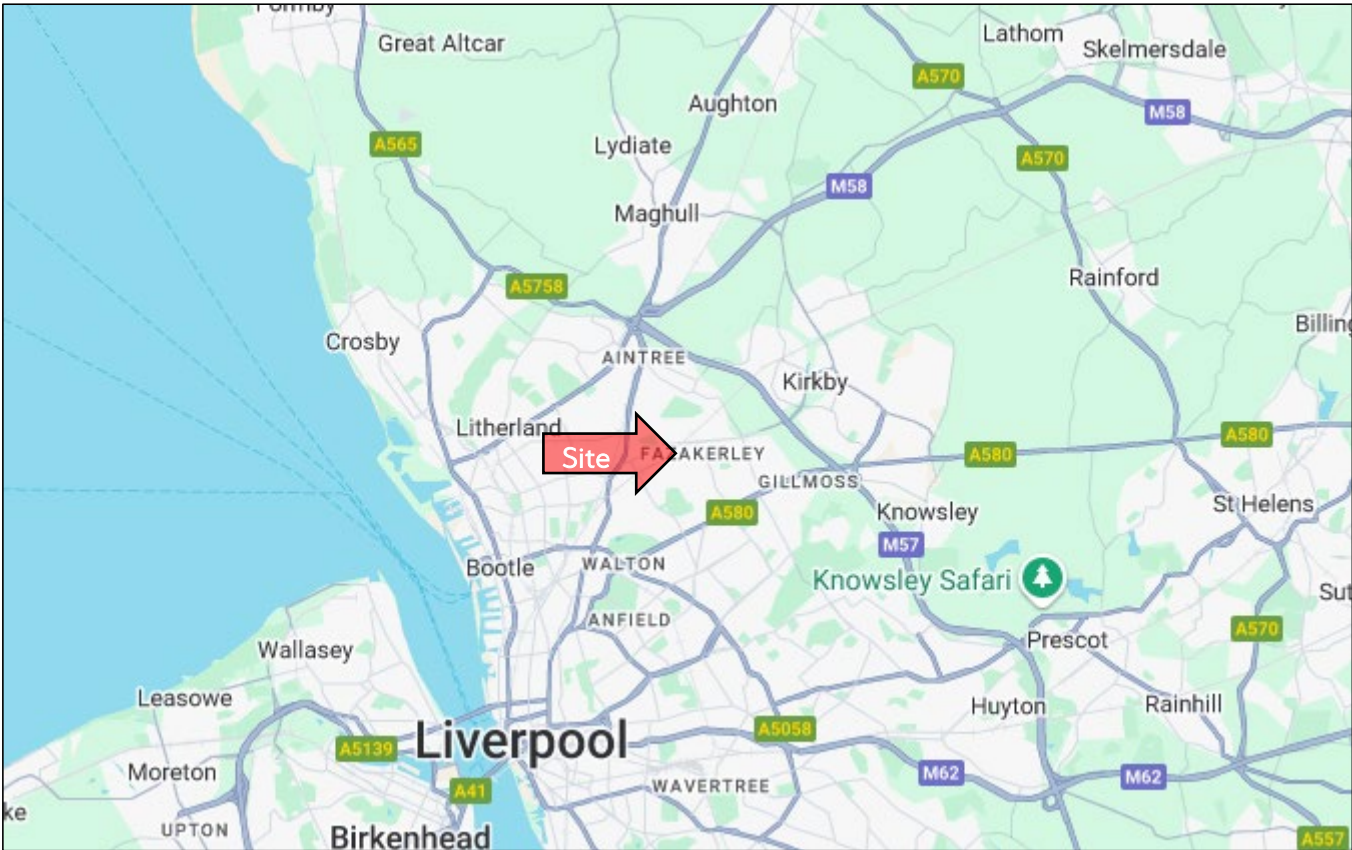
This Report has been produced in compliance with the Construction Industry Research and Information Association (CIRIA) C681 guidelines for the writing of Detailed UXO Risk Assessments.

## Bibliography

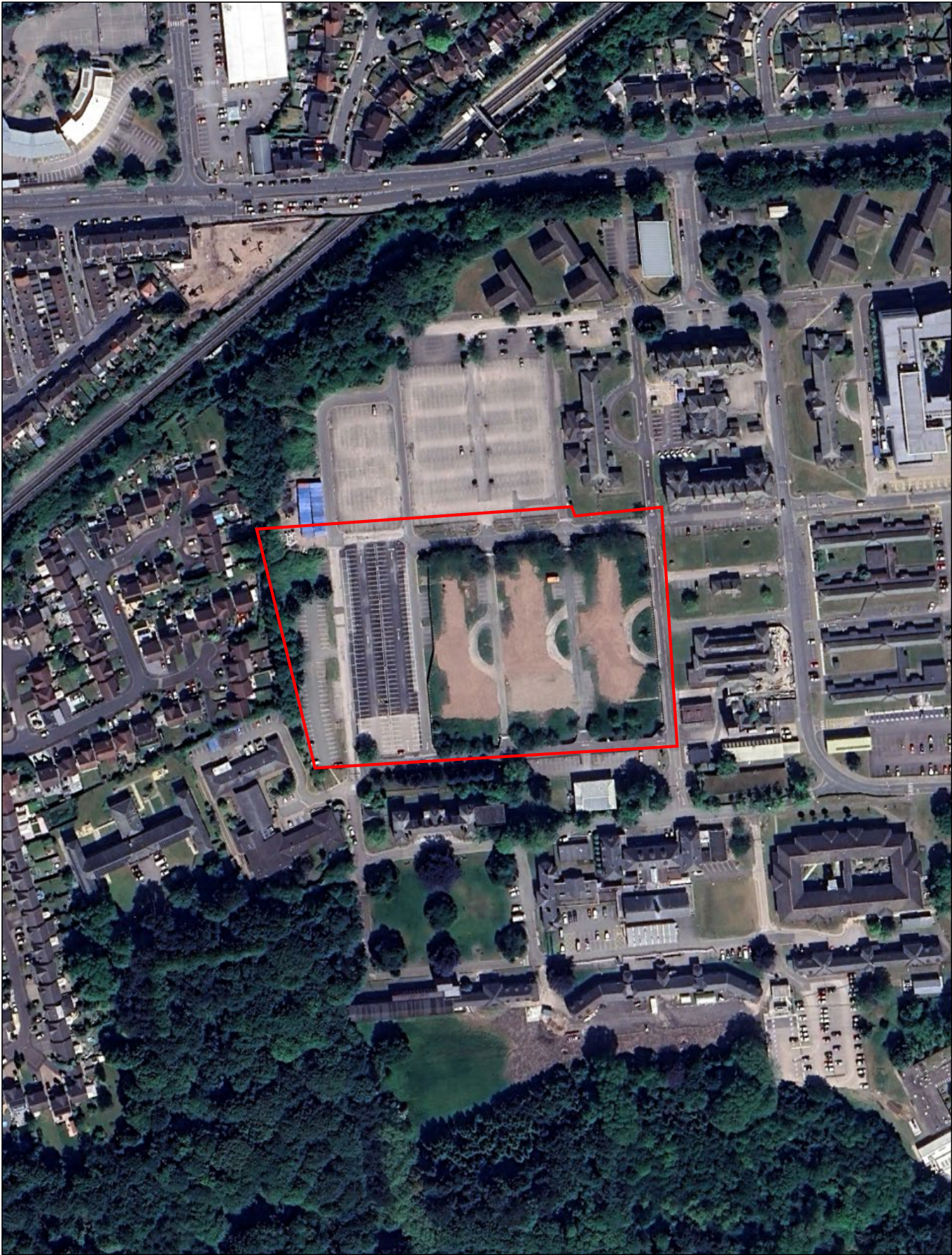
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This report has been prepared by 1st Line Defence Limited with all reasonable care and skill. The report contains historical data and information from third party sources. 1st Line Defence Limited has sought to verify the accuracy and comprehensiveness of this information where possible but cannot be held accountable for any inherent errors. Furthermore, whilst every reasonable effort has been made to locate and access all relevant historical information, 1st Line Defence cannot be held responsible for any changes to risk level or mitigation recommendations resulting from documentation or other information which may come to light at a later date.

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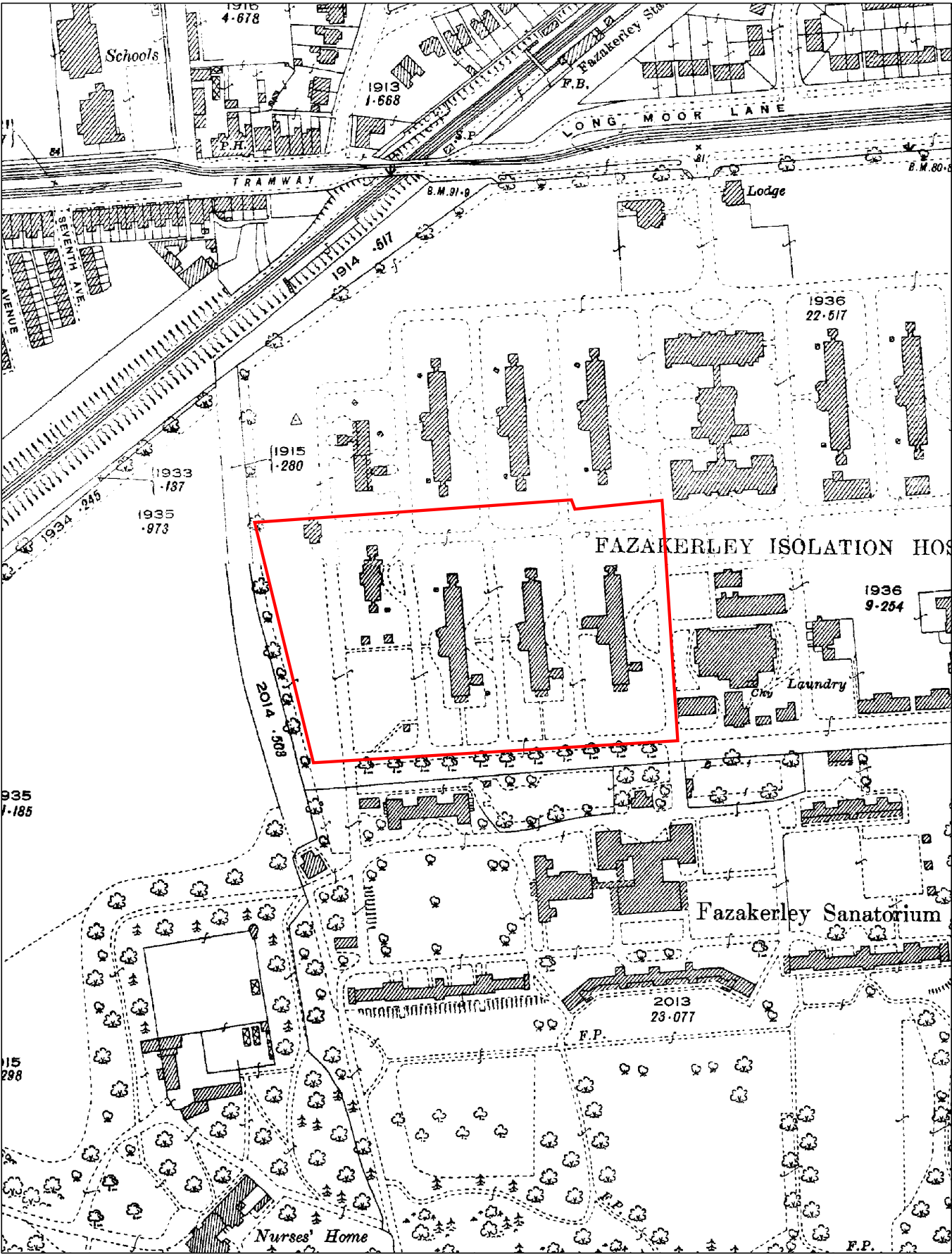












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Project: Aintree University Hospital, Liverpool

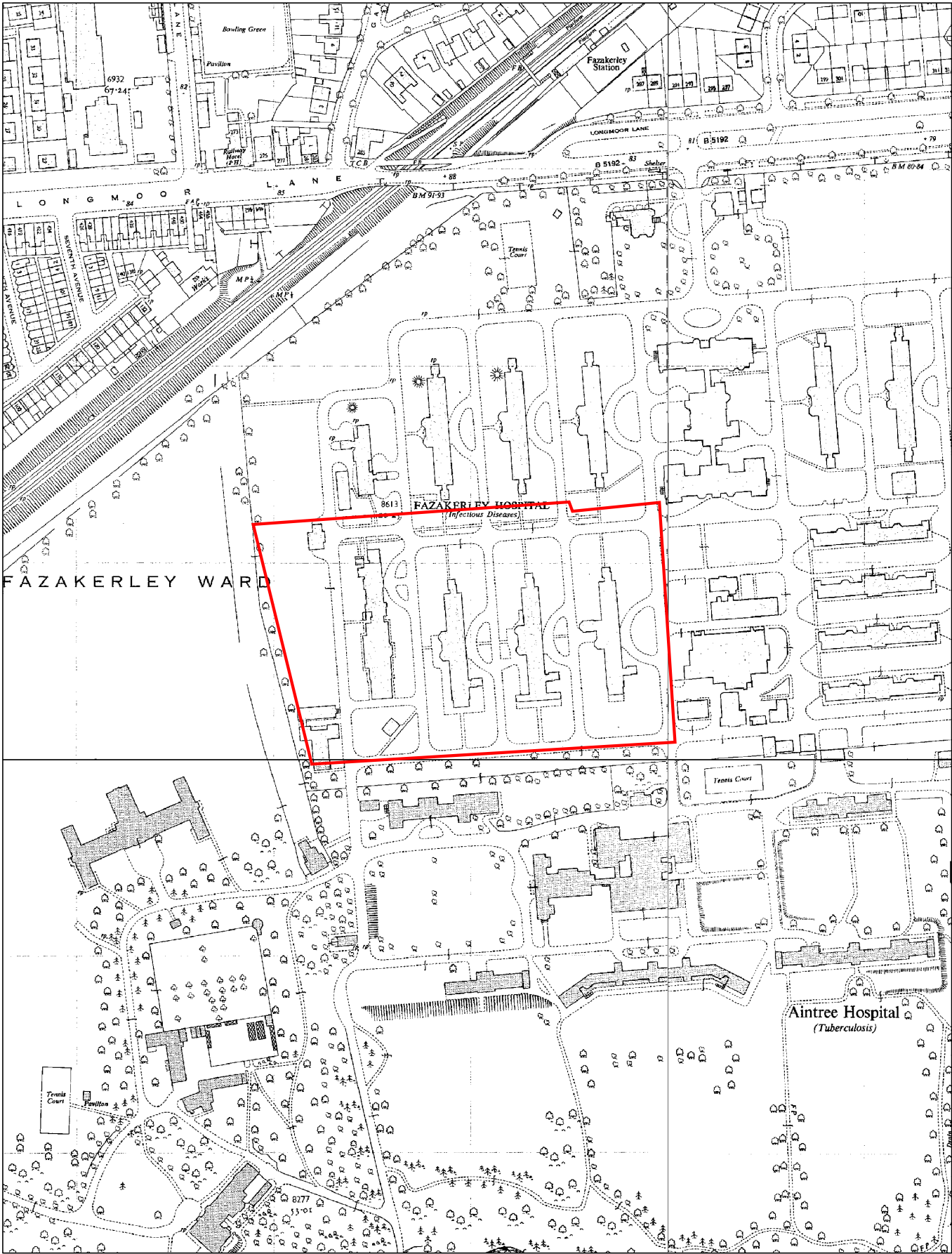
Ref: DA9796b-00

Source: Landmark Maps

— Approximate site boundary







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Tel: +44 (0)1992 245 020

**Client:** GRM Development Solutions Ltd

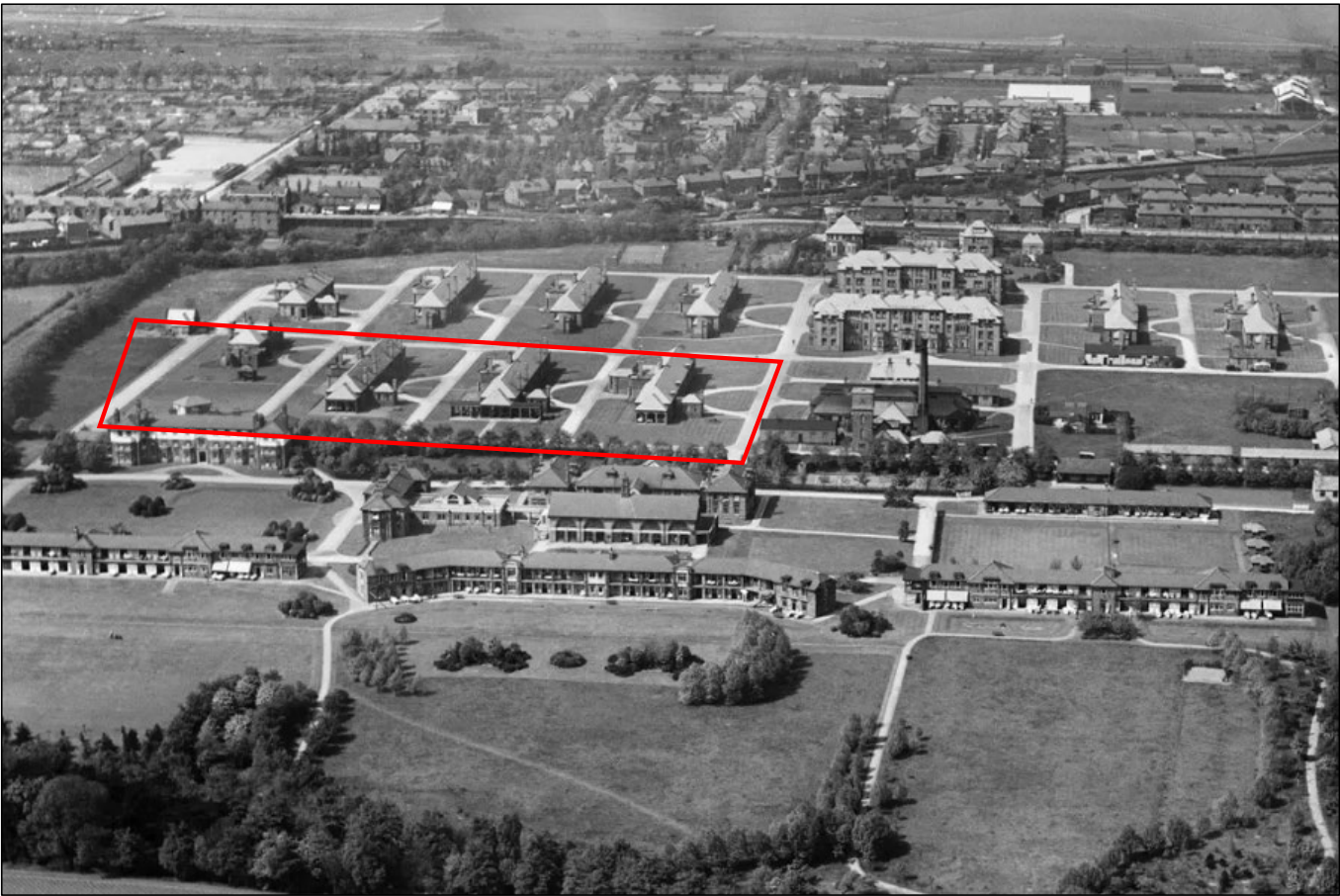
**Project:** Aintree University Hospital, Liverpool

**Ref:** DA9796b-00

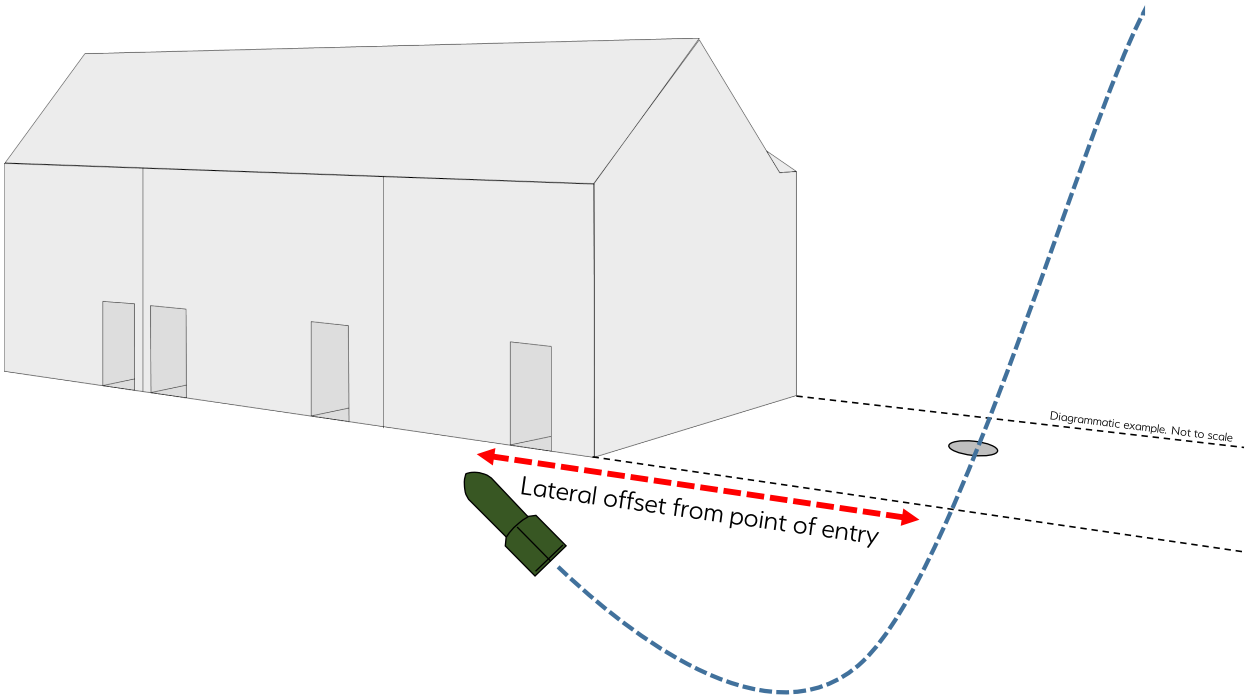
**Source:** Landmark Maps

**Approximate site boundary**









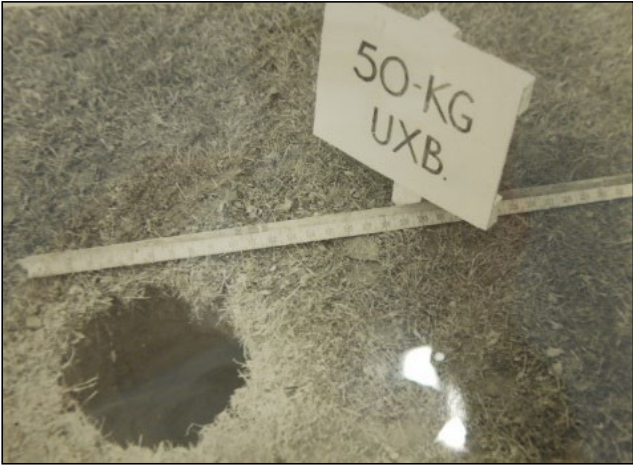




**Top:** J-curve Effect - Due to angle of entry, unexploded bombs would often end their trajectory at a lateral offset from point of entry, often ending up beneath adjacent extant structures/sites.

The photograph **above** shows a 250kg unexploded bomb found in Bermondsey in 2015, pointing upwards, demonstrating 'J-curve'.

One of the most common scenarios for UXO going unnoticed was when a UXB fell into a 'bomb site' (such as the area shown **Top Left**), the entry hole of the bomb obscured by any debris and rubble present. Note that the entry hole of a 50kg UXB could be as little as 20cm in diameter (**Left**).





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Source: Various sources

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BBC

NEWS

WW2 bomb found near London City Airport blown up



An unexploded World War Two bomb found near London City Airport has been detonated.

The 500kg device was discovered at the King George V Dock on Sunday during planned work at the airport.

It was closed and all flights were cancelled on Monday after an exclusion zone was put in place.

The detonation, which took place off Shoeburyness, Essex, was postponed on Tuesday because of high winds and dangerous conditions for divers.

The 1.5m-long German bomb - which was found in a bed of silt, 15m underwater - was carefully removed from the Thames and placed in a secure location a mile away from the coast of Essex.

500kg German HE Bomb, February 2018

BBC

NEWS

Great Yarmouth: Huge blast after unplanned WW2 bomb detonation



A World War Two bomb found in Great Yarmouth has detonated while work was being done to defuse it, causing a huge blast that was heard for miles.

Army specialists were attempting to disarm it when there was an unplanned detonation at about 17:00 GMT.

People on social media said they heard a loud bang and felt buildings shake 15 miles (24km) away.

There have been no reports of injuries among the Army, emergency services or the public, Norfolk Police said.

Cordons were put in place when the bomb was first discovered close to two gas pipes on Tuesday, and work began to make it safe.

250kg German HE Bomb, February 2023

BBC

NEWS

Exeter WW2 bomb is detonated after homes evacuated



More than 2,600 households and 12 university halls of residence were cleared before the 2,200lb (1,000kg) device **was destroyed** on Saturday.

Police said the blast left a crater about the size of a double-decker bus.

Police have reported large pieces of metal debris hitting buildings and said some properties in the 100m (330ft) exclusion zone had sustained "structural damage".



1000kg German HE bomb, February 2021

BBC

NEWS

Plymouth unexploded WW2 bomb: Thousands of people displaced



A 500kg (1,102lb) German World War Two bomb that forced the evacuation of thousands of people in Plymouth has been detonated at sea.

The unexploded device was **found in a garden** on St Michael Avenue on Tuesday, sparking four days of disruption.

On Friday police closed roads and rail and bus services were stopped as the bomb was transported 1.4 miles (2.3km) through the city's streets.

The device was taken by boat beyond the breakwater and detonated at 21:51 GMT.



500kg German HE Bomb, February 2024



BASF has confirmed that an explosive device, most likely a World War II-era bomb, caused the blast that left one person injured Tuesday at a plant construction site in Germany.

The explosion was reported at BASF's Ludwigshafen toluene diisocyanate (TDI) plant, which recently broke ground for a 300,000 metric tons per year TDI production plant and other construction to expand its facilities.



**BASF Provides Some Details**

Responding to a request from *PaintSquare News* for more information on Wednesday (Feb. 27), BASF's manager of media relations and corporate communications Europe, Ursula von Stetten, wrote in an email, "So here [are] the facts: The detonation took place at 10:00 a.m. One person was injured; the injury is not serious. He will be kept in the hospital for some days.

"Cause of the detonation was an explosive device, presumably a bomb deriving from the Second World War. The device detonated when grounding work was done. No details on [a] delay [are] available. At the moment, the exact circumstances of the incident are [being] evaluated."

1<sup>st</sup> March 2013

**SPIEGEL ONLINE**

**Blast Kills One**

**World War II Bomb Explodes on German Motorway**

A highway construction worker in Germany accidentally struck an unexploded World War II bomb, causing an explosion which killed him and wrecked several passing cars.



A World War II bomb has exploded during construction work on a German highway, killing one worker and injuring several motorists who were driving past, police said.

The worker had been cutting through the road surface near the south-western town of Aschaffenburg when his machine struck the bomb and triggered it. Police said they weren't sure yet what type of bomb it was. "The explosion seems to have been too small for it to have been an aircraft bomb," a police spokesman said.

23<sup>rd</sup> October 2006

**WWII bomb injures 17 at Hattingen construction site**



**Seventeen people were injured on Friday when a construction crew unwittingly detonated a buried World War II-era bomb in Hattingen.**

An excavator apparently drove over a 250-kilogramme (550 pound) American bomb, damaging surrounding buildings. Most of the injured suffered auditory trauma from the blast, and the excavator operator suffered injuries to his hands, police in the German state of North Rhine-Westphalia said.

"The hole was astoundingly small for such a large bomb full of so many explosives," Armin Gebhard, head of the Arnsberg department for military ordnance removal, told The Local. "But of course it damaged all the surrounding buildings too. We are really happy it wasn't worse."

19<sup>th</sup> September 2013

**BBC NEWS**

**World War II bomb kills three in Germany**



A special commission is investigating the causes of the explosion, while prosecutors are considering whether the team leader should face charges of manslaughter through culpable negligence, the BBC's Oana Lungescu reports from Berlin.

The blast happened an hour before the defusing operation was due to start.

Officials said the three men who died were experienced sappers, or combat engineers, who over 20 years had defused up to 700 bombs.

More than 7,000 people were immediately evacuated when the 500kg bomb was found. Several schools, a kindergarten and local companies remain closed.

2<sup>nd</sup> June 2010



June 2006



# WW1 bomb found in garden in Walton, Liverpool by gardener

🕒 21 May 2016 | [Liverpool](#)



An unexploded World War One bomb was found in a garden prompting an evacuation of homes

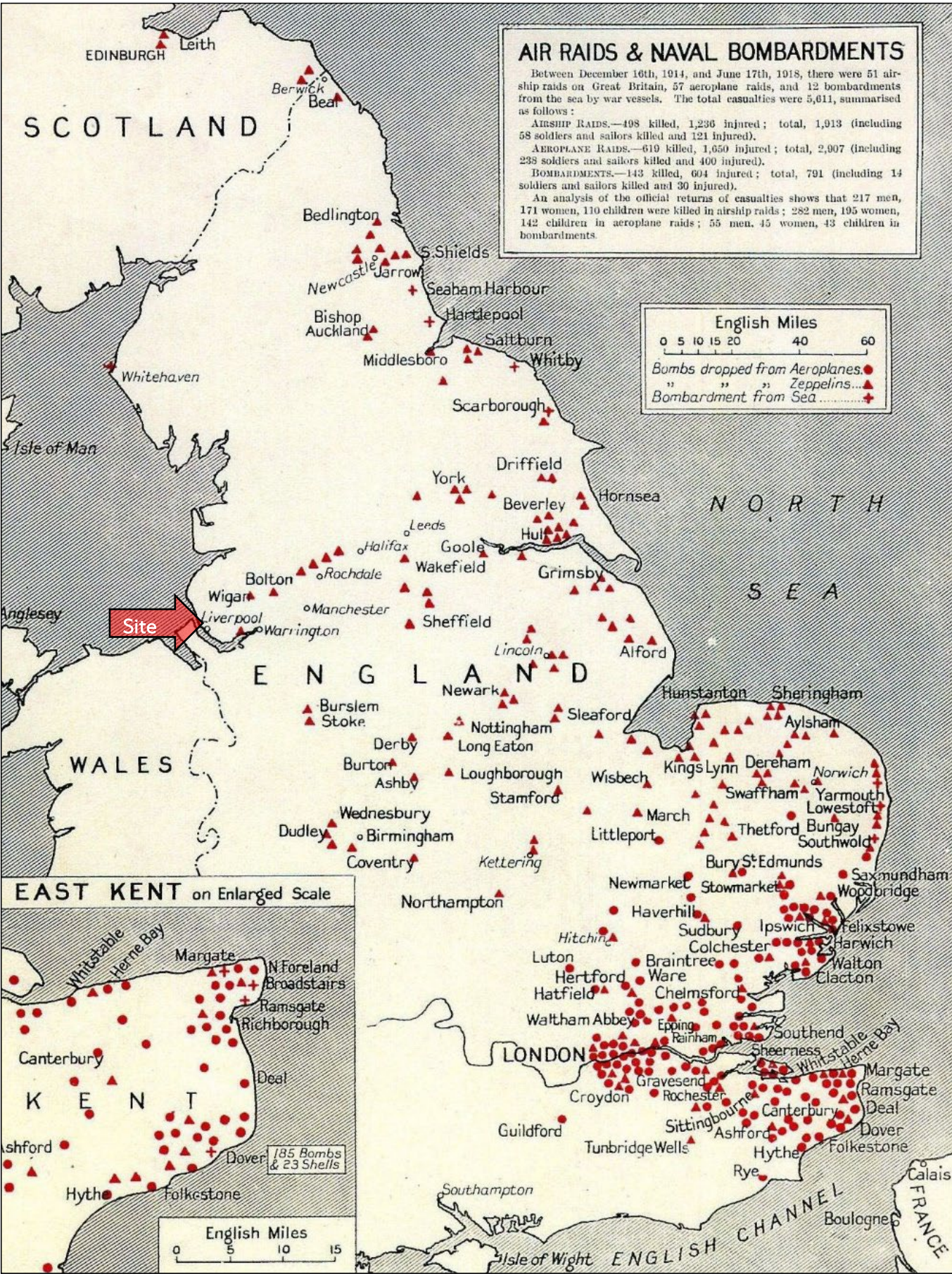
**An unexploded World War One bomb discovered in a garden in Liverpool has been "safely detonated" in a nearby park, said police.**

Police said a gardener found the device at a property on Byng Road, Walton at 16:20 BST on Friday and 20 homes were evacuated.

It was moved to Walton and Clubmoor recreation ground where it was made safe in a controlled explosion three hours later.

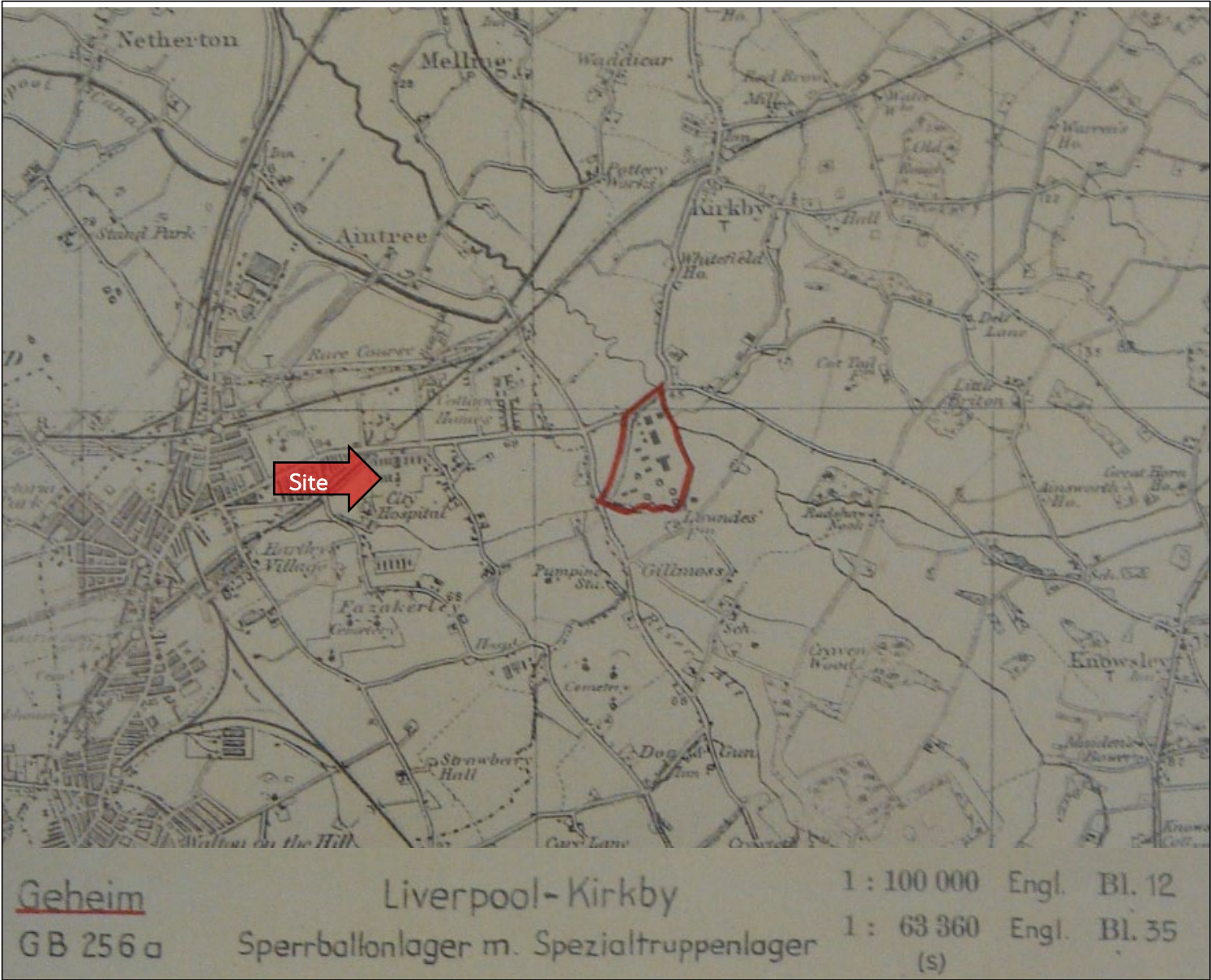
All residents have now returned home.







Luftwaffe Photograph, 1<sup>st</sup> October 1940



Translation: Liverpool – Kirkby. Barrage Balloon Camp/Special Group Camp

The Barrage Balloon Site was located approximately 1.5km east of the site.



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Ref: DA9796b-00

Source: Nigel J. Clarke, "Adolf Hitler's Home Counties Holiday Snaps"

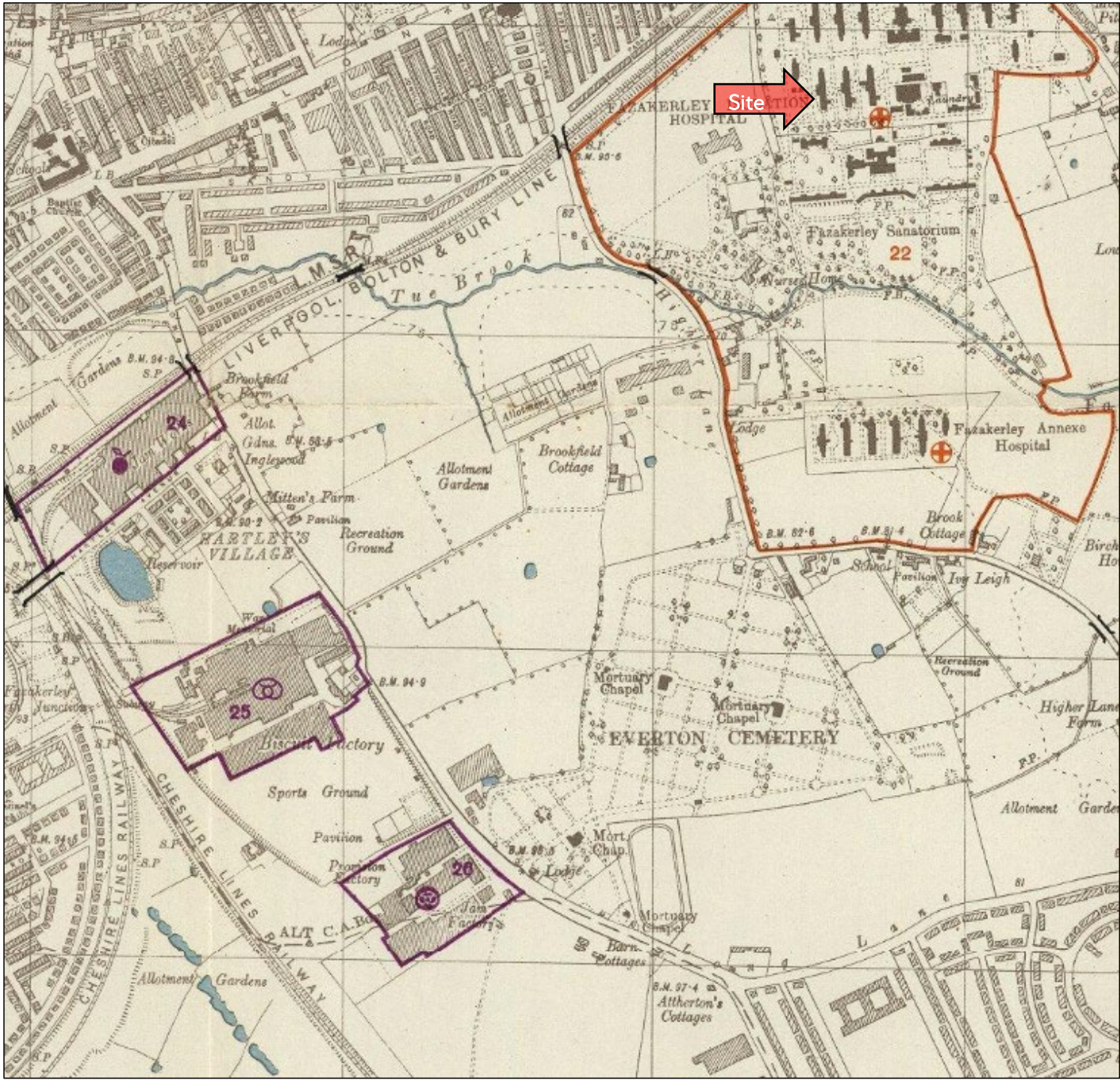
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Wehrmacht Target Mapping, 1941



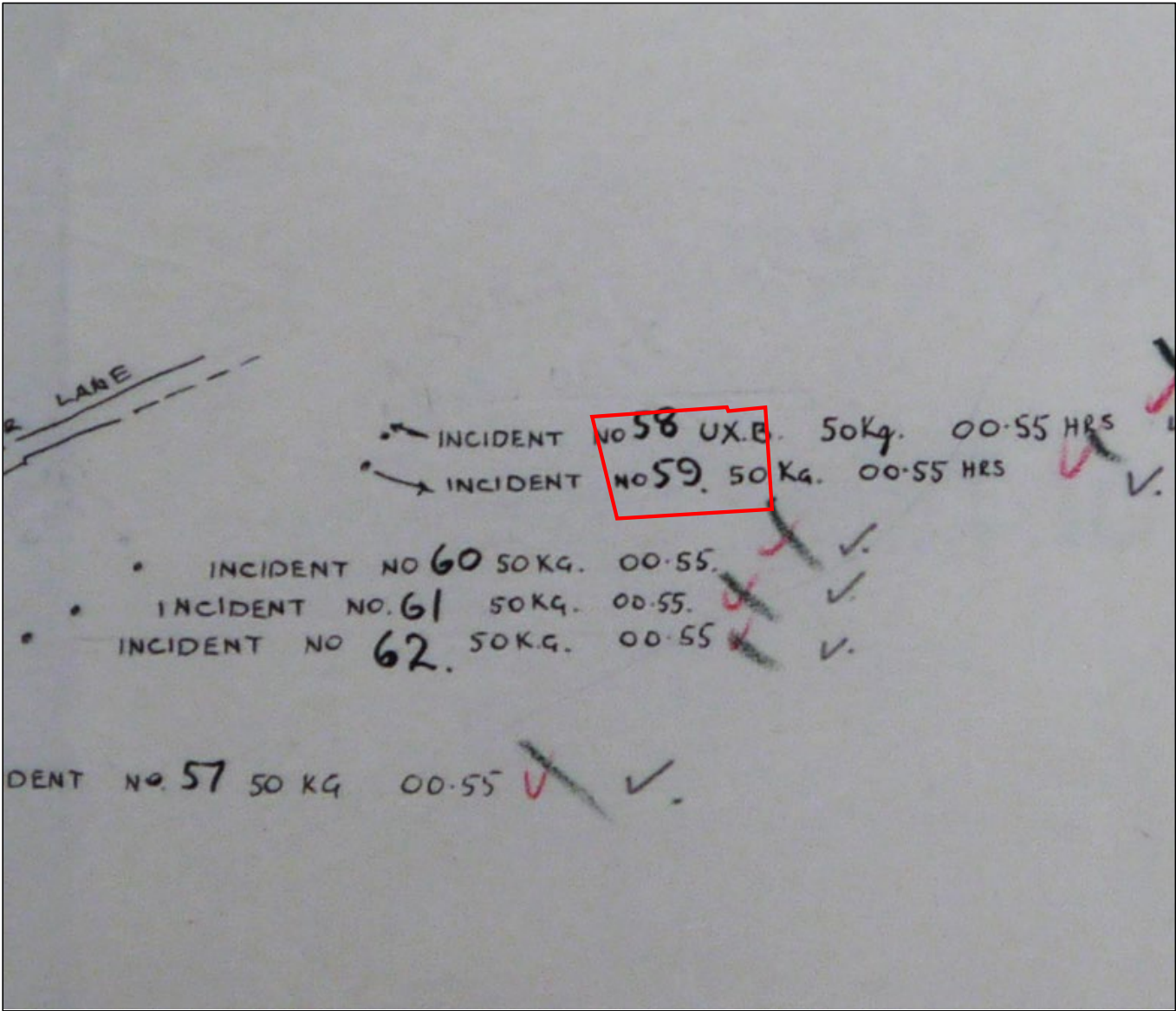
Designated Targets Approximate Translation

- 18 – Marshalling Yard Aintree
- 22- Fazakeley Hospital and Sanatorium
- 23 – Brickyards
- 24 – Jam Factory (Hartley’s)
- 25 – Biscuit Factory (Jacob’s Biscuit Factory)
- 26 – Food Factory
- 27 – Railway Workshops and Marshalling hotline Fazakerley of the L.M. & S.R.

|    |                                                                         |
|----|-------------------------------------------------------------------------|
| 18 | Verschiebebahnhof Aintree                                               |
| 22 | Fazakerley Spital und Sanatorium                                        |
| 23 | Ziegeleien                                                              |
| 24 | Marmeladenfabrik                                                        |
| 25 | Keksfabrik                                                              |
| 26 | Lebensmittelfabrik                                                      |
| 27 | Eisenbahnwerkstätten und Verschiebebahnhof Fazakerley der L. M. & S. R. |







● HE Bomb Strike



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Ref: DA9796b-00

Source: The National Archives, Kew

— Approximate site boundary







|                                     |                                                                                                                                                                                                                                                                   |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18/19 Sept.<br>R. 19.41<br>W. 01.04 | Heavy damage through whole of Liverpool. Walton Prison hit by H.E., trapping several people. Railway lines damaged Brownlow Street and St. Michaels Station, Southwood Road. A.T.M. Coy., work impeded for few hours by U.X.B. Nurses' Home, Fazakerley, damaged. |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                |                                                                                                                                                |
|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 17/18 Oct.<br>P. 21.12<br>R. 21.19<br>W. 22.39 | West wing Fazakerley Sanatorium demolished, and one patient killed. H.E. damage to dwelling houses West Derby. U.X.B. yard of Morrison School. |
|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|



1ST LINE DEFENCE

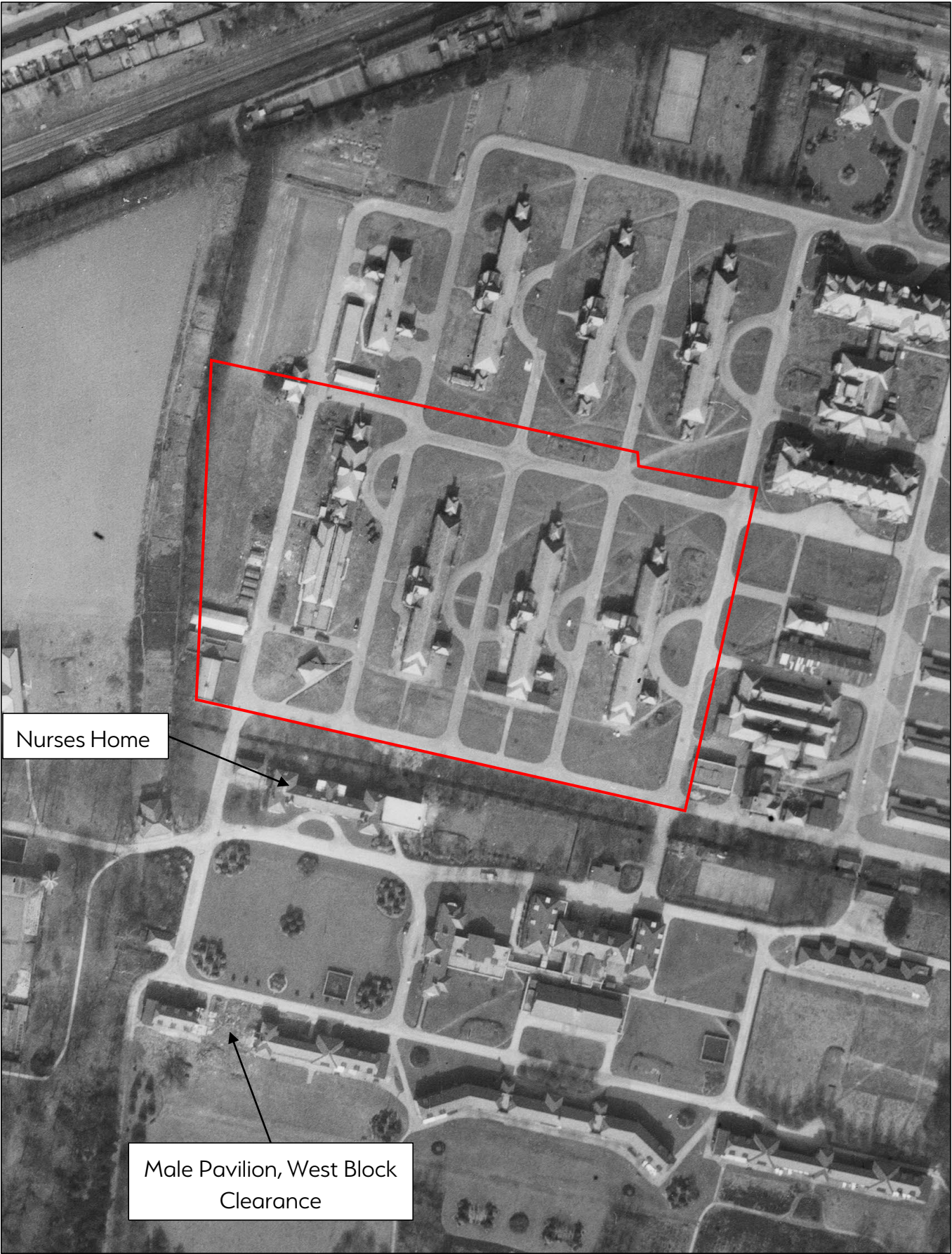
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Client: GRM Development Solutions Ltd

Project: Aintree University Hospital, Liverpool

Ref: DA9796b-00

Source: Liverpool Record Office



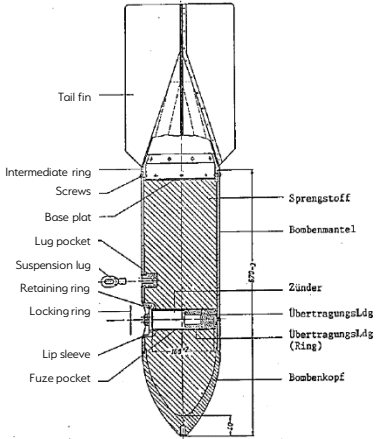






SC 50kg High Explosive Bomb

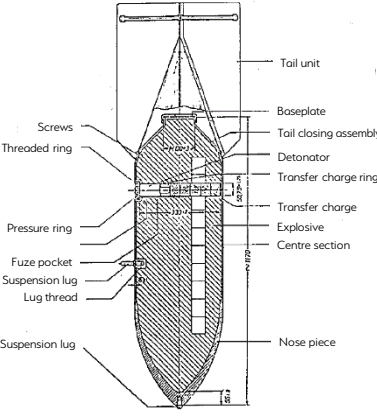
|                  |                                                                                                                                           |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Bomb Weight      | 40-54kg (88-119lb)                                                                                                                        |
| Explosive Weight | 25kg (55lb)                                                                                                                               |
| Fuze Type        | Impact fuze/electro-mechanical time delay fuze                                                                                            |
| Bomb Dimensions  | 1,090 x 280mm (42.9 x 11.0in)                                                                                                             |
| Body Diameter    | 200mm (7.87in)                                                                                                                            |
| Use              | Against lightly damageable materials, hangars, railway rolling stock, ammunition depots, light bridges and buildings up to three stories. |
| Remarks          | The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.                                   |





SC 250kg High Explosive Bomb

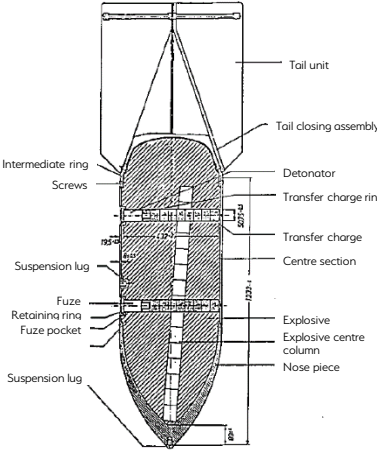
|                  |                                                                                                                                                          |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bomb Weight      | 245-256kg (540-564lb)                                                                                                                                    |
| Explosive Weight | 125-130kg (276-287lb)                                                                                                                                    |
| Fuze Type        | Electrical impact/mechanical time delay fuze                                                                                                             |
| Bomb Dimensions  | 1640 x 512mm (64.57 x 20.16in)                                                                                                                           |
| Body Diameter    | 368mm (14.5in)                                                                                                                                           |
| Use              | Against railway installations, embankments, flyovers, underpasses, large buildings and below-ground installations.                                       |
| Remarks          | It could be carried by almost all German bomber aircraft and was used to notable effect by the Junkers Ju-87 Stuka (Sturzkampfflugzeug, or dive-bomber). |

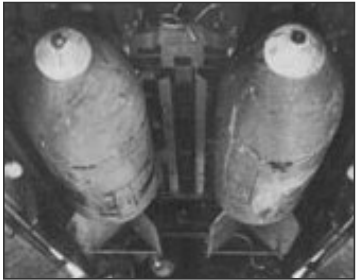




SC 500kg High Explosive Bomb

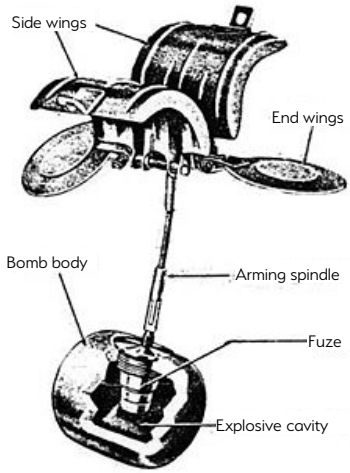
|                  |                                                                                                                                                       |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bomb Weight      | 480-520kg (1,058-1,146lb)                                                                                                                             |
| Explosive Weight | 250-260kg (551-573lb)                                                                                                                                 |
| Fuze Type        | Electrical impact/mechanical time delay fuze                                                                                                          |
| Bomb Dimensions  | 1957 x 640mm (77 x 25.2in)                                                                                                                            |
| Body Diameter    | 470mm (18.5in)                                                                                                                                        |
| Use              | Against fixed airfield installations; hangars, assembly halls, flyovers, underpasses, high-rise buildings and below-ground installations.             |
| Remarks          | 40/60 or 50/50 Amatol TNT, Trialene. Bombs recovered with Trialeen filling have cylindrical paper-wrapped pellets, 1-15/16in. in length and diameter. |





SD2 Anti-Personnel 'Butterfly Bomb'

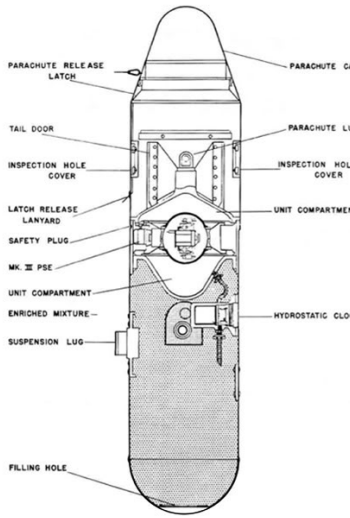
|                  |                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bomb Weight      | Approx. 2kg (4.41lb)                                                                                                                                                                                                                                                                                                                                                                              |
| Explosive Weight | Approx. 7.5oz (225 grams ) of Amatol surrounded by a layer of bituminous composition.                                                                                                                                                                                                                                                                                                             |
| Fuze Type        | 41 fuze (time) , 67 fuze (clockwork time delay) or 70 fuze (anti-handling device)                                                                                                                                                                                                                                                                                                                 |
| Body Diameter    | 3in (7.62 cm) diameter, 3.1in (7.874) long                                                                                                                                                                                                                                                                                                                                                        |
| Use              | Designed as an anti-personnel/fragmentation weapon. They were delivered by air, being dropped in containers of 23-144 sub-munitions that opened at a predetermined height, thus scattering the bombs.                                                                                                                                                                                             |
| Remarks          | Quite rare. First used against Ipswich in 1940, but were also dropped on Kingston upon Hull, Grimsby and Cleethorpes in June 1943, amongst various other targets in UK. As the bombs fell the outer case flicked open via springs which caused four light metal drogues with a protruding 5 inch steel cable to deploy in the form of a parachute & wind vane, which armed the device as it span. |





Parachute Mine (Luftmine B / LMB)

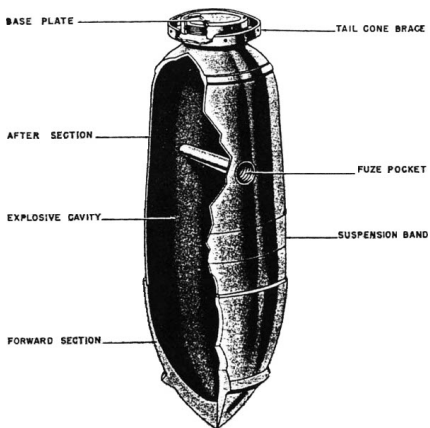
|                  |                                                                                                                                                        |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bomb Weight      | Approx. 990kg (2176lb)                                                                                                                                 |
| Explosive Weight | Approx. 705kg (1,554lb)                                                                                                                                |
| Fuze Type        | Impact/time delay/hydrostatic pressure fuze                                                                                                            |
| Dimensions       | 2.64m x 0.64m (3.04m with parachute housing)                                                                                                           |
| Use              | Against civilian, military and industrial targets. Used as blast bombs and designed to detonate above ground level to maximise damage to a wider area. |
| Remarks          | Deployed a parachute when dropped in order to control its descent. Had the potential to cause extensive damage within a 100m radius.                   |





SC 1000kg High Explosive Bomb

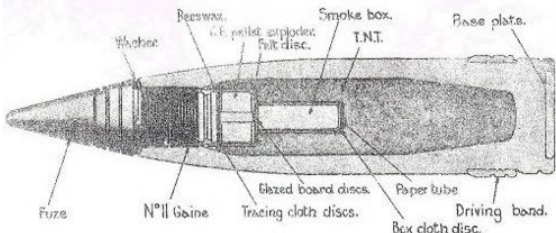
|                  |                                                                                                                                                                                                         |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bomb Weight      | Approx. 993-1027kg (2,189-2,264lb)                                                                                                                                                                      |
| Explosive Weight | Approx. 530-620kg (1168-1367lb)                                                                                                                                                                         |
| Fuze Type        | Electrical impact/mechanical time delay fuze.                                                                                                                                                           |
| Filling          | Mixture of 40% amatol and 60% TNT, but when used as an anti-shipping bomb it was filled with Trialen 105, a mixture of 15% RDX, 70% TNT and 15% aluminium powder.                                       |
| Bomb Dimensions  | 2800 x 654mm (110 x 25.8in)                                                                                                                                                                             |
| Body Diameter    | 654mm (18.5in)                                                                                                                                                                                          |
| Use              | SC-type bombs were General Purpose Bombs used primarily for general demolition work. Constructed of parallel walls with comparatively heavy noses, they are usually of three-piece welded construction. |

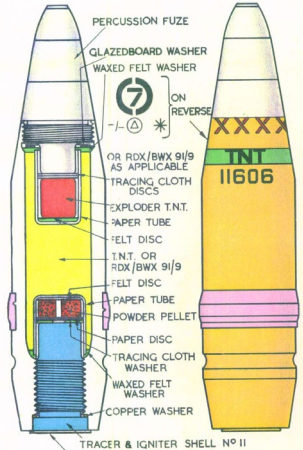


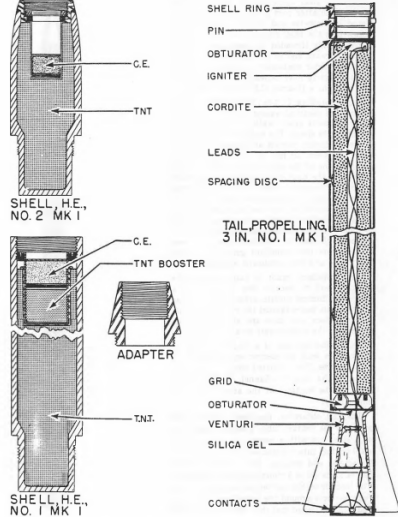




| 1kg Incendiary Bomb |                                     |  |
|---------------------|-------------------------------------|--|
| Bomb Weight         | Approx. 1.0 - 1.3kg (2.2 and 2.9lb) |  |

| 3.7 Inch QF Anti-Aircraft Projectile |                                                                                                                               |  | <br> |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Projectile Weight                    | 28lb (12.6 kg)                                                                                                                |                                                                                   |                                                                                                                                                                          |
| Explosive Weight                     | 2.52lbs                                                                                                                       |                                                                                   |                                                                                                                                                                          |
| Fuze Type                            | Mechanical Time Fuze                                                                                                          |                                                                                   |                                                                                                                                                                          |
| Dimensions                           | 3.7in x 14.7in (94mm x 360mm)                                                                                                 |                                                                                   |                                                                                                                                                                          |
| Rate of Fire                         | 10 to 20 rounds per minute                                                                                                    |                                                                                   |                                                                                                                                                                          |
| Use                                  | The 3.7in AA Mks 1-3 were the standard Heavy Anti-Aircraft guns of the British Army and were commonly used on the Home Front. |                                                                                   |                                                                                                                                                                          |
| Ceiling                              | 30,000ft to 59,000ft                                                                                                          |                                                                                   |                                                                                                                                                                          |

| 40mm Bofors Projectile |                                                                                                                                                                                                                            |  |  |  |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Projectile Weight      | 1.96lb (0.86kg)                                                                                                                                                                                                            |                                                                                    |                                                                                     |                                                                                      |
| Explosive Weight       | 300g (0.6lb)                                                                                                                                                                                                               |                                                                                    |                                                                                     |                                                                                      |
| Fuze Type              | Impact Fuze                                                                                                                                                                                                                |                                                                                    |                                                                                     |                                                                                      |
| Rate of Fire           | 120 rounds per minute                                                                                                                                                                                                      |                                                                                    |                                                                                     |                                                                                      |
| Projectile Dimensions  | 40 x 180mm                                                                                                                                                                                                                 |                                                                                    |                                                                                     |                                                                                      |
| Ceiling                | 23,000ft (7000m )                                                                                                                                                                                                          |                                                                                    |                                                                                     |                                                                                      |
| Remarks                | Light quick fire high explosive anti-aircraft projectile. Each projectile fitted with small tracer element. If no target hit, shell would explode when tracer burnt out. Designed to engage aircraft flying below 2,000ft. |                                                                                    |                                                                                     |                                                                                      |

| 3in Unrotated Projectile (UP) Anti-Aircraft Rocket ("Z" Battery) |                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| HE Projectile Weight                                             | 3.4kg (7.6lb)                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                      |                                                                                       |
| Explosive Weight                                                 | 0.96kg (2.13lb)                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                      |                                                                                       |
| Filling                                                          | High Explosive – TNT. Fitted with aerial burst fuzing                                                                                                                                                                                                                                                                                                                                                    |                                                                                      |                                                                                       |
| Dimensions of projectile                                         | 236 x 83mm (9.29 x 3.25in)                                                                                                                                                                                                                                                                                                                                                                               |                                                                                      |                                                                                       |
| Remarks                                                          | As a short range rocket-firing anti-aircraft weapon developed for the Royal Navy. It was used extensively by British ships during the early days of World War II. The UP was also used in ground-based single and 128-round launchers known as Z Batteries. Shell consists of a steel cylinder reduced in diameter at the base and threaded externally to screw into the shell ring of the rocket motor. |                                                                                      |                                                                                       |
|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                      |                                                                                       |



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