Slate Wharf, Castlefield, Manchester

Combined Phase 1 Desk Study and Phase 2 Geo-Environmental Ground Investigation Report

For: Prestbury Estates Ltd.

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1.0 INTRODUCTION

This Combined Phase 1 Desk Study and Phase 2 Geo-Environmental Ground Investigation report has been prepared at the request of Prestbury Estates Ltd. Instructions were received in May 2021. Desk study works were undertaken between 12th and 15th May 2021 and the ground investigation works were undertaken on 9th - 10th August and 12th October 2021.

Proposed Development

This Combined Phase 1 and Phase 2 Geo-Environmental Investigation is to be used for submission to the Local Authority as part of a planning application as it is the Client's intention to develop the site into a residential development comprising a single 4-storey apartment block containing 24 No. apartments with areas of soft landscaping (public open space). No private gardens are proposed.

1.1 Brief

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

The investigation was to include the following:

a) Assess the probable ground conditions and contaminated land conditions on and below the site based on existing and historic site and relevant off site activities to produce a Preliminary Risk Assessment for potential human health, ground gas and controlled waters receptors and to determine potential development issues (i.e. sub-surface features – obstructions, infilling, compressible ground, faulting, mineral extraction, mining and land instability).

b) Design and undertake an appropriate intrusive site investigation including installing appropriate exploratory holes, collect representative samples, arranging appropriate chemical testing in accordance with the latest legal

framework, record olfactory and / or visual evidence of contamination and undertake on site in-situ and laboratory geotechnical testing.

c) Carry out ground gas and groundwater level monitoring for 5 visits over 2 months to establish the presence or otherwise of a groundwater table and ground gas concentrations.

d) Revise the conceptual models within the Preliminarily Risk Assessment to accommodate the findings of the site investigation works in terms of the risk to human health, controlled waters and the wider environment.

e) Identify the risks and evaluate whether a Phase 3 numerical risk assessment and / or a Remedial Strategy, is required.

f) Undertake an assessment of the geological findings to provide outline recommendations for foundations, floor slabs and external areas.

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

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

1.2 Third Parties

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

2.0 DESK STUDY

2.1 Documentation

The following documents were obtained and examined during the desk study:

a) Aerial photographs of the site dated; April 2019, June 2015, June 2009 and June 2000. The photographs are contained within the Groundsure Enviro and Geo Insight report in Appendix 4.

b) Historical Ordnance Survey maps dated between 1848 and 2021, at scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

c) Groundsure maps, all dated 2021 as follows:

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

These maps are contained within the geo and enviro insight report in Appendix 4.

d) A combined Enviro and Geo Insight report was obtained from Groundsure, an environmental database company, which provides a list of recorded past and present activities at or adjacent to the site which could have an impact on the levels of contamination in the soils and groundwater at the site. The report is contained in Appendix 4.

e) The following sources were obtained and examined from the British Geological survey. All items were copied under licence; [C18/01] British Geological Survey ©UKRI. All rights reserved:
   - The British Geological Survey (BGS) 1:50,000 solid and drift geological maps (85 dated 2010 and 2011 respectively).
   - 5 No. BGS Borehole logs were also obtained (Ref: SJ89NW1215, SJ89NW1304 SJ89NW3416, SJ89NW3417 and SJ89NW3932).

f) The Indicative Atlas of Radon in England and Wales published by the British Geological and the Health Protection Agency and BR 211 Radon Report (2015) were examined to assess the probable presence or otherwise of radon gas in the ground. Extracts of the relevant maps are contained in Appendix 6.

g) A Zetica UXO Risk Map, a Preliminary and a Detailed UXO Risk Assessment were also obtained and are included in Appendix 12.

h) A historical aerial image dated 1934 was purchased from Britain From Above (Ref: EPW1045993) and is included within this report under license.

2.2 Site Location and Description

The site is a c. 0.11 Ha site, located to the east of Slate Wharf, Manchester, approximately 1.2km from Manchester City centre, at the postcode M15 4ST. The National Ordnance Survey grid reference for the centre of the site is 383047E, 397510N. The site comprises a grassed area of vacant land.

The site is bound by the Bridgewater Canal and Tow Path to the east, Slate Wharf and The Wharf restaurant to the south, Slate Wharf and a car park to the west and residential dwellings to the north. The site is shown on the below aerial image:



Figure 1; Aerial image dated April 2019

A site location plan is contained in Appendix 2.

2.3 Walkover Survey

The site was visited on 20th July 2021 in clear weather conditions and the objectives of the site walkover were, where applicable:

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

- to assess site access and potential investigation locations and constraints; and
- to assess any visual subsurface geotechnical features / anomalies (e.g. foundations, made ground, subsidence etc.).

The findings of the walkover survey are discussed below:

Geology

The site was noted to be an area of open grass, The topography was noted to gently slope down from c. 27.60m AOD in the north western corner to c. 25.80m AOD in the south eastern corner.

Semi-mature trees were noted along the western extent of the southern boundary and an area of dense vegetation was noted along the northern boundary.

2 No. paths were noted to cross the northern site section, the first from east to west along the northern boundary and the second from south west to north east through the northern half of the site.



Figure 2; Photographs showing the site, taken from the south eastern corner (left) and western boundary (right)

Contamination

No evidence of contamination (i.e. spillages or leakages) or contaminative sources were identified.

The features mentioned above are shown on the Site Features Plan in Appendix 2.

2.4 Site History

The site development history has been researched by reference to historical maps, street plans and aerial photographs. The historical maps are included in Appendix 3 to this report and the principal observations which are divided into on-site history and off-site history are summarised below:

On-Site History

Date	Site Feature
1848 – 1893	A smithy is recorded in the northern site section, the remainder of the site is recorded as open land associated with Castle Quay Slate Wharf.
1893 – 1932	The smithy is no longer present. The site is open land associated with Timber Wharf.
1932 – 1953	The site remains mostly open land, however the Duke's New Warehouse encroaches onto the western boundary of the site by 1932.
1953 – 1977	A second warehouse is recorded to the north of the site which extends across the northern site section by 1953.
1977 – 1990	By 1977 a warehouse occupies the entire site.
1990 – 2021	By 1990 the warehouse has been demolished and the site is open land. The site has remained relatively unchanged since.



Figure 3; Extracts of the OS historical maps dated 1851, 1893, 1953 and 1981 from top left to bottom right.



Figure 4; Historical aerial image dated 1934 showing the site (circled) as vacant land

Off Site History

Given the industrial nature of the area surrounding the site, numerous warehouses, wharfs, travelling cranes, iron works, mills, works and other industrial land uses have existed within 250m of the site since the late 19th century. Therefore, only the most pertinent and adjacent off-site historic features have been included in the below table.

Date	Site Feature	Distance (m)	Direction
1851 - 1977	**The New Basin** and **The New Warehouse.** The warehouse appears to have been extended by the 1930s and encroaches onto the western boundary of the site. By the 19070s the basin appears to have been **partially infilled** and warehouse demolished. 2 No. new **warehouses** and 2 No. **depots** are recorded in the location of the former warehouse and basin by the 1980s which are demolished and replaced with **residential apartment blocks** by the 2000s.	0	W
1922 – 1953	A **Timber Yard** was recorded adjacent to the southern boundary of the site by 1922, but was no longer recorded by 1932	0	S
1953 - 1990	**Warehouses** were recorded to the north and south of the site by 1953, the northern warehouse encroaching onto the northern site section. By 1977, the northern warehouse appears to have been extended south and west and is present across the site. Both warehouses appear to have been **demolished** by the 1990s.	0	N /S
1948 – 1893	A **Gravel Pit** is recorded on the earliest historic map, however is no longer recorded by the 1890s and appears to have been infilled.	80	W

2.5 Geology and Mining

2.5.1 BGS Geological Map

The BGS 1:50,000 Solid and Drift Geological Maps of the area (Sheet No :85 dated 2010 and 2011 respectively) indicate that no superficial deposits are recorded on-site. The site is underlain by bedrock comprising the CHESTER FORMATION which typically comprises reddish brown, pebbly SANDSTONE with subordinate beds of reddish brown mudstone.

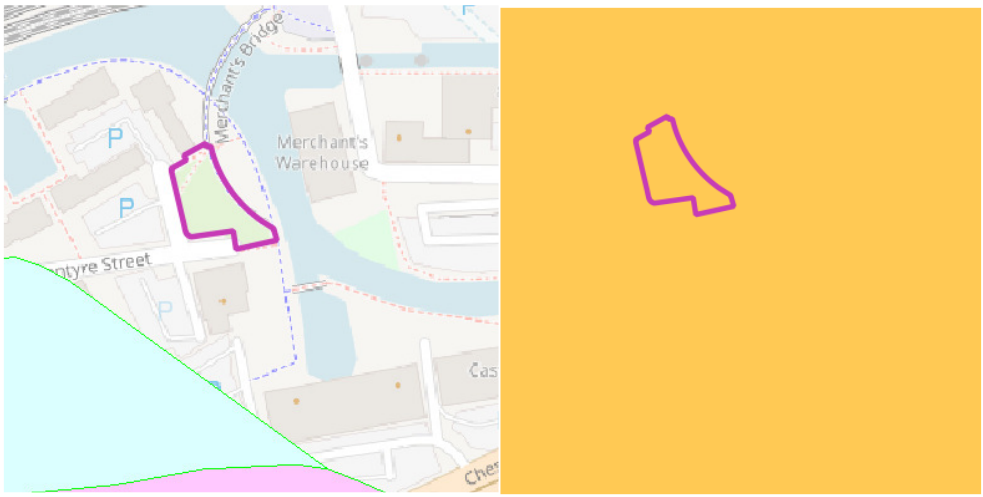


Figure 5; Extracts of the BGS 1:50,000 Drift (left) and Solid (right) Geological Maps. Blue = Glacial Till, Pink = Glaciofluvial Deposits, Orange = Chester Formation

A bedrock dip of 8° south west is recorded on the BGS 1:50,000 Geological Map. No faults exist on-site, the nearest fault is located 300m north east of the site.

2.5.2 BGS Borehole Logs

There were no available BGS boreholes on-site. There were 5 No. BGS boreholes available in close proximity to the site within a comparable geological setting. The pertinent information from the borehole logs is outlined below:

BGS Borehole Reference: SJ89NW1215

This borehole is located approximately 169m south west of the site and was excavated to a depth of 3.10m bgl in 1998. The log recorded the following pertinent information:

- MADE GROUND comprising dark grey and brown CLAY with brick and cinder to a depth of 0.60m bgl, underlain by;

- MADE GROUND comprising firm to stiff, brown, sandy CLAY with some fine to medium gravel, cinder and rootlets and occasional bands of reddish brown, clayey, fine to coarse sand to a depth of 2.10m bgl, underlain by;
- Reddish brown, moderately weathered SANDSTONE to a depth of 3.10m bgl.

Groundwater was encountered at 2.50m bgl.

BGS Borehole Reference: SJ89NW1304

This borehole is located approximately 160m south west of the site and was excavated to a depth of 5.50m bgl in 1991. The log recorded the following pertinent information:

- MADE GROUND comprising BRICK and brown, medium SAND and CLAY to a depth of 2.40m bgl, underlain by;
- Brown, medium grained, highly weathered SANDSTONE to a depth of 5.50m bgl.

No groundwater was encountered within the borehole.

BGS Borehole Reference: SJ89NW3416

This borehole is located approximately 53m east of the site and was excavated to a depth of 3.45m bgl in 1986. The log recorded the following pertinent information:

- MADE GROUND comprising COBBLES to a depth of 0.20m bgl, underlain by;
- MADE GROUND comprising ASHES to a depth of 0.50m bgl, underlain by;
- MADE GROUND comprising SAND, CLAY, ASHES and SANDSTONE pieces to a depth of 3.00m bgl, underlain by;
- Dense, slightly clayey, fine to medium grained SANDSTONE to a depth of 3.45m bgl.

No groundwater was encountered within the borehole.

BGS Borehole Reference: SJ89NW3417

This borehole is located approximately 66m north east of the site and was excavated to a depth of 2.50m bgl in 1986. The log recorded the following pertinent information:

- MADE GROUND comprising COBBLES, SANDSTONE pieces and TOPSOIL to a depth of 0.50m bgl, underlain by;
- Very dense, reddish brown, fine to medium grained SANDSTONE to a depth of 2.50m bgl.

No groundwater was encountered within the borehole.

BGS Borehole Reference: SJ89NW3932

This borehole is located approximately 53m east of the site and was excavated to a depth of 4.50m bgl in 1986. The log recorded the following pertinent information:

- MADE GROUND comprising ASPHALT to a depth of 0.20m bgl, underlain by;
- MADE GROUND comprising light brown SANDSTONE FILL to a depth of 0.40m bgl, underlain by;
- MADE GROUND comprising loose, dark brown and reddish brown mottled, clayey, gravelly SAND with some fragments of brick, ash, charcoal and ash to a depth of 2.80m bgl, underlain by;
- Dense, reddish brown, silty, fine to medium SAND with occasional fine gravel size fragments of weakly cemented sandstone to a depth of 3.50m bgl, underlain by;
- Weak, reddish brown SANDSTONE to a depth of 4.50m bgl.

No groundwater was encountered within the borehole.

2.5.3 BGS Geohazards

Data Type	Details
Ground Stability Data	➢ The Potential for Shrinking or Swelling Clay Ground Stability Hazards is regarded as negligible. ➢ The Potential for Landslide Ground Stability Hazards is regarded as very low. ➢ The Potential for Dissolution Ground Stability Hazards is regarded as negligible. ➢ The Potential for Compressible Ground Stability Hazards is regarded as negligible. ➢ The Potential for Collapsible Ground Stability Hazards is regarded as very low. ➢ The Potential for Running Sand Ground Stability Hazards is regarded as negligible to low.

For further details please see the Groundsure Geo and Enviro Insight Report contained in Appendix 4.

2.5.4 BGS Estimated Soil Chemistry

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

- Arsenic – 25mg/kg – 35mg/kg
- Cadmium – 1.8mg/kg
- Chromium – 60mg/kg – 90/kg
- Nickel – 15mg/kg
- Lead – 100mg/kg – 200mg/kg

2.5.5 Coal Mining

The site does lie within a Coal Authority Coal Mining Reporting Area, however no coal outcrops, mine entries, development high risk areas, recorded or probable shallow workings or underground workings are recorded on-site or in close proximity to the site. The nearest coal outcrops, mine entries and recorded workings are located >2.5km north east of the site.

2.5.6 Salt Mining / Brine Extraction and Non-Coal Mining

The site does not lie within a recognised salt mining or brine extraction area.

The Groundsure geo and enviro-insight report (contained in Appendix 4) indicates that no non-coal mining is recorded within 2km of the site.

2.5.7 Historical Surface Excavations

No recorded historic surface excavations exist on-site. However, numerous basins and a gravel pit have been recorded in close proximity to the site (<100m). Therefore, the presence of unrecorded historical excavations on-site cannot be discounted.

2.5.8 Mineral Safeguarding

Where mineral resources are present the mineral planning authority may designate areas as Mineral Safeguarding Areas (MSA) and Mineral Consultation Areas (MCA). These are aimed to safeguard mineral resource areas from unnecessary sterilization

by non-mineral development. The BGS Mineral Resources maps designate the areas of potential mineral resources and where active / lapsed planning permission was granted for mineral extraction.

The BGS Mineral Resources Map for Greater Manchester indicates that no mineral resources, surface or underground planning permissions (valid or expired) or active / inactive mineral works exist on-site. The Greater Manchester Joint Minerals Development Plan Mineral Maps indicate that no mineral safeguarding areas exist on-site.

The BGS Mineral Resource Map for Greater Manchester and The Greater Manchester Joint Minerals Development Plan Mineral Maps are contained in Appendix 5.

2.6 Previous Site Investigations

No known previous site investigations have been undertaken on-site, however, a site investigation was undertaken c. 140m south east of the site. The site investigation was undertaken by GeoAssist Ltd. in 2015. The site investigation works comprised 10 No. light cable percussive boreholes and follow-on rotary core holes to prove bedrock depth and 5 No. window sample holes. 6 No. ground gas and groundwater visits were also undertaken following the site investigation works.

The ground conditions encountered were as follows:

- MADE GROUND comprising very loose to medium dense, sandy GRAVEL to depths of between 0.40m and 4.70m bgl, underlain by;
- GLACIOFLUVIAL DEPOSITS comprising very loose to medium dense SAND and GRAVEL to a depth of between 1.30m and 2.20m bgl, underlain by;
- Weathered BUNTER SANDSTONE comprising very dense, silty SAND becoming very weak, medium strong, inferior cemented, thickly laminated SANDSTONE.

Groundwater was recorded at depths of between 24.69m and 23.49m AOD during the site works. Subsequent groundwater depth monitoring recorded a relatively consistent groundwater table at between 24.20m and 24.50m AOD.

14 No. soil samples and 3 No. water samples were sent for laboratory chemical testing for a wide range of determinands. No human health GAC exceedances for the residential without home grown produce land use scenario or EQS standards exceedances were recorded.

Ground gas monitoring undertaken recorded a maximum carbon dioxide concentration of 2.5% (v/v), no methane, hydrogen sulphide or carbon monoxide were recorded above detection limits and flow rates of between 0.1l/hr and 0.3l/hr were recorded. Consequently, the site was designated as a Characteristic Situation 1 (CS1).

2.7 Hydrology and Hydrogeology

Environmental data relevant to the site and its immediately surrounding area has been obtained from sources available in the public domain. In addition, an environmental report was obtained from Groundsure. The Geo and Enviro Insight report and associated maps that have been inspected are presented in Appendix 4 and the principal observations in relation to waters and flooding can be summarised as follows:

Data Type	Details
Flooding	➢ With respect to rivers and seas, the majority of the site lies within a **Flood Zone 1**, with the exception of the southern extent of the eastern boundary which lies within a **Flood Zone 2** associated with the adjacent Bridgwater Canal. A Flood Zone 3 are also exists 5m east of the site. ➢ The site is recorded to be at negligible risk of surface water flooding with the highest risk within 50m of the site pertaining to a 1 in 30 year even with 0.10m – 0.30m of floodwater. ➢ However, the south eastern site section is noted to be at Moderate to High risk of groundwater flooding based on the BGS groundwater flooding map.
Surface Water Features	➢ No surface water features exist on-site. ➢ The nearest surface water feature pertains to the Bridgwater Canal which is located c. 5m east.
Surface Water Abstractions	➢ There are no surface water abstraction licenses recorded on-site. ➢ There are 5 No. surface water abstraction licenses recorded within 2km of the site, all No. are historical. The nearest was located 542m west of the site and pertained to the abstraction of water from the River Irwell at Irwell Works for general cooling.

Superficial Aquifer	➢ No superficial deposits are recorded on-site.
Bedrock Aquifer	➢ The majority of the site is underlain by bedrock (Helsby Formation) classed as a **Principal Aquifer** - *layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.*
Groundwater Abstractions	➢ There are no recorded groundwater abstraction licenses located on-site. ➢ There are 47 No. groundwater abstraction licenses located within 2km of the site, the majority are historic licenses. The nearest active license is located 976m south east of the site and pertains to the abstraction of groundwater from a borehole at Manchester Metropolitan University for general use.
Source Protection Zones	➢ There are no recorded Source Protection Zones recorded on-site or within 500m of the site.
Nitrate Vulnerable Zones	➢ There are no Nitrate Vulnerable Zones recorded on-site or within 2km of the site.
Licensed Discharge Consents	➢ There are no recorded licensed discharge to controlled waters consents on-site. ➢ There are 33 No. licensed discharge to controlled waters consents within 500m of the site. Most consents are revoked. The nearest consent is located 176m north of the site and pertains to the discharge of surface water into the Bridgewater Canal.
Pollution Incidents to Controlled Waters	➢ There are no recorded pollution incidents to controlled waters located on-site. ➢ There are 3 No. pollution incidents recorded within 500m of the site, the nearest is located 342m north west and pertained to a Minor Impact (Category 3) incident involving the discharge of diesel on 12th June 2001.

For further details please see the Groundsure Enviro and Geo Insight Report contained in Appendix 4.

2.8 Hazardous Installations, Landfill and Waste

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

Data Type	Details
Environment Agency Recorded Active Landfill Sites	➢ There are no Environment Agency recorded landfill sites located on-site or within 500m of the site.
Environment Agency Recorded Historical Landfill Sites	➢ There are no Environment Agency recorded historical landfills located on-site. ➢ There is a single Environment Agency recorded historical landfill located within 500m of the site, pertaining to a landfill which accepted unknown waste at an unknow time located 469m north west of the site.
BGS Recorded Historical Landfill Sites	➢ There are no BGS recorded historical landfill sites located on-site or within 500m of the site.
Local Authority Recorded Historical Landfill Sites	➢ There are no Local Authority recorded historical landfill sites located on-site or within 500m of the site.
Local Authority Pollution	➢ There are no Local Authority Part A2 or Part B Activities or Enforcements located on-site.

Prevention and Control (Part A(2) and Part B Activities and Enforcements)	➢ There are 3 No. Local Authority Part A2 or Part B Activities or Enforcements located within 500m of the site, all 3 No. are historical, the nearest is located 189m west and pertains to a Part B permit for the use of bulk cement at Hanson Aggregates.
Registered Radioactive Substances	➢ There are no Registered Radioactive Substances recorded on-site or within 500m of the site.
Registered Waste Treatment, Transfer or Disposal Sites	➢ There are no waste treatment, transfer or disposal sites located on-site. ➢ There are 23 No. waste exemptions recorded within 500m of the site, the nearest is located 128m north east and pertains to sorting and de-naturing of controlled drugs for disposal at Bestway national Chemists.
Industrial Land Use	➢ There are no current industrial land uses recorded on-site. ➢ There are 22 No. current industrial land uses recorded within 250m of the site, pertaining to moorings and unloading facilities, container and storage facilities, electrical features, tanks, published goods conveyors, scrap metal merchants and hoppers and silos. ➢ There are no historical tanks recorded on-site. There are 91 No. historical tanks located within 500m of the site, the nearest is located 97m south. ➢ There are no petrol or fuel sites located on-site or within 500m of the site. ➢ There are 4 No. historical industrial land uses recoded on-site, pertaining to a warehouse, a quay and unspecified depots. ➢ There are a further 159 No. historical industrial land uses recorded within 500m of the site, pertaining to unspecified warehouses, unspecified ground workings, slate wharf, timber wharf, gravel pit, railway buildings, unspecified wharves, railway sidings, unspecified depots, sand pit, paper mill, unspecified mills, unspecified works, automobile works, goods sheds, goods depots, chemical works and numerous other industrial uses.
Dangerous Substances	➢ There are no recorded discharges of dangerous substances on-site or within 500m of the site.
Hazardous Building Materials	➢ There are no hazardous building materials (i.e. asbestos containing materials) anticipated on-site, however, their presence within the made ground cannot be discounted.

For further details please see the Groundsure Geo and Enviro Insight Report contained in Appendix 4.

2.9 Radon

The Indicative Atlas of Radon in England and Wales produced by the Health Protection Agency and British Geological Survey indicates the site lies within a lower probability area as less than 1% of homes are above the action level. Consequently, BR211 (2015) indicates that no protection measures are necessary in the construction of new dwellings or extensions on-site.

Map 13 of the Indicative Atlas of Radon in England and Wales and BR 211 (2015) are contained within Appendix 6.

2.10 Unexploded Ordnance (UXO)

The Zetica UXO risk map, contained in Appendix 12, indicates that the site lies within an area of moderate risk. Therefore, a Preliminary UXO Risk Assessment was obtained which stated that Manchester was subject to a low to moderate bombing density during WWII and confirmed Luftwaffe targets were located within 2km of the site as well as bombing incidents within 500m of the site. The preliminary report recommended that a Detailed UXO Risk Assessment is obtained prior to development works, however, was not require prior to the site investigation works due to the small volume of soil disturbed within the proposed window sample holes.

Consequently, a detailed risk assessment was obtained. The overall risk rating for the site was deemed low to moderate with a recommendation to undertake UXO safety awareness briefings prior to all intrusive works being undertaken on site. No further remedial actions were deemed necessary for the ground investigation or construction works. For full details, refer to the Brimstone detailed UXO Risk Assessment included in Appendix 12.

2.11 Animal Burial Sites

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

2.12 Archaeology

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

2.13 Ground Conditions and Geotechnical Hazards

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

- TOPSOIL to a depth of between 0.10m and 0.30m bgl, underlain by;

- MADE GROUND of unknown composition to an unknown depth, possibly between 0.50m and 3.00m bgl, underlain by;
- Weathered CHESTER FORMATION comprising dense, reddish brown, slightly clayey, fine to medium grained SAND with occasional gravel of weakly cemented sandstone to a depth of between 3.00m and 3.50m bgl, underlain by;
- CHESTER FORMATION comprising weak, highly weathered, reddish brown, fine to medium grained SANDSTONE.

Geotechnical Hazard Identification

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

Factors	Remarks	Considerations	Risk
Made Ground	Made ground of unknown composition is anticipated to be present across the majority the site. The made ground is of unknown depth and may be deep (>1.00m bgl).	Made ground may settle variably, have highly inconsistent bearing capacity and may suffer significant movements that may be problematic for foundations, externals and infrastructure elements without treatment. The presence of made ground may be problematic for foundations as there may be loose / soft spots within the made ground and it may not be suitable to utilise traditional foundation.	**Low to Moderate**
Aggressive Ground and Groundwater	While the risk posed from the natural strata is anticipated to be very low, given the anticipated presence of made ground of unknown composition there is potential for aggressive ground conditions to be present on-site.	Acidic ground / groundwater and sulphate may attack the concrete and steel used in foundations and react with aggregates. The oxidation of pyrite and other sulphides can also occur due to geotechnical activities. This can lead to the generation of high concentrations of sulphate and low pH that attacks construction materials and may lead to the precipitation of gypsum resulting in the heave of foundations and floor slabs. Pyrite oxidation can also be triggered by mixing susceptible materials with lime or cement resulting in high pH that can lead to the expansion of some sulphates that cause heave of stabilised soils.	**Low**
Shallow Bedrock	No superficial deposits are recorded on-site and shallow bedrock has been recorded in numerous BGS boreholes off-site as well as within off-site ground investigations. Therefore, bedrock is anticipated to be present at shallow depth, however, based on nearby boreholes the sandstone is likely to be weathered to sand to near surface.	Rock break may be required for the installations of foundation and / or services i.e. drainage.	**Low to Moderate**
Obstructions	Although no buildings currently exist on-site, as historical buildings have been recorded on-site there is potential for obstructions including relic foundations, ground floor slabs and walls.	May act as obstructions to excavations and / or the chosen foundation solution or act as 'hard spots' within the ground if left in-situ.	**Low to Moderate**

2.14 Sources of Contamination and Probable Contaminants

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

Potentially Contaminative Source	Associated Determinands	Remarks	Risk
Made Ground	Unknown – possible wide range of determinands including metals, semi-metals, PAHs, hydrocarbons and asbestos. Ground Gas – carbon dioxide, methane, hydrogen sulphide, VOCs	Widespread made ground anticipated, however depth and composition is unknown. Widespread contamination possible given historical industrial nature of the site and immediately surrounding area as well as possible contaminative hotspots.	**Low to Moderate**
On-Site Historical Smithy (1840s – 1890s)	Metals and semi-metals, inorganic compounds including phosphates, sulphates and cyanides, acids including sulphuric and hydrochloric, PAHs, hydrocarbons including fuel oils, phenols, asbestos, organic solvents and PCBs.	Given the length time since the smithy was recorded on-site (120+ years), any residual contamination is anticipated to have been diluted and dispersed	**Very Low**
On-Site Historical Warehouses (1950s – 1990s)	Unknown – possible wide range of determinands including metals, semi-metals, PAHs, hydrocarbons and asbestos.	The uses of the warehouses are unknown therefore possible associated contaminants are unknown. Give the length of time since any warehouses were recorded on-site (30+ years), any residual contamination is anticipated to have been diluted and dispersed.	**Low**
Off-Site Industrial Land Uses (Warehouses, Timber Yard, Depots)	Wide range of determinands including semi-metals, inorganic compounds including phosphates, sulphates and cyanides, acids including sulphuric and hydrochloric, PAHs, hydrocarbons including fuel oils, BTEX and MTBE, VOCs, phenols, asbestos, organic solvents, possible creosote, possible resins and waxes and PCBs.	There is potential for contamination to be present associated with historical off-site industrial site uses given the industrial nature of the area. However, the immediately surrounding area has been primarily residential and commercial since c. 1990s therefore there is potential for any residual contamination however the concentrations are anticipated to be relatively low given the time since industrial use were present. Additionally, is it anticipated that remediation would have taken place off-site during the development of the residential developments off-site.	**Low to Moderate**
Infilled Basin (35m W 1970s)	Ground Gas – carbon dioxide, methane, hydrogen sulphide, VOCs	The basin appears to have been partially infilled by the 1970s. The infill material is unknown and the depth of the basin is also unknown. However, given the 50+ years since the partial infill was undertaken the ground gas generation potential is anticipated to be low.	**Low**

Infilled Gravel Pit (70m W)		The gravel pit appears to have been infilled by the 1890s, although the infill material is unknown, given the time since the pit was infilled (120+ years), the ground gas generation potential is anticipated to be very low.	**Very Low**

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

Unknowns

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

- Extent, composition and thickness of made ground.
- Depth of competent bedrock
- Presence of perched water within the made ground
- Presence of obstructions
- Depth of groundwater within bedrock

2.15 Pathways for Contamination

Human Health

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

End Users (Residential Without Home Grown Produce Land Use Scenario):

- Ingestion of soil directly and indoor dust*
- Inhalation of soil dust (indoor and outdoor);
- Dermal contact with soil (indoor and outdoor);
- Inhalation of soil vapours (indoor and outdoor);
- Oral background;
- Inhalation background.

** Treated as one pathway*

Controlled Waters

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

- Vertical migration along future foundations and pooling at base / beneath foundations.
- Vertical migration through granular made ground and granular natural granular deposits.
- Lateral migration along low permeability natural deposits and pooling at relative low points (if cohesive deposits present).
- Negligible infiltration through low-permeability natural cohesive deposits.
- Migration through porous sandstone bedrock.
- Migration along groundwater flow.
- Overland flow

Ground Gas

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

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

2.16 Receptors of Contamination

Human Health receptors for these pathways include the following:

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

Controlled waters receptors for these pathways include the following:

- Groundwater contained within the underlying Principal Aquifer (Chester Formation),

- Surface Water – Bridgewater Canal

Other receptors for these pathways include the following:

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

2.17 Conceptual Model

Source	Pathway	Receptor	Likelihood	Risk
Made Ground	Ingestion of soil and dust (indoor and outdoor) Dermal contact with contaminated soil (indoor and outdoor) Inhalation of dust (indoor and outdoor), airborne fibres and soil vapours	End-user General public	**Low Likelihood**: Widespread made ground of unknown composition and depth anticipated. Possible widespread contamination given the historical industrial nature of the site and surrounding area, however, concentrations of contaminants are not anticipated to be significantly elevated across the site, but contaminative hotspots possible with higher concentrations. Dermal, ingestion and inhalation pathways will be negated across the majority of the site as hardstanding will be present (building and pathways), however, areas of soft landscaping will be at increased risk.	**LOW TO MODERATE**
		Construction workers	**Low Likelihood**: Construction workers are at the highest risk due to acute interaction with soils, however, appropriate PPE and health and safety measures is anticipated to significantly reduce the risk. The contaminant of concern is anticipated to be asbestos as disturbance of soil during earthworks and construction may liberate any possible asbestos fibres present.	**LOW TO MODERATE**
	Migration through ground vertically into aquifer groundwater	Principal Aquifer	**Low Likelihood**: Although possible contaminants may be present within the made ground and pathways to the underlying aquifer may also be present through granular made ground and granular weathered sandstone bedrock, the contaminants of concern are anticipated to be of low mobility and solubility (i.e. metals and PAHs). Additionally, since the made ground is anticipated to have been present for a significant period of time (site has remained unchanged since c. 1990s), any contamination is likely to have been diluted and dispersed and is not anticipated to be present at significantly elevated concentrations. However, a risk of migration remains.	**LOW TO MODERATE**
	Migration through ground laterally into surface water Overland flow	Off-Site Bridgewater Canal (5m East)	**Unlikely**: Although possible low concentration contamination may be present on site, the site is entirely grassed, therefore overland flow is considered highly unlikely as no hardstanding is present on-site to facilitate lateral migration. Migration along groundwater flow possible however no shallow groundwater is anticipated.	**LOW**
On-Site Historical Smithy and Warehouses (1840s – 1990s)	Ingestion of contaminated soil and dust Dermal contact with contaminated soil	End-user General public	**Unlikely**: Although residual contamination may be present associated with the historical warehouses and smithy, any contamination is anticipated to be of low concentration as any residual contamination will have been diluted and dispersed given the time since the site the smithy and warehouse were present.	**LOW**

	Inhalation of contaminated dust, soil vapours and airborne fibres	Construction worker	**Unlikely:** Construction workers at increased risk due to acute interaction with soils and disturbance of the ground and exposure of possible contaminants during construction works may increase prevalence of soil vapours and liberate fibres, however the risk remains low.	**LOW**
	Migration through ground vertically into aquifer groundwater	Principal Aquifer	**Unlikely**: Significantly contamination not anticipated, potential for contaminative hotspots to remain however unlikely to be present at significant concentrations, additionally the contaminants of concern are anticipated to be of low mobility and solubility.	**LOW**
	Migration through ground laterally into surface water Overland flow	Bridgewater Canal (5m East)	**Unlikely**: Any residual contamination is anticipated to be of low concentration and low solubility and mobility, additionally no shallow groundwater anticipated consequently migration along groundwater unlikely. Overland flow is also deemed unlikely dur to the lack of hardstanding.	**LOW**
Off-Site Historical Industrial Uses (1840s – 1990s)	Ingestion of contaminated soil and dust Dermal contact with contaminated soil Inhalation of contaminated dust, soil vapours and airborne fibres	End Users General public	**Unlikely:** Although significant off-site industrial site uses were recorded adjacent to the site, primarily warehouses, wharfs a timber yard and later depots, any residual contamination is anticipated to have been diluted and dispersed since the industrial uses ceased (c. 1990s). Additionally, no significant low permeability deposits are recorded to facilitate lateral migration on to site (i.e. glacial till).	**LOW**
		Construction worker	**Unlikely:** Construction workers at increased risk due to acute interaction with soils and disturbance of the ground and exposure of possible contaminants during construction works may increase prevalence of soil vapours and liberate fibres, however the risk remains low.	**LOW**
Made Ground	Migration through fractures and fissures in bedrock Preferential migration along foundations, culverts, service ducts / trenches Migration within groundwater	End-user Construction worker Building structure and fabric	**Unlikely**: Although widespread made ground is anticipated, no significant organic rich or putrescible content is anticipated. Localised contaminative hotspots may increase ground gas generation locally, however widespread made ground anticipated to have low ground gas generation potential. Disturbance of the ground may increase ground gas generation potential temporarily.	**LOW**
Infilled Basin (35m West 1970s)			**Low Likelihood:** The basin was partially infilled c. 1970s and the infill material and depth is unknown, as the basin has been infilled for c. 50+ years the ground gas generation potential is anticipated to be low, however, there is potential for organic rich or putrescible material to be present which may increase the ground gas generation potential in localised areas of the infilled basin, therefore, due to the possible low to moderate ground gas generation potential as well as the close proximity to the site, the infilled basin is anticipated to pose a low to moderate ground gas risk.	**LOW TO MODERATE**

Off-Site Infilled Gravel Pit (70m South West 1890s)	Ingress through wall cavities and floors and subsequent accumulation Vertical migration through granular natural deposits or made ground		**Unlikely:** Given the time since the gravel pit was infilled, the distance from the site as well as the presence of shallow weathered bedrock and granular superficial deposits (glaciofluvial deposits) in the area which will facilitate vertical migration the ground gas risk associated with the infilled gravel pit is deemed low.	**LOW**

2.18 Preliminary Risk Assessment Summary

Human Health

Based on the human heath conceptual model the risk to human health is deemed low to moderate to end users and construction workers given the potential for contaminative linkages to be present, primarily associated with the anticipated widespread made ground. However, it is envisaged that with appropriate PPE and site management, risks to construction workers can be mitigated.

Ground Gas

Potential ground gas sources have been identified on-site and in the vicinity of the site, however, the surrounding shallow geology (granular weathered sandstone and granular glaciofluvial deposits) will reduce lateral migration of ground gas, therefore the ground gas risk is deemed to be low. Consequently, it is recommended to undertake ground gas monitoring over a period of 2 months with a minimum of 4 No. visits to confirm the ground gas regime, based on BS 8576 (2013).

If any organic rich made ground deposits are identified or if previously unrecorded potential ground gas sources are recorded during the site investigation works, then additional ground gas monitoring may be required. The length and frequency of the ground gas monitoring regime and the sampling method, initial results and alterations to the conceptual model are subject to the findings of the site investigation works and development constraints (i.e. development timescales and liaison with the local authority).

Controlled Waters

Although sensitive receptors have been identified on-site and in close proximity to the site (Principal Aquifer and Bridgewater Canal), any contamination present is anticipated to be at low concentrations due to the time since any significant sources were present on-site or in close proximity. Consequently, the risk to controlled waters is deemed low to moderate.

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

2.19 Scope of Phase 2 Intrusive Geo-Environmental Ground Investigation

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

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

In order to provide adequate assessment in terms of both environmental and geotechnical site parameters, site investigation works will be required on a spatial basis. The proposed initial site investigation works should comprise the following:

- Window sample holes
- If required for geotechnical reason core recovery rotary holes maybe required to facilitate recovery of sandstone cores for geotechnical testing.

The rationale for the exploratory holes is discussed below:

- To allow the collection of samples from the made ground and natural deposits for chemical laboratory testing (solid samples) for an appropriate suite of determinands and for soluble sulphate (2:1 extract) and / or total sulphate and pH testing to determine the suitable concrete classification in associated with relevant guidance e.g. BRE Special Digest 1.
- To determine the extent, composition and depth of the made ground.
- Enable in-situ and ex-situ geotechnical testing, including density testing (SPTs), of the underlying made ground and natural deposits for the purposes of sub-structure design;
- Window sample holes to allow the installation of wells for monitoring of the groundwater regime and ground gas.

Site investigation should also include the following:

- Ground gas and groundwater depth monitoring of wells for 4 No. visits over 2 No. months, although, this monitoring period is subject to change following intrusive site investigation findings.

3.0 GROUND INVESTIGATION SCOPE

The ground investigation works were undertaken in two stages due to numerous concrete obstructions being encountered during the first stage. The first stage was undertaken on 9th and 10th August 2021 and comprised 16 No. hand dug pits / window sample holes and 3 No. falling head tests. 3 No. ground gas and groundwater monitoring wells were installed. Subsequent chemical and geotechnical laboratory testing was undertaken between 10th and 19th August 2021.

The second stage was undertaken on 12th October 2021 and comprised 3 No. trial trenches. Subsequent chemical and geotechnical laboratory testing was undertaken between 12th and 27th October 2021.

Drilling of window sample holes and associated installation of ground gas and groundwater monitoring wells was carried out by Earth Engineering Ltd. Testing of soil samples for environmental and geotechnical purposes was carried out by i2 Analytical in accordance with the Environment Agency's MCERTS (Monitoring Certification) quality assurance accreditation scheme. These organisations were appointed directly by IGE Consulting to carry out these contracting works.

The locations of the exploratory holes were topographically surveyed (X-Y-Z axis) with an accuracy of 20mm.

The ground investigation was undertaken in general accordance with:

- BS 5930 (2015) + A1 (2020) Code of Practice for Ground Investigation;
- BS 1377 (1990) Methods of test for Soils for Civil Engineering Purposes;
- BS 10175 (2011) Investigation of Potentially Contaminated Sites – Code of Practice; and
- BS EN 1997-2 (2007) Eurocode 7 – Geotechnical Design – Ground Investigation and Testing.

The sampling strategy for the site has been completed in accordance with CLR4 and the design of the investigation was carried out in accordance with R&D Technical

Report P 5-TR066, LCRM (2020) and BS 8485 (2015) + A1 (2019). Further details pertaining to the site investigation works are outlined in the following sections.

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

3.1 Window Sample Holes

Initially, 8 No. window sample holes were proposed. However, due to numerous concrete obstructions being encountered, including suspected concrete slabs, in total 16 No. hand dug pits were undertaken to depths of between 0.50m and 1.10m bgl (25.63 and 26.78m AOD), and 6 No. follow-on window sample holes to depths of between 0.70m and 1.30m (25.63m and 25.85m AOD).

The window sample holes were placed spatially across the site and targeting proposed areas of soft landscaping in order to achieve the following:

- to establish the thickness, extent and characteristics of possible made ground;
- to undertake in-situ geotechnical testing within these deposits;
- to obtain samples from these deposits for classification and laboratory testing;
- to allow for the installation of ground gas and groundwater monitoring wells.

The following window sample holes were installed with a standpipe to allow for monitoring of the underlying groundwater depth, if present, together with ground gas concentrations:

Exploratory Hole	Response Zone Stratum	Response Zone Depth m bgl (m AOD)	
		Top of Response Zone	Base of Response Zone
WS02	MADE GROUND comprising reddish brown and dark brown, gravelly, fine to coarse SAND	0.25 (26.31)	0.75 (25.81)
WS03B	MADE GROUND comprising brown and dark grey, gravelly, fine to coarse SAND	0.50 (26.65)	1.00 (26.15)
WS07	MADE GROUND dark brown, very gravelly, fine to coarse SAND	0.50 (26.95)	1.00 (26.45)

The monitoring wells are constructed of a 50mm diameter HDPE plain pipe to the depth of the response zone which is screened with slotted pipe with bentonite seals top and bottom. The monitoring well is topped with a flush lockable cover.

It should be noted that the response zones for the ground gas wells are shallow due to the shallow weathered sandstone recorded which resulted in the window sample holes refusing at a maximum depth of 1.10m bgl.

The locations of the window sample holes are shown on the exploratory hole location plan in Appendix 2 and the window sample hole logs are contained in Appendix 7.

3.2 Trial Trenches

During the second stage of ground investigation works, 3 No trial trenches were undertaken to depths of between 1.00m and 2.00m bgl (26.50m – 24.20m AOD).

The trial trenches were placed to target spatially across the site and targeting the locations of previously encountered obstructions, in order to achieve the following:

- to establish the thickness, extent and characteristics of the made ground;
- to undertake in-situ geotechnical testing within these deposits;
- to establish to depth to bedrock;
- to obtain samples from these deposits for classification and laboratory testing.

The locations of the trial trenches are shown on the Exploratory Hole Location Plan in Appendix 2. The trial trench logs are contained in Appendix 8.

3.3 Site Testing and Sampling

The following site tests and sampling were carried out:

a) Retrieval of bulk disturbed samples from trial trenches and window sample hand dug pits from ground level to 1.10m bgl.
b) Standard Penetration Tests (SPTs) were undertaken at regular 1.00m intervals, SPTs were undertaken between and termination depth in the window sample /

dynamic sampling holes.

c) 3 No. falling head tests were undertaken in order to determine the permeability of the underlying ground conditions.

No sleeves were obtained from the window sample holes as the window sample holes refused on weathered sandstone at c. 1m bgl.

No hand shear vane tests were undertaken as no natural cohesive deposits were encountered.

3.3 Laboratory Testing

3.3.1 Chemical Laboratory Testing

During the first stage of ground investigation, 6 No. soil samples were sub-sampled from the samples obtained during exploratory hole construction and sent to i2 Analytical laboratories for chemical testing. During the second stage of site investigation works, 3 No. additional samples of Made Ground from beneath the concrete slabs were taken and sent for chemical testing. These samples were placed into sterile sealed containers to facilitate MCERTS chemical laboratory testing of potential contaminants. Chemical testing suites were based upon a wide range of possible contaminative sources, outlined below:

Asbestos ID, sulphate, pH, nitrate, total and free cyanide, arsenic, barium, beryllium, boron, cadmium, chromium, chromium (hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc, Total Petroleum Hydrocarbon screen and Speciated Polyaromatic Hydrocarbons.

3.3.2 Geotechnical Laboratory Testing

The following geotechnical laboratory tests were carried out on selected samples obtained from across the site:

a) BRE Special Digest Suite for aggressive ground conditions.
b) Determination of point load strength in accordance with ASTM D 5731-05 (2005).

4.0 GROUND INVESTIGATION FINDINGS

4.1 Ground Conditions

The ground conditions encountered across the majority of the site typically comprised:

- Grassed TOPSOIL comprising dark brown, gravelly, slightly clayey, fine to coarse SAND to a depth of between 0.10m and 0.30m bgl (26.03m and 27.73m AOD), underlain by;
- MADE GROUND comprising brown or dark grey, gravelly, fine to coarse SAND with occasional cobbles and red brick fragments to a depth of between at least 0.50m and at least 1.10m bgl, underlain by;
- WEATHERED CHESTER FORMATION (SANDSTONE) recovered as very dense, reddish brown, gravelly, fine to coarse SAND to a depth of at least 1.30m bgl (25.85m AOD).
- CHESTER FORMATION comprising reddish brown, very weak to weak, fine to coarse grained SANDSTONE.

Notable exceptions

The only notable exception to the above typical ground conditions was the presence of suspected reworked cohesive deposits comprising firm, reddish brown and grey, slightly gravelly, sightly sandy, silty CLAY to a depth of between 1.10m and 1.80m bgl (24.40m and 25.10m AOD) in TP02 in the south eastern site section. It is anticipated that the cohesive deposits may be associated with the construction of the nearby canal.

Obstructions

Numerous obstructions were noted across the site including suspected concrete slabs at depths of between 0.50m and 1.10m bgl across the majority of the site and numerous concrete cobbles and boulders within the made ground. Whole and half red bricks were also noted within the made ground. It should also be noted that concrete boulders were also visible at surface in areas.

During the second stage of investigation works, trial trenches were undertaken across the site which revealed significant concrete slabs across the majority of the site as well as concrete boulders, sandstone slabs / boulders and suspected foundations. The obstructions were broken out in areas in order to allow the underlying materials to be sampled and the underlying sandstone to be inspected.

4.2 Visual and Olfactory Contamination Findings

During the intrusive exploratory hole investigation works, the soils were examined carefully for both visual and olfactory evidence of contamination. No visual and / or olfactory evidence of contamination was encountered during the site investigation.

4.3 Water Strikes

No water strikes were recorded during the intrusive investigation works.

4.4 Geotechnical Site Testing

The results of the in-situ site tests undertaken during the site investigation are summarised below.

4.4.1 Standard Penetration Tests

SPT tests were undertaken at regular 1.00m intervals during the construction of the window sample holes. The following table outlines the uncorrected N-Values and corrected N_{60} values (energy ratio of 62%), derived from the SPT tests undertaken in the made ground and weathered sandstone strata during the site investigation works:

Deposit Type	Depth Range of Test Start Depths m bgl (m AOD)	Number of Tests	Uncorrected N-Value Range	Uncorrected N-Value Average	Corrected N_{60} Range	Corrected N_{60} Average
MADE GROUND	1.00 (27.25)	2	50	50	39	39

WEATHERED SANDSTONE	0.70 – 1.00 (25.74 – 26.05)	4	50	50	39	39

*Where an N-value of 50+ has been recorded, a value of 50 has been used to calculate the N60.

No correlation with depth can be determined for the weathered sandstone as all standard penetration tests within the stratum resulted in a refusal (N-value of 50+). Both standard penetration tests undertaken within made ground at 1.00m bgl also resulted in refusals on suspected concrete slabs.

4.5 Geotechnical Laboratory Testing

The results of the geotechnical laboratory tests undertaken during the site investigation are summarised below.

4.5.1 BRE Special Digest Suite Testing

BRE SD1 testing suites were undertaken on 2 No. samples of made ground and 2 No. samples of weathered sandstone in order to determine the design sulphate levels and subsequently the Aggressive Chemical Environment for Concrete (ACEC)

Sample	Depth (m bgl)	Strata	DS Class	ACEC Class
WS02	0.60	Made Ground	DS-2	AC-2
WS05	0.60		DS-1	AC-1
WS03	1.00	Sandstone	DS-1	AC-1
WS01	0.90		DS-1	AC-1

4.5.2 Point Load Tests

Samples of weathered sandstone were recovered from TP01 at 1.40m bgl and subsampled into 3 No. samples at the geotechnical laboratory. 3 No. point load tests were carried out and the following point load strength index results were recorded:

Subsample	Size (mm)	Load (P) (kN)	$Is_{(50)}$ (MPa)
1	30.0 x 29.5	0.2	0.15
2	28.0 x 28.0	0.1	0.08
3	29.5 x 29.0	0.2	0.15

Average:	**0.13**

Due to the small subsample size (30mm x 30mm), the results may be unrepresentatively low.

The geotechnical laboratory test results are contained in Appendix 10.

4.6 Environmental Laboratory Test Results

The findings of the chemical test results, summarised below, will be assessed against generic assessment criteria (GAC) for the purposes of screening allowable concentrations in comparison to the measured site concentrations. The GAC are defined based on the critical receptors identified at the site. Receptors are considered in relation to:

- Human health receptors (e.g. end-users, construction workers and the general public) via measured solid concentrations, and;
- Additional receptors may be relevant dependant on the site e.g. flora/fauna, water, buried concrete.

The GAC adopted for assessment of soils in relation to Human Health are based on published LQM/CIEH S4ULs (2015) for those compounds for which published criteria are available for varying scenarios (residential, commercial, allotment, public open space). In the absence of LQM/CIEH S4ULs (2015) the following GAC defining documents are adopted - CL:AIRE Soil GAC for Human Health Assessment (2010) and Category 4 Screening Levels (C4SLs) (2014).

The primary risk to human receptors from free cyanide in soils is an acute risk (i.e. a single dose could have a lethal affect as opposed to adverse effects from cumulative intake (chronic affect)). There is no current UK guidance available for calculating acute risks from free cyanide, therefore an in-house methodology has been used to derive an acute GAC of 60 mg/kg for all exposure scenarios. The value is given for Free or Easily Liberatable Cyanide but should be used to assess Total Cyanide in the absence of cyanide speciation. In cases where the Total Cyanide exceeds the GAC then analysis for Free or Easily Liberatable Cyanide should be completed.

GACs / Tier 1s for waters must be selected to assess potential risks to the identified environmental receptors. There are numerous UK and European guidelines for waters based on the site situation and different receptors. GACs utilised include - The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2009 (Part 7:Groundwater Threshold Values), UK Drinking Water Standards (2000), Environmental Quality Standards, World Health Organisation concentrations, Environment Agency guidance concentrations and United States Environmental Protection Agency – Region 9 GACs.

4.6.1 Solid Samples

Summary tables indicating the results from both stages of site investigation, assessed against their relevant GACs (**residential Public Open Space POS_{resi} scenario** as no private gardens are included within the proposed development), are noted below:

MADE GROUND					
Solid Contamination Results					
Determinand	**No. of Samples**	**Range of Results**	**Mean**	**GAC**	**Exceeded Allowable**
Inorganics, Carbon and Asbestos					
Asbestos Quantification (%)	7	None Detected		-	-
Water Soluble Sulphate as SO4 2:1 Extract (mg/l)	7	20 – 84	54	-	-
Soil Organic Matter (%)	7	1.2 – 5.3	3.2	-	-
pH	7	7.2 – 8.8	8.2	-	-
Cyanide, Total	7	<1.00	<1.00	60[2]	0
Cyanide, Free	7	<1.00	<1.00	60[2]	0
Nitrate as NO_3 2:1 water soluble (mg/l)	7	<5.0 – 12	6.0	-	-
Boron (hot water soluble)	7	<0.2 – 0.6	0.5	21000	0
Metals and Semi-Metals					
Arsenic	7	4.7 – 44	21	79	0
Barium	7	130 – 210	177	-	0
Beryllium	7	0.71 – 3.0	1.2	2.2	**WS02@0.60m**
Cadmium	7	<0.20 – 0.60	0.3	120	0
Chromium	7	15 – 29	20	1500	0
Copper	7	26 – 130	66	12000	0
Mercury	7	<0.30 – 1.9	0.6	16	0
Nickel	7	17 – 53	26	230	0
Lead	7	18 – 250	158	630[1]	0
Selenium	7	<1.00	<1.00	1100	0
Vanadium	7	19 – 61	32	2000	0
Zinc	7	87 – 160	109	81000	0
Chromium (Hexavalent)	7	<1.20	<1.20	7.7	0
Total Petroleum Hydrocarbons Screen					
Petroleum Range Organics (C6-C10)	7	<0.10	<0.10	-	-
TPH C10-C40	7	39.0 – 180	88	-	-
TPH C6-C10	7	<0.10	<0.10	-	-
TPH C6-C40	7	39.0 – 180	88	-	-

TPH (C10-C25)	7	20.0 – 77.0	41	-	-
TPH (C25-C40)	7	19.0 – 100	51	-	-
Polynuclear Aromatic Hydrocarbons (PAHs)					
Naphthalene	7	<0.05	<0.05	-	0
Acenaphthylene	7	<0.05	<0.05	-	0
Acenaphthene	7	0.22 – 0.89	0.30	-	0
Fluorene	7	0.20 – 0.73	0.30	-	0
Phenanthrene	7	2.20 – 7.20	2.99	-	0
Anthracene	7	0.49 – 1.80	0.75	-	0
Fluoranthene	7	3.70 – 13	4.96	-	0
Pyrene	7	3.70 – 12	4.74	-	0
Benzo(a)anthracene	7	2.10 – 6.90	2.72	-	0
Chrysene	7	1.80 – 5.40	2.34	-	0
Benzo(b)fluoranthene	7	1.70 – 6.70	2.55	-	0
Benzo(k)fluoranthene	7	0.85 – 2.10	1.27	-	0
Benzo(a)pyrene	7	2.20 – 6.10	2.66	10[1]	0
Indeno(1,2,3-cd)pyrene	7	0.99 – 2.90	1.28	-	0
Dibenz(a,h)anthracene	7	0.34 – 0.92	0.41	-	0
Benzo(ghi)perylene	7	1.10 – 3.60	1.55	-	0
Total PAH (Sum of USEPA 16)	7	22.4 – 70	28.8	-	-

Generic Assessment Criteria Used: LQM/CIEH S4ULs for Human Health Risk Assessment (3rd edition, 2015), unless stated:

1) *Category 4 Screening Levels (March 2014)*
2) *In-house screening value has been used as no GAC methodology currently exists*

Note 1 – Units are in mg/kg unless stated.
Note 2 – Used 2.5% SOM (average organic matter %) used for GACs as a conservative measure.
Note 3 – Detection limit values used to calculate arithmetic mean
Note 4 – All GAC used relate to the 'POS_{resi}' land use scenario.

TOPSOIL

Solid Contamination Results

Determinand	No. of Samples	Range of Results	Mean	GAC	Exceeded Allowable
Inorganics, Carbon and Asbestos					
Asbestos Quantification (%)	2	None Detected		-	-
Water Soluble Sulphate as SO4 2:1 Extract (mg/l)	2	12.9 – 36.6	24.75	-	-
Soil Organic Matter (%)	2	4.4 – 5.9	5.15	-	-
pH	2	7.8 – 8.6	8.2	-	-
Cyanide, Total	2	<1.00	<1.00	60[2]	0
Cyanide, Free	2	<1.00	<1.00	60[2]	0
Nitrate as NO_3 2:1 water soluble (mg/l)	2	<5.00	<5.00	-	0
Boron (hot water soluble)	2	<0.60	<0.60	21000	0
Metals and Semi-Metals					
Arsenic	2	24.0 – 26.0	25.0	79	0
Barium	2	200 – 360	280	-	0
Beryllium	2	<1.00 – 1.10	1.05	2.2	0
Cadmium	2	<0.20	<0.20	120	0
Chromium	2	21.0 – 25.0	23.0	1500	0
Copper	2	61.0 – 68.0	64.5	12000	0
Mercury	2	<0.30 – 0.80	0.55	16	0
Nickel	2	22.0 – 23.0	22.5	230	0
Lead	2	190 – 330	260	630[1]	0
Selenium	2	<1.00	<1.00	1100	0
Vanadium	2	30.0 – 36.0	33.0	2000	0
Zinc	2	120 – 130	125	81000	0
Chromium (Hexavalent)	2	<1.20	<1.20	7.7	0
Total Petroleum Hydrocarbons Screen					

Petroleum Range Organics (C6-C10)	2	<0.10	<0.10	-	-
TPH C10-C40	2	110 – 180	145	-	-
TPH C6-C10	2	<0.10	<0.10	-	-
TPH C6-C40	2	110 – 180	145	-	-
TPH (C10-C25)	2	49.0 – 73.0	61.0	-	-
TPH (C25-C40)	2	56.0 – 110	83.0	-	-
Polynuclear Aromatic Hydrocarbons (PAHs)					
Naphthalene	2	0.05 – 0.59	0.32	-	
Acenaphthylene	2	<0.05	0.05	-	
Acenaphthene	2	0.72 – 2.30	1.51	-	
Fluorene	2	0.61 – 2.00	1.305	-	
Phenanthrene	2	7.30 – 14.0	10.65	-	
Anthracene	2	1.90 – 3.10	2.5	-	
Fluoranthene	2	9.00 – 15.0	12	-	
Pyrene	2	8.00 – 13.0	10.5	-	
Benzo(a)anthracene	2	4.80 – 7.30	6.05	-	
Chrysene	2	4.10 – 6.30	5.2	-	
Benzo(b)fluoranthene	2	3.70 – 8.60	6.15	-	
Benzo(k)fluoranthene	2	2.50 – 2.80	2.65	-	
Benzo(a)pyrene	2	4.40 – 8.20	6.3	10[1]	0
Indeno(1,2,3-cd)pyrene	2	2.20 – 4.10	3.15	-	
Dibenz(a,h)anthracene	2	0.67 – 1.10	0.885	-	
Benzo(ghi)perylene	2	2.30 – 4.90	3.6	-	
Total PAH (Sum of USEPA 16)	2	52.3 – 93.0	72.65	-	-

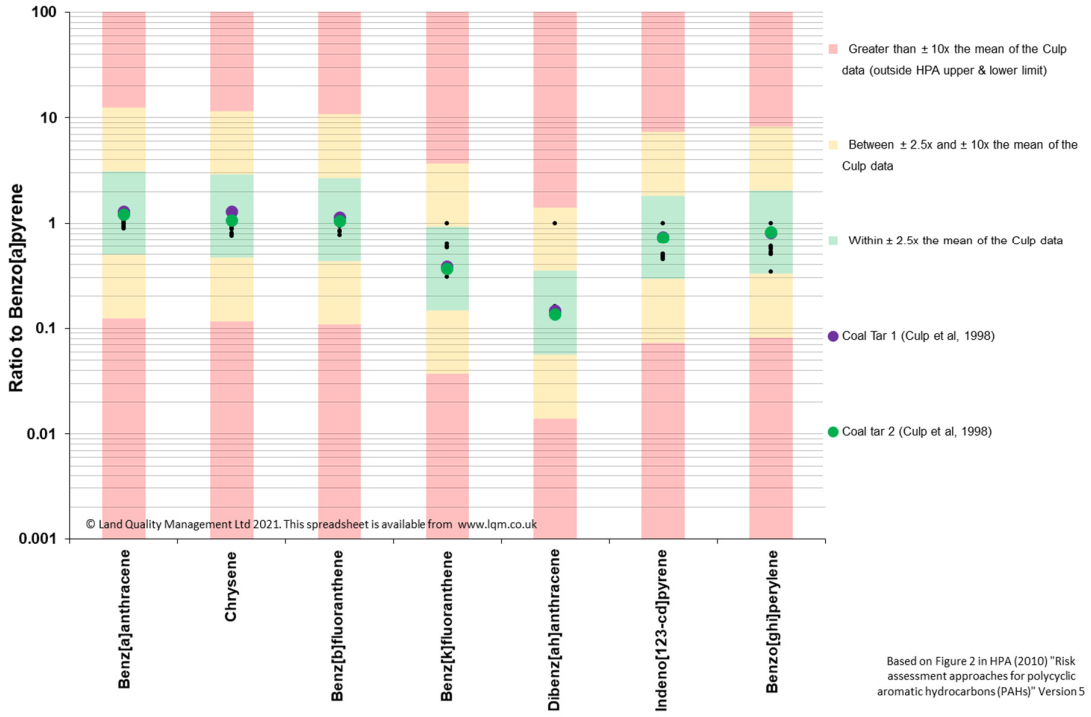
Generic Assessment Criteria Used: LQM/CIEH S4ULs for Human Health Risk Assessment (3rd edition, 2015), unless stated:

1) *Category 4 Screening Levels (March 2014)*
2) *In-house screening value has been used as no GAC methodology currently exists*

Note 1 – Units are in mg/kg unless stated.
Note 2 – Used 2.5% SOM (average organic matter %) used for GACs as a conservative measure.
Note 3 – Detection limit values used to calculate arithmetic mean
Note 4 – All GAC used relate to the 'POS_{resi}' land use scenario.

The 'surrogate marker' approach has been used to assess PAHs based on Benzo(a)pyrene (BaP) representing a complex mixture of PAHs. The following graph shows the PAH data from the made ground samples plotted against the PAH data from the Culp et al. (1998)[1] study, the pivotal toxicity study from which the surrogate marker approach was derived:

[1] Culp et al. (1998), *A comparison of the tumors induced by coal tar and benzo[a]pyrene in a 2-year bioassay*, **Carcinogenesis,** vol.19, no.1, pp.117–124.



*LQM PAH profiling tool used. Where a concentration of <0.05mg/kg was present, a value of 0.05mg/kg was used for graphing purposes.

As shown in the above graph, the distribution of PAHs in the made ground samples are similar to those in the Culp et al. (1998)[1] study, with all being within just 2.5x the mean of the Culp et al. (1998)[1] data. Therefore, it is appropriate to use the surrogate marker approach.

Full chemical test results are contained in Appendix 10.

4.7 Ground Gas Monitoring Results

3 No. wells were installed on site in order to allow monitoring and subsequent ground gas risk assessment to be undertaken. The response zones for the monitoring wells are detailed in Section 2.1. Following 5 No. visits the below results have been recorded:

Gas Monitoring Well	Steady O_2 Concentration (%)	Peak CO_2 Concentration (%)	Peak CH_4 Concentration (%)	Peak H_2S Concentration (ppm)	Atmospheric Pressure (mbar)	Steady Gas Flow (l/hr)
WS02	13.8 – 17.9	3.0 – 4.6	0.0	0.0	998 – 1026	0.0
WS03B	11.8 – 14.7	4.2 – 4.7	0.0	0.0	998 – 1026	0.0
WS07	14.9 – 15.4	1.3 – 1.6	0.0	0.0	1020 – 1026	0.0

Ground gas monitoring was undertaken utilising a GFM 4300 gas analyser.

The ground gas monitoring results and calibration certificate are included in Appendix 11.

4.8 Groundwater Depth Monitoring Results

The above wells were also installed for the purposes of groundwater depth monitoring. Groundwater monitoring is ongoing, however, after 5 No. visits the following results have been recorded:

Groundwater Monitoring Well	Response Zone (m bgl)	Water Level (m bgl)	Remarks
WS02	0.20 – 0.70	Dry	-
WS03B	0.50 – 1.00	Dry	-
WS07	0.50 – 1.00	Dry	-

The groundwater monitoring results are included with the gas monitoring results in Appendix 11.

4.9 Potable Water Supply

A United Utilities Risk Assessment (UURA) has been undertaken for the site, which recommends the use of Barrier Pipe. This is contained in Appendix 13.

4.10 Soil Infiltration Testing

Falling head tests were undertaken in WS01 (3 runs) in accordance with the methodology defined in BS 5930 (2015) and BRE 365. Falling head tests were undertaken in order to measure soil infiltration within the underlying deposits.

WS01 was constructed to a depth of 0.95m bgl and was terminated on refusal within weathered sandstone. 3 No. falling head tests were then undertaken within WS01. Depths recorded after 0 and 120 minutes were utilised for T^1 and T^2, the results of the falling head test calculations are as follows:

Window Sample Hole Location	Test Depth (m bgl)	Permeability (m/s)
WS01 (Run 1)	0.29 – 0.95	$2.86x10^{-4}$
WS01 (Run 2)	0.21 – 0.95	$2.50x10^{-4}$
WS01 (Run 3)	0.61 – 0.65	$1.39x10^{-4}$

The falling head test calculations are contained within Appendix 9.

5.0 ENVIRONMENTAL CONCLUSIONS

5.1 Assessment of Environmental Results

Soil sample analyses have assessed the presence of contaminants and visual and olfactory evidence of contamination from window sample holes and trial trenches and the concentrations at which they occur on a spatial basis across the site.

Based on the above chemical test results, no human health GAC exceedances for the residential Public Open Space land use scenario have been recorded within the topsoil. Only a single exceedance was recorded within the made ground, pertaining to a single beryllium exceedance within WS02 at 0.60m bgl (3mg/kg compared to a GAC of 2.2mg/kg). No human health GAC exceedances were recorded within the 4 No. samples of Made Ground obtained from beneath the concrete slabs.

Although a single beryllium exceedance was recorded within the made ground, as the exceedance is considered marginal and significant earthworks and enabling works will be undertaken, including the grubbing out of extensive concrete obstructions, the elevated beryllium is likely to be removed as the site levels are being cut, leaving an average of just c.0.4m Made Ground across the site.

The quality of the topsoil on-site is poor (i.e., contains anthropogenic material) and the volume of topsoil is small. On this basis, a minimum of 300mm topsoil will be imported for the public open space (POS_{resi}) areas of soft landscaping. Therefore, if the affected made ground does remain in-situ, the clean placed topsoil will act as a clean cover system, breaking any pathways to the made ground.

No asbestos was recorded in any of the samples tested.

5.2 Updated Conceptual Models

5.2.1 Human Health Risk Assessment

The made ground, the historical on-site warehouses and smithy, and the historical off-site industrial land uses were all considered to be potentially contaminative sources. Based on the chemical test results and the lack of visual and / or olfactory

evidence of contamination noted during the intrusive works, all of the aforementioned potential sources can be discounted. Although a single beryllium exceedance was recorded within the Made Ground in WS02 (at 0.60m bgl), as the concentration is only marginally elevated (3mg/kg compared to a GAC of 2.2mg/kg) and the areas of soft landscaping are public open space rather than residential gardens, the risk is considered negligible. Additionally, as discussed above, extensive 'grubbing out' enabling works and earthworks are to be undertaken and a significant proportion of the on-site Made Ground is to be removed to facilitate the ground floor slab build up which will occupy the majority of the site. Therefore, the affected Made Ground is likely to be removed off-site. If the Made Ground does remain in-situ, no pollutant linkages will be present as a minimum of 300mm of imported topsoil will be placed in the area of WS02 which lies within an area of soft landscaping. It is not considered necessary to install a 'no-dig' stratum or a geotextile marker to form a 'clean cover system' as the risk posed by the beryllium is considered to be low.

4 No. samples of Made Ground from beneath the concrete slabs were sent for chemical laboratory testing which recorded on human health GAC exceedances.

Therefore, the risk to human health is considered to be **low** and no remedial measures are deemed necessary.

As a significant grubbing out exercise is required and, although deemed unlikely, unexpected contamination may be present beneath the concrete slab which remained in-situ, an unexpected contamination discovery strategy is contained in Section 5.3.

5.2.2 Ground Gas Risk Assessment

4 No. ground gas monitoring visits over 2 months were recommended in-line with BS 8576 (2013). The sources identified ('made ground with low degradable organic content' and 'inert landfill sites' / off-site historic infilling) are likely to be low sources of ground gas, and gas monitoring over a period of 2 months with up to weekly measurements is sufficient based on the sources, in accordance with BS 8576 (2013). The chemical testing undertaken during the ground investigation confirmed that the Made Ground has low organic content (<5%) therefore this holds true.

The results of the 5 No. ground gas monitoring visits have been assessed in accordance with BS 8485 (2015) + A1 (2019) as follows.

The characteristic Gas Screening Value (GSV) is calculated by dividing the maximum methane or carbon dioxide concentration by 100 and multiplying by the maximum steady flow rate recorded at the same monitoring point (the instrument detection limit of 0.1 l/hr is utilised when below detection limit flow rates are recorded). If required, the worst case GSV can be calculated by dividing the maximum carbon dioxide and methane concentration by 100 and multiplying by the maximum steady flow rate on-site.

Ground gas monitoring has recorded a maximum peak carbon dioxide concentration of 4.7% v/v in WS03. No methane was recorded above detection limit and no steady flow rates were recorded.

As no steady flow rates were recorded, both the GSV and the worst case GSV can be calculated as (4.7/100)*0.1 = 0.0047 l/hr. Therefore, the site falls in-line with Characteristic Situation 1 (CS1) / Green (CIRIA 665).

In addition to the above GSV assessment, the following CSM is also considered:

Receptors

The receptors are the end-users of the proposed apartment block development and the building structure itself.

Sources

The potential ground gas sources are as follows:

- On-Site Made ground – The only on-site ground gas source was determined to be the Made Ground. The depth of the made ground was found to be a maximum of 1.30m bgl. The TOC of the Made Ground was determined to be 1% - 3% (based on the SOM measured). Additionally, the Made Ground was visually assessed and found to contain no putrescible components (such as soft organics, waste materials etc.), therefore, the on-site Made Ground is considered a low ground gas generation source. It should also be noted that

due to the extent of the building envelope which will occupy the majority of the site and the ground floor build-up being proposed at a lower level than the current site level, a significant proportion of the existing made ground on-site will be removed, leaving just c.0.40m (average thickness) of Made Ground across the site, further reducing the source.

- Off-Site Partially Infilled Basin (35m west, infilled in 1970s, 50+ years ago) – deemed to be of low ground gas generation potential given the time since infilling.
- Off-Site Infilled Gravel Pit (70m W, infilled in 1900s, 120+ years ago) – deemed to be of low ground gas generation potential given the time since infilling.

The above sources are deemed to be very low to low ground gas risk based on the BS 8576 (2013) Decision Matrix tool, and the ground gas monitoring results concur with this.

Pathways

The migration pathways are as follows:

- No credible lateral migration pathways have been identified from the off-site sources – migration through fractures in sandstone is possible but given the granular nature of the Made Ground and natural soils in the area, any ground gas is much more likely to migrate vertically to atmosphere rather than laterally, as confirmed by the ground gas monitoring results and negligible flows.
- The proposed building is to be constructed on pad foundations bearing onto the sandstone at c. 1m – 2m bgl, rather than piled foundations so no future pathways will be created.

On the basis of the above lines of evidence, it is considered appropriate to designate the site as **very low risk / Characteristic Situation 1 / Green**. On this basis, no ground gas protection measures will be necessary.

The above ground gas assessment and recommendation for no further monitoring and no protection measures was agreed by the Manchester City Council EHO in an

email dated 29th October 2021. A copy of this correspondence is contained in Appendix 14.

Radon

The Indicative Atlas of Radon in England and Wales produced by the Health Protection Agency and British Geological Survey indicates that the site lies within a lower probability area as <1% of homes are above the action level. Consequently, BR211 (2015) indicates that no radon protection measures are necessary in the construction of new dwellings or extensions.

5.2.3 Controlled Waters Risk Assessment

Made Ground was recorded across the site, however, based on the chemical test results this can be discounted as a potentially contaminative source as no significantly elevated concentrations of determinands were recorded. Historical on-site uses (warehouses and smithy) can also be discounted as contaminative sources as no visual and / or olfactory evidence of contamination was noted. Consequently, although sensitive receptors are present beneath (Principal Aquifer, unknown depth) and in close proximity to the site (Bridgewater Canal), no feasible contaminative linkages have been identified. The presence of unexpected contamination being present beneath the concrete slabs is also considered unlikely. Therefore, the risk to controlled waters is deemed low. No further assessment is deemed necessary.

5.3 Unexpected Contamination Discovery Strategy

If unexpected contamination is encountered during the enabling and remediation works, the below procedures should be followed.

1. Unexpected contamination identified may have an oily sheen and / or odour, a solvent odour, may contain fragments of ACM, coal / coke clinker or may contain man-made materials including paint cans, car parts etc.
2. All site works in the location of the unexpected contamination must stop and site personnel must inform the Site Manager to contact the remediation contractor.

3. Visual and olfactory observations of the extent of the contamination and the ground conditions should be made.
4. In the presence of a suitably qualified geo-environmental engineer, investigation works should be undertaken to recover samples and the area affected by the contamination should be delineated, including a photographic record of relevant observations.
5. Samples should be sent for chemical laboratory testing to determine the nature of the contamination. The chemical testing suite should be determined by a suitably qualified geo-environmental engineer and / or the remediation contractor.
6. If deemed appropriate, the contaminated material should be carefully excavated, segregated and stockpiled on an impermeable surface and quarantined while chemical testing of the samples obtained are undertaken. Alternatively, the contaminated material is to be left in-situ until receipt of the chemical laboratory test results.
7. Chemical test results will be compared against current assessment criteria for the end-use of the area affected by the contamination.
8. If the contamination is found to alter the remediation strategy or provides a new contaminative linkage not previously addressed in the remediation strategy, the Local Authority and Environment Agency are to be informed.
9. Following liaison with the LA and EA, the contaminated material should either be disposed of off-site to a licensed waste management facility or the material should be remediated to an agreed clean-up criteria.

6.0 GEOTECHNICAL CONCLUSIONS

6.1 Geotechnical Assessment of Ground Conditions

The site investigation works have revealed that the ground conditions at the site are relatively consistent comprising topsoil, underlain by granular made ground, underlain by weathered sandstone.

The principal strata identified are outlined in further detail below.

6.1.1 Topsoil

Topsoil was encountered in all exploratory holes to a depth of between 0.10m and 0.30m bgl and typically comprised dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Based on an average thickness of 0.14m there is anticipated to be c. 140m^3 of topsoil on-site.

6.1.2 Made Ground

Made ground was encountered in all exploratory holes to a maximum depth of 1.10m bgl, however, the base of the made ground was not recorded in the majority of exploratory holes due to the presence of concrete obstructions. The made ground was granular in nature and typically comprised brown or dark grey, gravelly, fine to coarse SAND with occasional cobbles and red brick fragments.

2 No. standard penetration tests were carried out within the made ground, however, both resulted in refusals (N-value of 50+) on concrete slabs at 1.00m bgl.

6.1.3 Weathered Sandstone (Chester Formation)

Weathered sandstone was recorded in 5 No. exploratory holes at a depth of between 0.60m and 1.10m bgl, to a depth of at least 1.30m bgl. The weathered sandstone was recovered as very dense, reddish brown, gravelly, fine to coarse SAND.

4 No. standard penetration tests were undertaken within the weathered sandstone which all resulted in refusals (N-value of 50+).

6.2 Groundwater

No water strikes were recorded in any of the exploratory holes during construction or monitoring. Monitoring is ongoing.

6.3 Mining / Geological Assessment

Site investigation works to investigate the solid geology were beyond the scope of these works, however, weathered sandstone comprising very dense, reddish brown, fine to coarse SAND, pertaining to the Chester Formation was recorded at depths of between 0.60m and 1.10m bgl

The site does not lie within a Coal Authority Mining Reporting Area or within the Cheshire Brine Subsidence Compensation District.

6.4 Foundations

Based on existing site levels and the ground conditions encountered, it is considered feasible to utilise pad foundations bear onto the weathered sandstone with a minimum allowable bearing capacity of c. 450kN/m^2 at the termination depth of c. 1.40m – 1.50m bgl (c. 25.70m - 25.90m AO) below the proposed building footprint.

The above allowable bearing capacity has been derived from visual inspection of the sandstone and undertaking field tests. Although 3 No. point load tests were undertaken, which recorded a compressive strength of between 0.08 MPa and 0.15Mpa, the results of the point load tests are considered to be unrepresentatively low due to the very small subsample sized utilised (30mm x 30mm).

6.5 Floor Slabs

Based on existing level and the presence of over 600mm of made ground across the majority of the site it is envisaged that in line with NHBC / Premier guidance that a suspended floor slab will be required.

6.6 Earthworks and External Areas

Based upon the site investigation works, it is envisaged that the hard-surfaced external works including the pavements may be constructed on proof rolled made ground across the site. These materials are regarded with careful management to achieve CBR% in excess of 5%.

The contractor should employ a suitably experienced engineer to be present on site during these earthwork operations to ensure soil suitability, placement, compaction and testing is undertaken in accordance with this specification and to ensure that any unforeseen circumstances, such as adverse weather, do not compromise the earthworks process.

Works should be halted during periods of intermittent or prolonged rainfall to ensure the materials are not placed in a manner that would result in softening of either the formation or the newly placed material. It will be the contractor's responsibility to determine appropriate weather conditions and determine the suitability of works. Particular attention must be given to variable weather conditions when re-engineering clay soils as a moisture content fluctuation (2%+/-) of the tolerable limit will result in unacceptable degree of compaction loss.

The below Earthwork Specification should be utilised:

END USE	REQUIREMENT
External Areas - Highways, driveways, drainage runs, backfill behind retaining walls	Method of compaction in line with Department of Transport Specification for Earthworks Series 600 Method 2 to achieve CBR >5%. Formation level for adoptable highways to achieve CBR >15% utilising 450mm diameter plate and in line with local / county highways guidance. Engineering advice to be sort if unachievable / uneconomic.
Soft Landscaping - Private Gardens / Public Open Space	Compacted to achieve <30mm settlement. Subsoil material should not be excessively tracked with plant – should permit surface water drainage.

Excavations

Where any excavations are to be made i.e. for drainage purposes given the presence of granular made ground with brick and concrete cobbles, it is considered that all excavations are supported or battered back in accordance with guidance contained in CIRIA R97.

6.7 Concrete Classification

In accordance with BRE Special Digest 1: Concrete in Aggressive Ground (2005), soluble sulphates, total sulphur, soluble magnesium, soluble nitrate and soluble chloride within the made ground were recorded within design sulphate levels DS-2 and subsequently within the Aggressive Chemical Environment for Concrete (ACEC) classification of AC-2.

Concentrations of the aforementioned determinants within the sandstone were in-line within design sulphate levels DS-1 and subsequently within the Aggressive Chemical Environment for Concrete (ACEC) classification of AC-1.

7.0 RECOMMENDATIONS

- Following any variation in a finalised proposed development detailed design including earthworks design, proposed levels and it is recommended that the above conclusions are re-appraised to determine the suitability.
- The conclusions of this report should be agreed with relevant regulatory authorities prior to the commencement of works.
- Re-appraisal of the above conclusions following detailed design including earthworks design to determine their suitability.
- Following completion of the 5 No. ground gas monitoring visits, the site has been designated as a Characteristic Situation 1 (CS1) no ground gas protection measures are required for the proposed development.
- It is recommended that a Build Phase Strategy detailing standard construction aspects relating to soils i.e. testing rates and suites of imported soils, requirements for exporting etc is undertaken prior to construction.

APPENDIX 1

LIMITATIONS OF INVESTIGATION WORK AND REPORT AND CONTAMINATED LAND LEGISLATIVE FRAMEWORK

LIMITATIONS OF REPORT

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

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

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

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

This report is a function of the date it was written and should be read in light of any subsequent changes in legislation, statutory requirements and industry practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal

provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of IGE. In the absence of such written advice of IGE, reliance on the report in the future shall be at the client's own and sole risk. Should IGE be requested to review the report in the future, IGE shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between IGE and the client.

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

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

LIMITATIONS OF INVESTIGATION WORK

Desk Study References

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

Historical Mapping

Historical Ordnance Survey maps do not provide a comprehensive description of a site history. They provide details of the site from a date prior to the publication of the map (i.e. a snapshot in time). The period between map editions can be substantial (i.e. several decades). Not all map series are available for every date range in many areas of the UK and therefore there will be gaps in this mapped record for some sites. Potentially contaminative land uses could have been present and removed during such periods and may therefore not form a part of this particular record. In addition, there will be potentially contaminative land uses which are not identified on the map records such as small scale storage / use of hazardous materials, illegal / unlicensed

waste disposal activities etc. Different map series identify different features utilising different symbols which can result in features that remain on-site being removed from maps. Some features are also not mapped for security reasons (e.g. airfields and other military installations). These areas are mostly shown as blank areas on historical maps.

Site Walkover

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

Flooding

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

Extent of Contamination Studies

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

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

Intrusive Investigation

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

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

Exploratory Holes

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

Extent of Contamination Testing

The extent of contaminated land testing carried out on samples obtained from the site has been determined in accordance with the latest legal guidance issued by the

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

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

Extent of Geo-Environmental Studies

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

site, UXOs will only be determined as a contaminative source following a positive identification on site.

PLANNING CONTEXT

The National Planning Policy Framework (NPPF, 2019) states that the purpose of the planning system is to contribute to the achievement of sustainable development. In order to do this the planning system has three overarching objectives, one of which directly relates to the potential for pollution and contaminated land:

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

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

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

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

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

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

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

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

APPENDIX 2

FIGURES AND DRAWINGS

FOR GUIDANCE PURPOSES ONLY

Approximate Site Boundary

N

0 10 20 30 40 m

Rev	Drawn	Date	Description

Drawing Status:
Information

Contract:
Slate Wharf, Castlefield, Manchester

For: Prestbury Estates Ltd.

Drawing Title:
Site Location Plan

IGE consulting

Office 11, Bartle House, Oxford Court, Manchester M2 3WQ
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk
Tel: 0161 914 9170

Scale: 1:750 @A3	Date: Aug 2021	
Drawn: AJ	Checked: AE	
Contract No. 3548	Drawing No. SI-01	P1

FOR GUIDANCE PURPOSES ONLY

Approximate Site Boundary

Walkover Photographs

N

Blantyre Street

1

2

3

4

5

0 10 20 30 40 m

Rev	Drawn	Date	Description

Drawing Status:
Information

Contract:
Slate Wharf, Castlefield, Manchester

For: Prestbury Estates Ltd.

Drawing Title:
Walkover Photographs Location Plan

IGE consulting

Office 11, Bartle House, Oxford Court, Manchester M2 3WQ
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk
Tel: 0161 914 9170

Scale: 1:200 @A3	Date: Aug 2021	
Drawn: AJ	Checked: AE	
Contract No. 3548	Drawing No. SI-02	P1

FOR GUIDANCE PURPOSES ONLY

N

- Approximate Site Boundary
- Historical Warehouses (1950s - 1990s)
- Historical Smithy (1840s - 1890s)
- Infilled Basin (1970s)
- Infilled Gravel Pit (1890s)

Rochdale Canal

Merchant's Bridge

Merchant's Warehouse

Albert's Shed

Castle Street

Blantyre Street

The Wharf

P

0 10 20 30 40 m

Rev	Drawn	Date	Description

Drawing Status:
Information

Contract:
Slate Wharf, Castlefield, Manchester

For: Prestbury Estates Ltd.

Drawing Title:
Site Features Plan

IGE consulting

Office 11, Bartle House, Oxford Court, Manchester M2 3WQ
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk
Tel: 0161 914 9170

Scale: 1:500 @A3	Date: Aug 2021	
Drawn: AJ	Checked: AE	
Contract No. 3548	Drawing No. SI-03	P1

Notes

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

SOURCES

PATHWAYS

RECEPTORS

Sources
1. On-Site Made Ground
2. On-Site Historical Warehouses (1950s - 1990s)
3. On-Site Historical Smithy (1840s - 1890s)
4. Off-Site Historical Industrial Uses (Depots, Warehouses, Timber Yard 1840s - 1990s)

Secondary Sources
5. Pooling Beneath Relic and / or Future Foundations
6. Pooling in Relative Low Points Above Low Permeability Deposits (i.e. Cohesive Made Ground)
7. Pooling within Granular Lenses within Low Permeability Deposits (i.e. Granular Made Ground)

Ground Gas Sources
1. On-Site Made Ground
2. Off-Site Infilled Basin (35m West, 1970s)
3. Off-Site Infilled Gravel Pit (70m West, 1890s)

Pathways To Human Health
1. Dermal Contact
2. Inhalation of Soil Dust and Vapours
3. Ingestion of Soil Directly

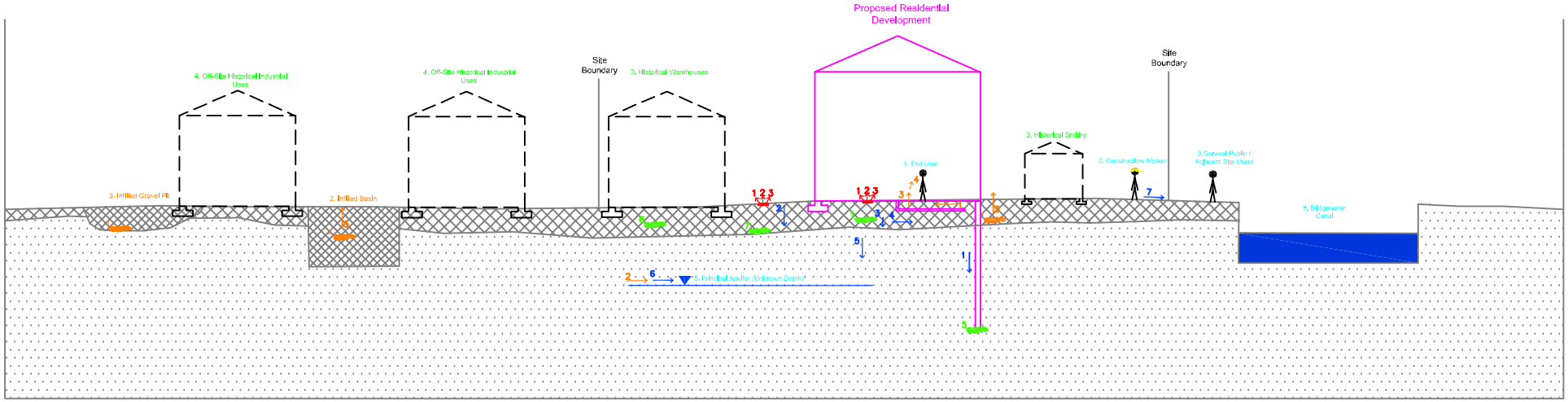
Pathways To Controlled Waters
1. Vertical Migration Along Relic and / or Future Foundations
2. Vertical Migration Through Granular Made Ground and Granular Natural Deposits
3. Negligible Infiltration Through Low Permeability Deposits (possible cohesive made ground)
4. Lateral Migration Along Low-Permeability Deposits
5. Migration Through Fractures and Fissures in Bedrock
6. Migration Along Groundwater Flow
7. Overland Flow

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

Receptors
1. End User - Residential Without Home Grown Produce
2. Construction Workers
3. General Public / Adjacent Site Users
4. Principal Aquifer (Unknown Depth)
5. Bridgewater Canal (5m East)
6. Buildings and Services

Key

- Proposed Development
- Made Ground
- Chester Formation (Sandstone)



Rev	Drawn	Date	Description

Drawing Status: INFORMATION

Contract: SLATE WHARF, CASTLEFIELD, MANCHESTER

FOR: PRESTBURY ESTATES LTD.

Drawing Title: CONCEPTUAL SITE MODEL DIAGRAM

IGE consulting
Suite 4, 14-22 Hewitt Street, Manchester, M15 4GB
email: contact@igeconsulting.co.uk
web: www.igeconsulting.co.uk
tel: 0161 237 8310

Scale	NTS	Date	MAY 2021
Drawn	AJ	Checked	AE
Contract No.	3548	Drawing No.	SI–04
			P1

FOR GUIDANCE PURPOSES ONLY

Approximate Site Boundary
Proposed Development
Window Sample Holes (August 2021)
Trial Pits (October 2021)

N

WS07
WS08
WS05
WS06A
WS06B
WS03B
WS03
WS03A
WS02
WS01
WS04
WS04A
WS04B
HDP01
TP03
TP01
TP02

Slate Wharf
Slate Wharf
The Wharf P.H

0 10 20 m

A	AJ	10/21	Additional exploratory holes
Rev	Drawn	Date	Description

Drawing Status:
Information

Contract:
Slate Wharf, Manchester

For: Prestbury Estates Ltd.

Drawing Title:

Exploratory Hole Location Plan

IGE consulting

Office 11, Bartle House, Oxford Court, Manchester M2 3WQ
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk
Tel: 0161 914 9170

Scale: 1:250 @A3	Date: Aug 2021	
Drawn: AJ	Checked: AE	
Contract No. 3548	Drawing No. SI-05	P1

FOR GUIDANCE PURPOSES ONLY

N

Approximate Site Boundary
Proposed Development
Window Sample Holes

Numerous other concrete cobbles and bricks recorded in all holes within made ground between 0.10m and 1.10m bgl.

Concrete Slab at 1.00m bgl

Concrete Slab at 1.00m bgl

Concrete at 0.50m, 0.70m and concrete slab at 1.10m bgl in WS06

Concrete at 0.65m bgl in WS06A and WS06B

Concrete Slab at 0.70m bgl

Concrete Slab at 0.50m bgl in WS03 - WS03B

No concrete

No concrete

Concrete Slab at 0.50m bgl in WS04 - WS04B

No concrete

WS01
WS02
WS03
WS03A
WS03B
WS04
WS04A
WS04B
WS05
WS06A
WS06B
WS07
WS08
HDP01

Slate Wharf

Slate Wharf

The Wharf P.H

0 10 20 m

Rev	Drawn	Date	Description

Drawing Status:
Information

Contract:
Slate Wharf, Manchester

For: Prestbury Estates Ltd.

Drawing Title:

Obstructions Location Plan

IGE consulting

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Web: www.igeconsulting.co.uk
Tel: 0161 914 9170

Scale: 1:250 @A3	Date: Aug 2021	
Drawn: AJ	Checked: AE	
Contract No. 3548	Drawing No. SI-02	P1

APPENDIX 3

HISTORICAL ORDNANCE SURVEY MAPS



![Groundsure INSIGHTS]

Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: 1056 Scale Town Plan

Map date: **1851**

Scale: 1:1,056

Printed at: 1:1,056

N
W E
S

Surveyed 1849
Revised N/A
Edition 1851
Copyright N/A
Levelled N/A

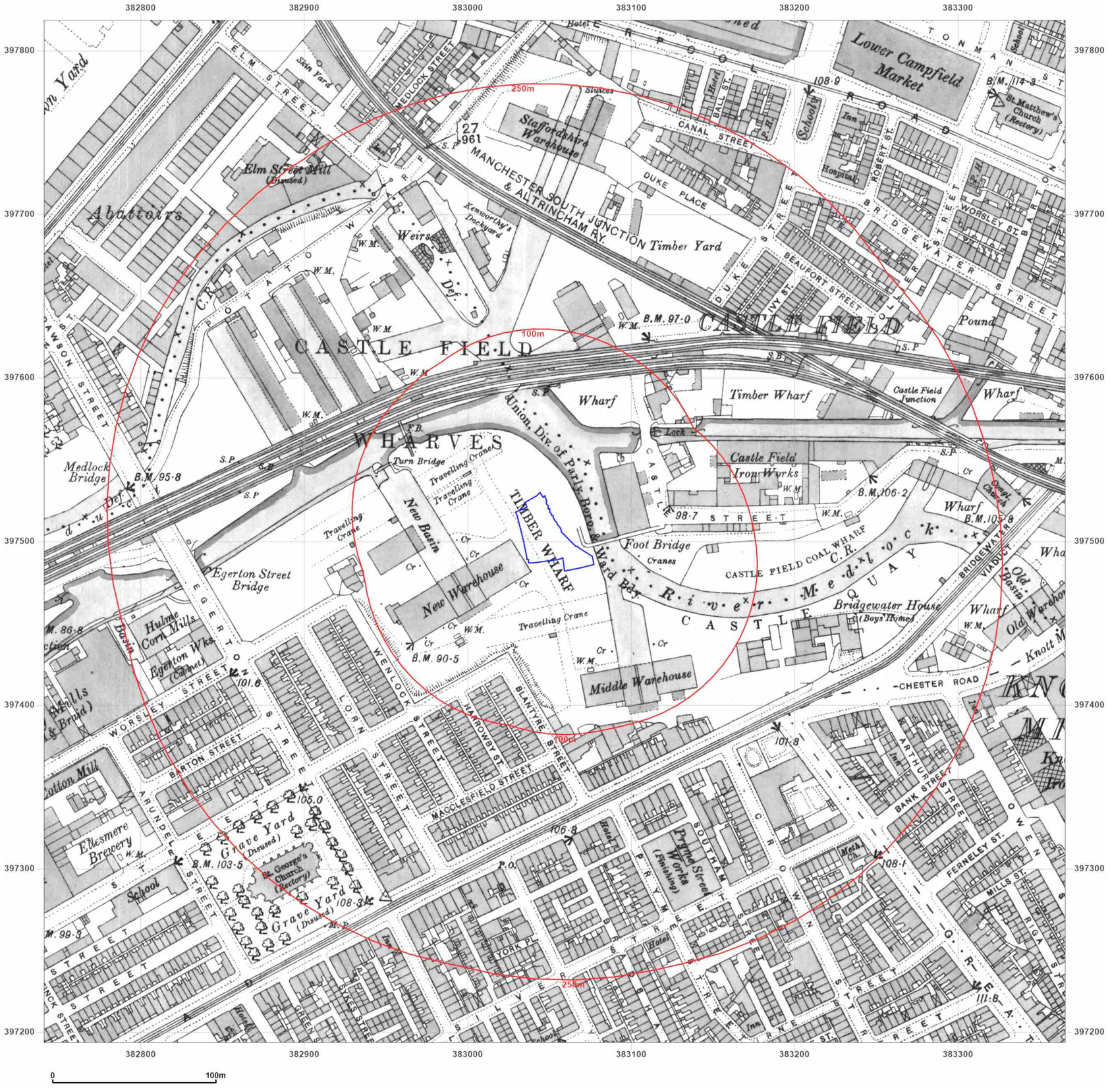
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Production date: 12 May 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: County Series

Map date: **1893**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1893
Revised N/A
Edition 1893
Copyright N/A
Levelled N/A

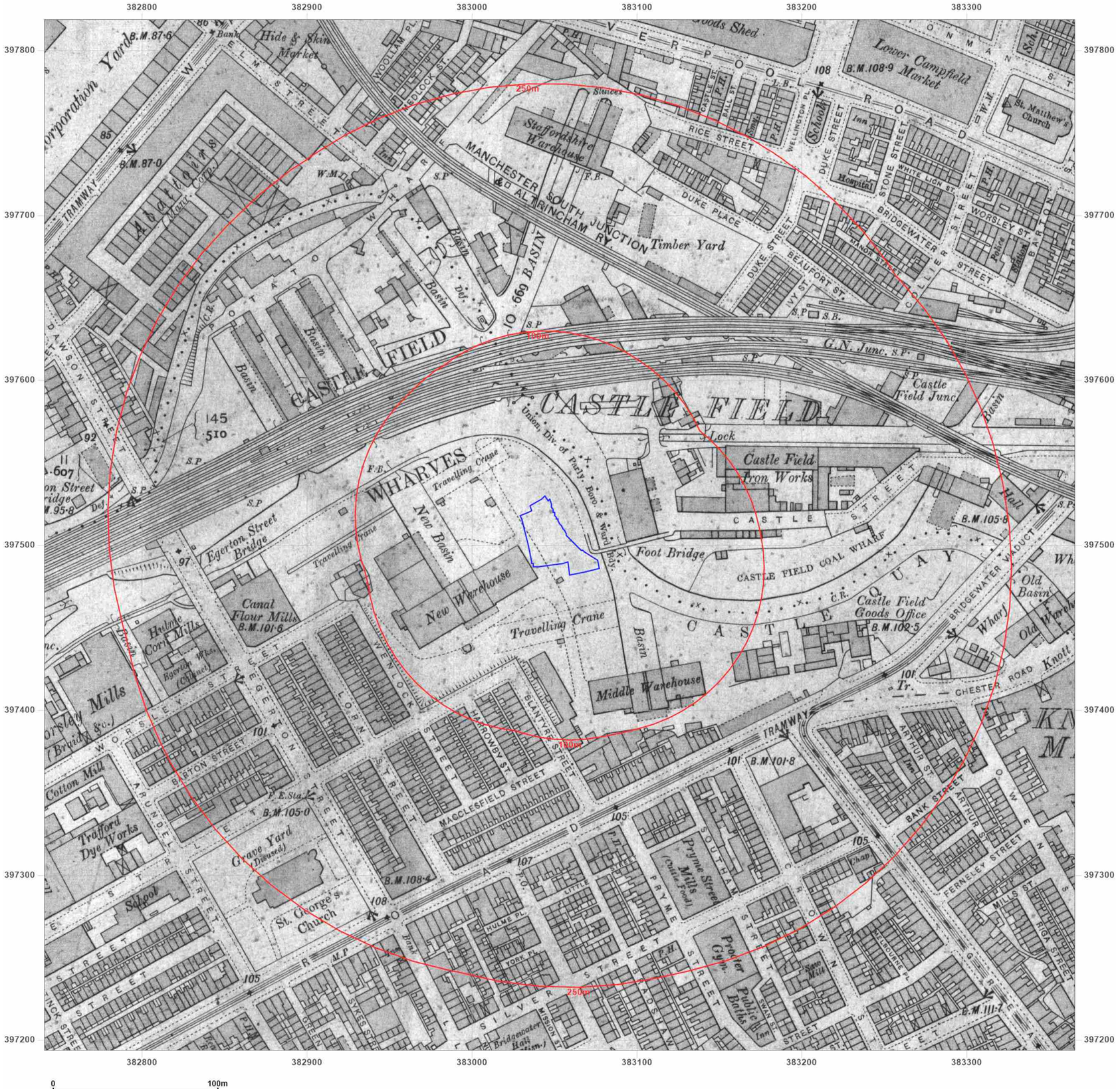
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Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: County Series

Map date: **1908**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1891
Revised 1905
Edition 1908
Copyright N/A
Levelled N/A

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Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: County Series

Map date: **1922**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1922
Revised 1916
Edition 1922
Copyright N/A
Levelled 1915

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Site Details:

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Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: County Series

Map date: **1932**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1873
Revised 1932
Edition N/A
Copyright N/A
Levelled 1927

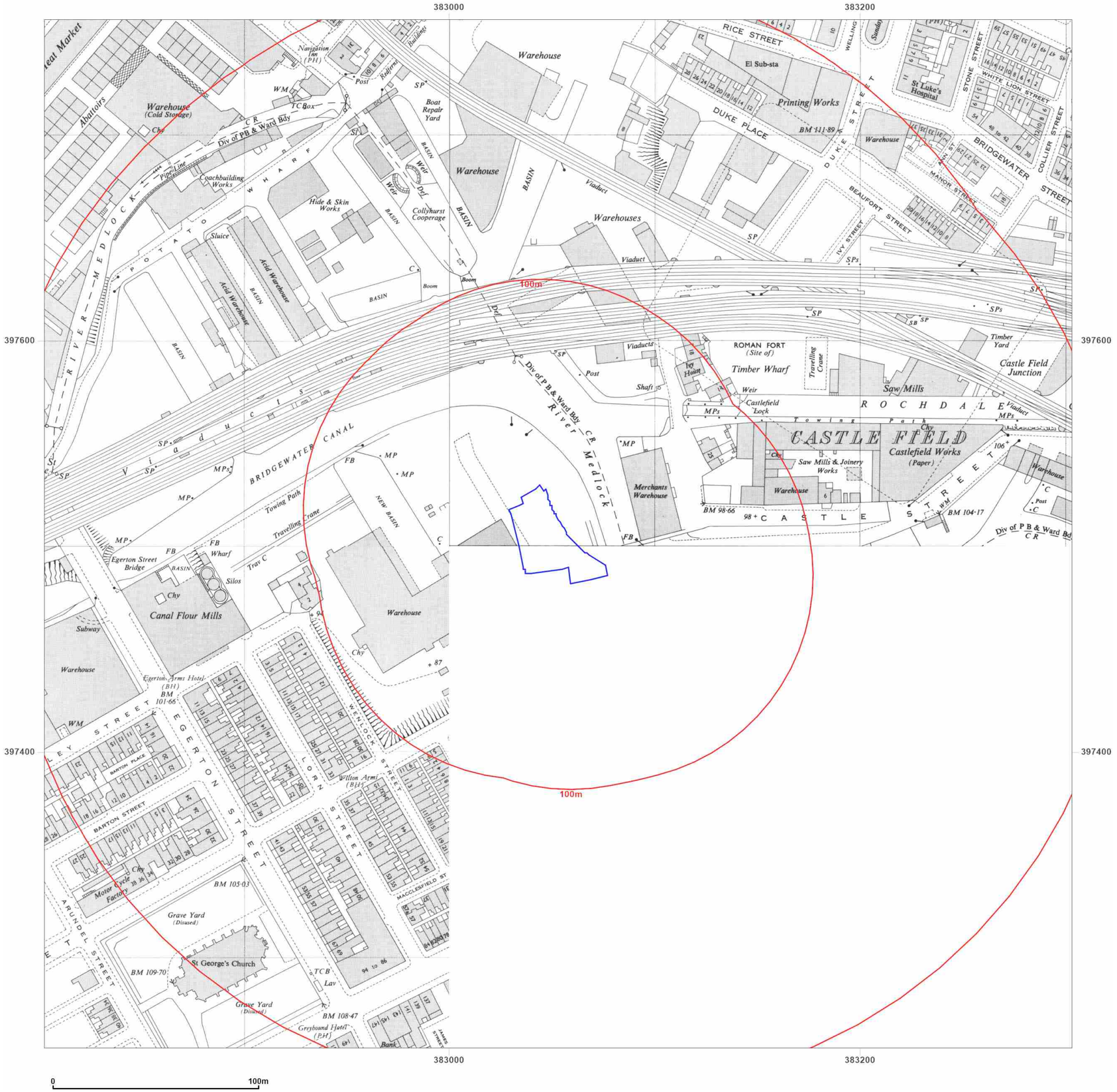
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Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1948-1949**

Scale: 1:1,250

Printed at: 1:2,000

N
W E
S

Surveyed 1949
Revised 1949
Edition N/A
Copyright N/A
Levelled 1948

Surveyed 1948
Revised 1948
Edition N/A
Copyright 1948
Levelled 1927

Surveyed 1948
Revised 1948
Edition N/A
Copyright N/A
Levelled 1948

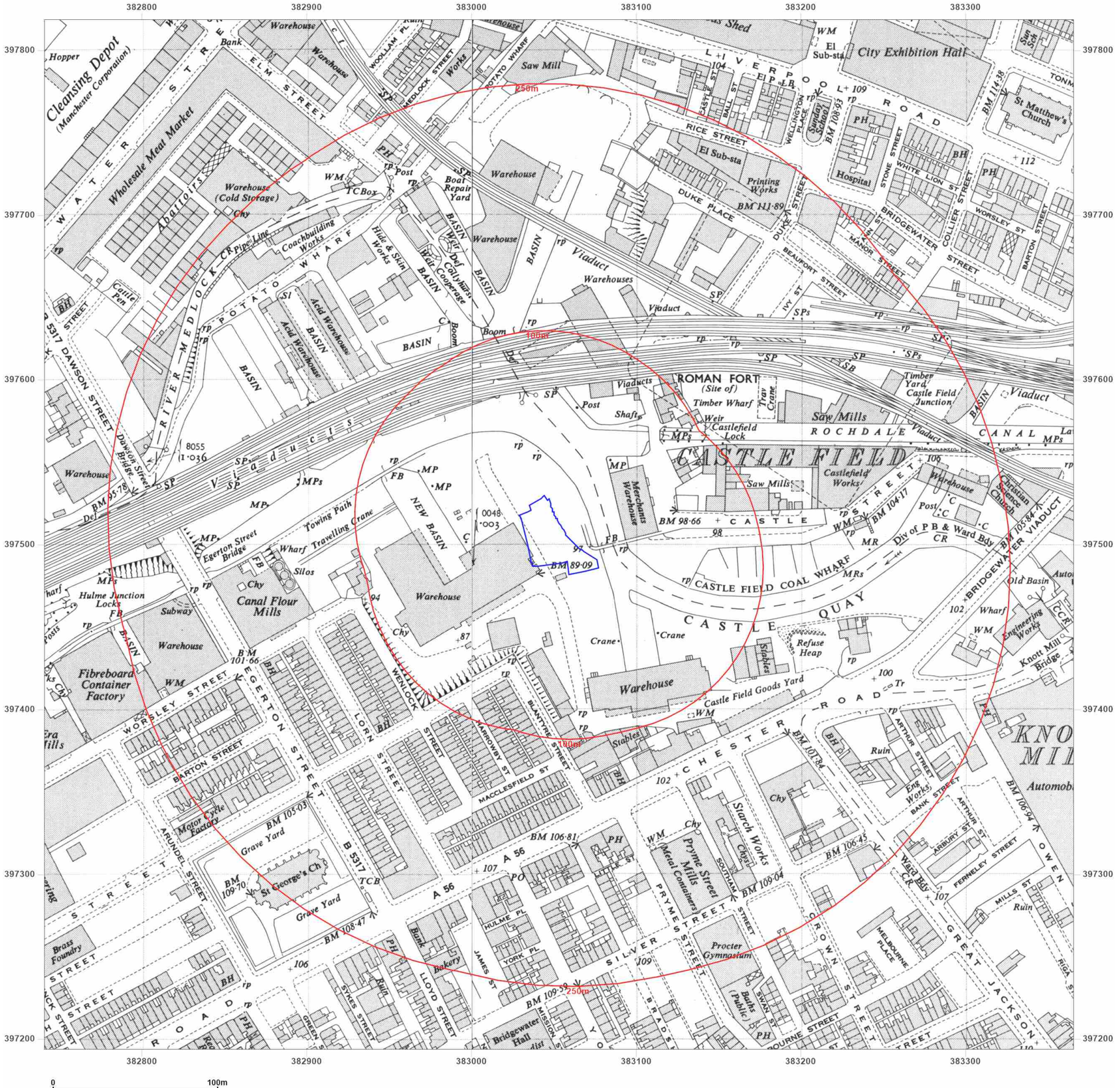
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Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1948-1949**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1949 Revised 1949 Edition N/A Copyright N/A Levelled 1948	Surveyed 1948 Revised 1948 Edition N/A Copyright 1949 Levelled 1927

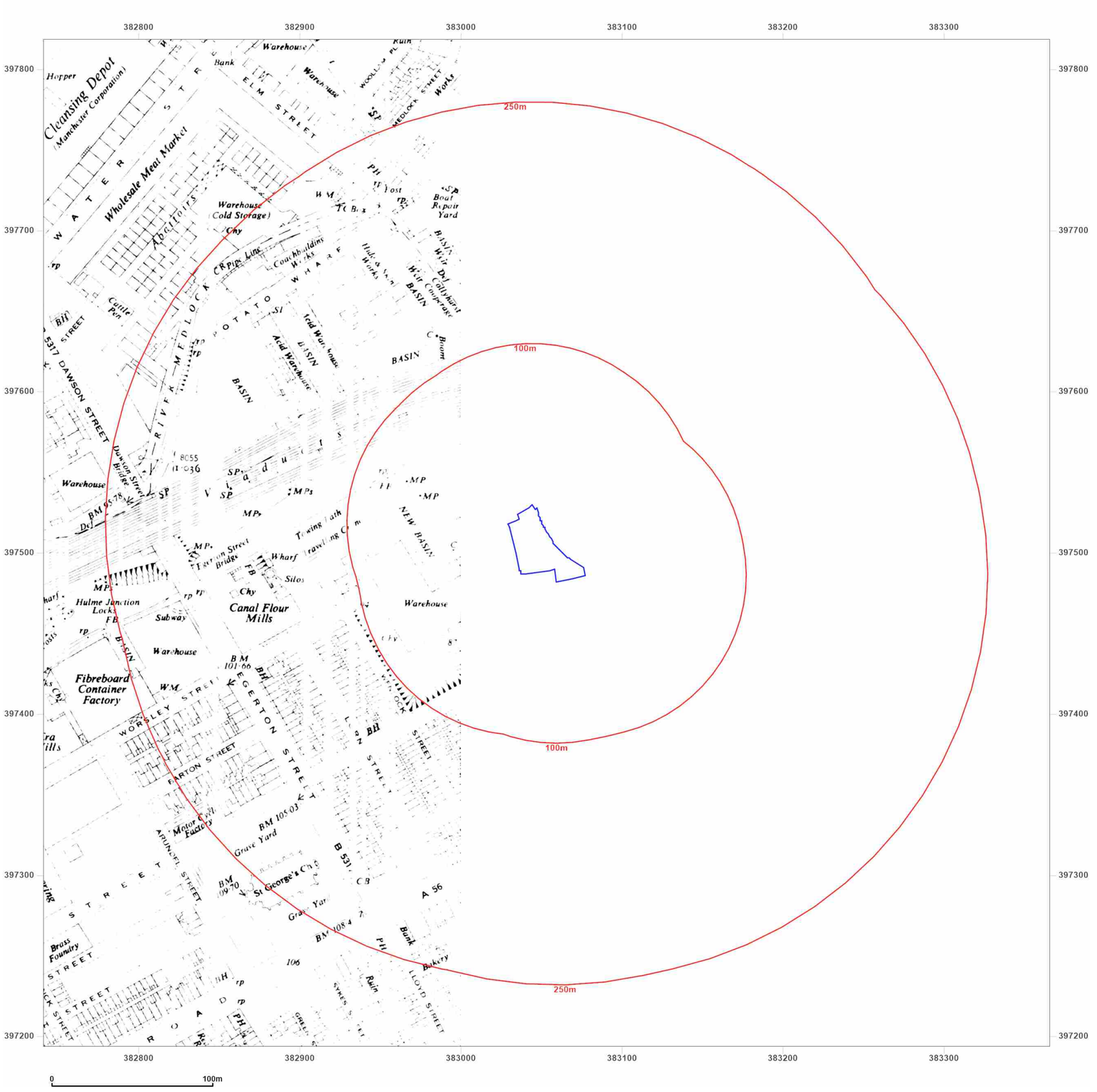
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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1950**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

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

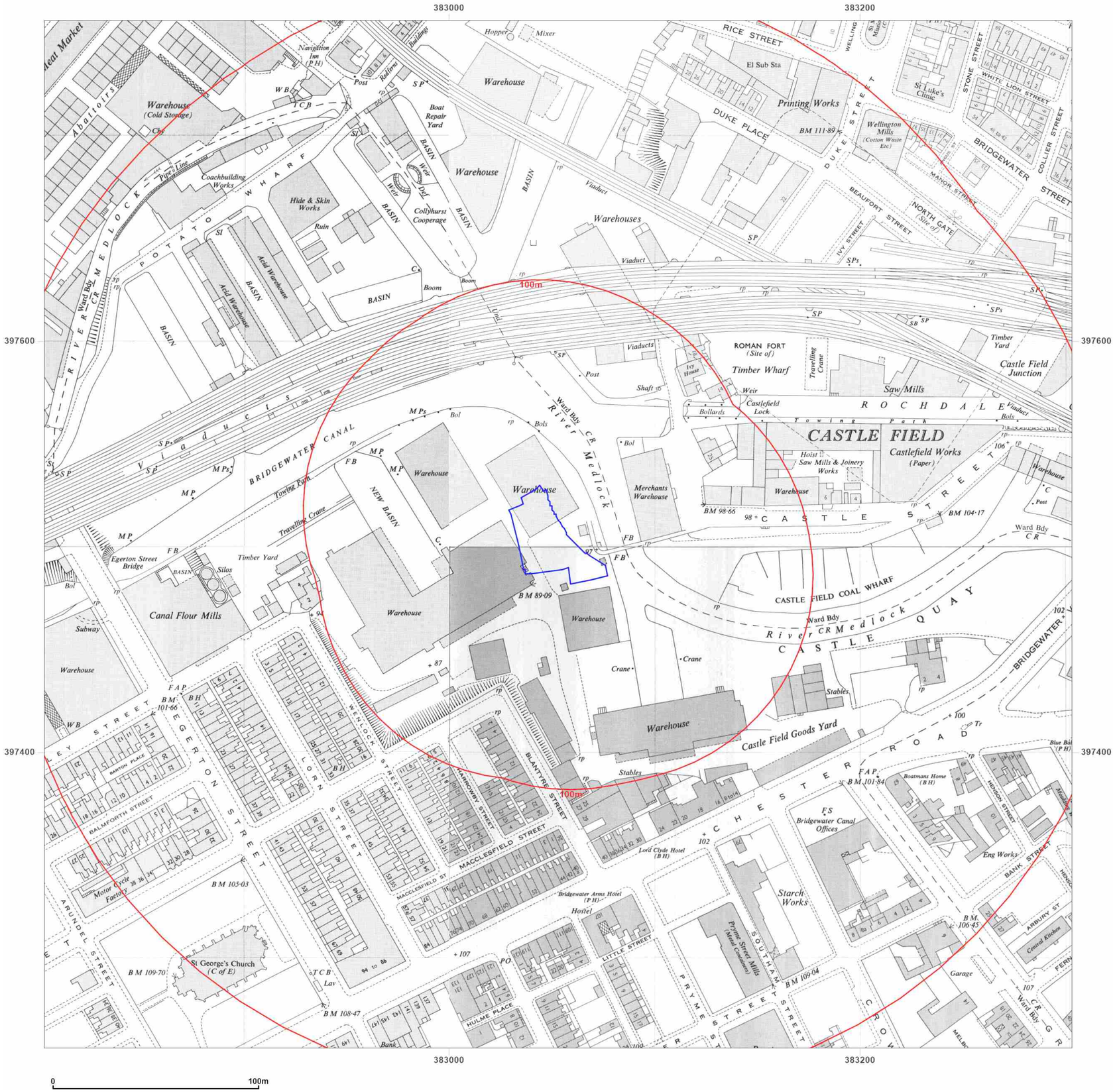
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Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1953-1955**

Scale: 1:1,250

Printed at: 1:2,000

N
W E
S

Surveyed 1949 Revised 1952 Edition 1953 Copyright N/A Levelled 1948	Surveyed 1948 Revised 1955 Edition N/A Copyright 1955 Levelled 1927
Surveyed 1954 Revised 1954 Edition N/A Copyright N/A Levelled 1948	Surveyed 1953 Revised 1953 Edition N/A Copyright 1954 Levelled 1927

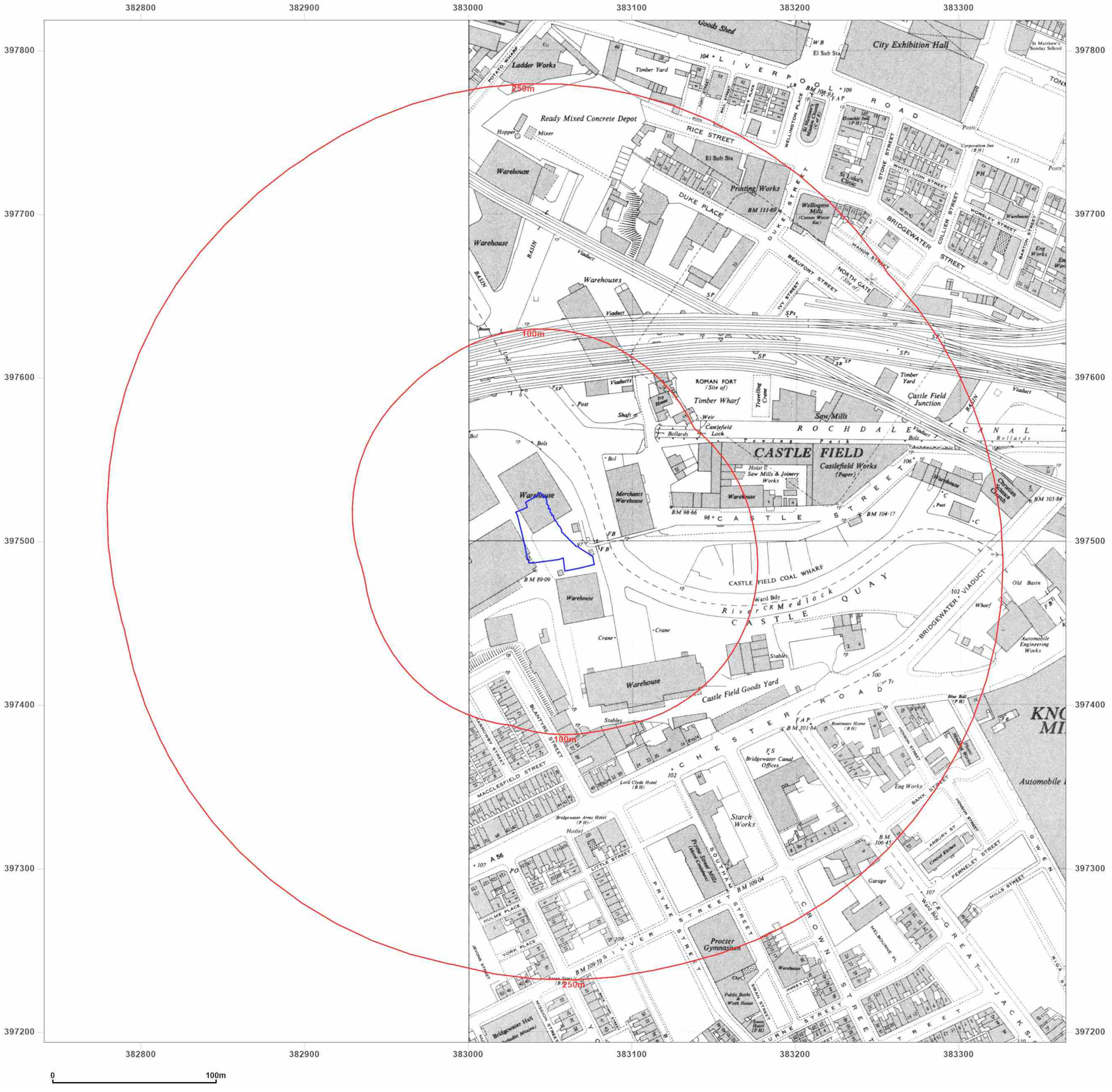
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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1956**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1953
Revised 1953
Edition N/A
Copyright 1957
Levelled 1927

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Production date: 12 May 2021

Map legend available at:
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Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1953-1960**

Scale: 1:1,250

Printed at: 1:2,000

N
W E
S

Surveyed 1949
Revised 1952
Edition 1953
Copyright N/A
Levelled 1948

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

Surveyed 1959
Revised 1959
Edition N/A
Copyright 1960
Levelled 1958

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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1963**

Scale: 1:1,250

Printed at: 1:2,000

N
W E
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Surveyed 1948
Revised 1962
Edition N/A
Copyright 1963
Levelled 1958

Surveyed 1963
Revised 1963
Edition N/A
Copyright 1963
Levelled 1958

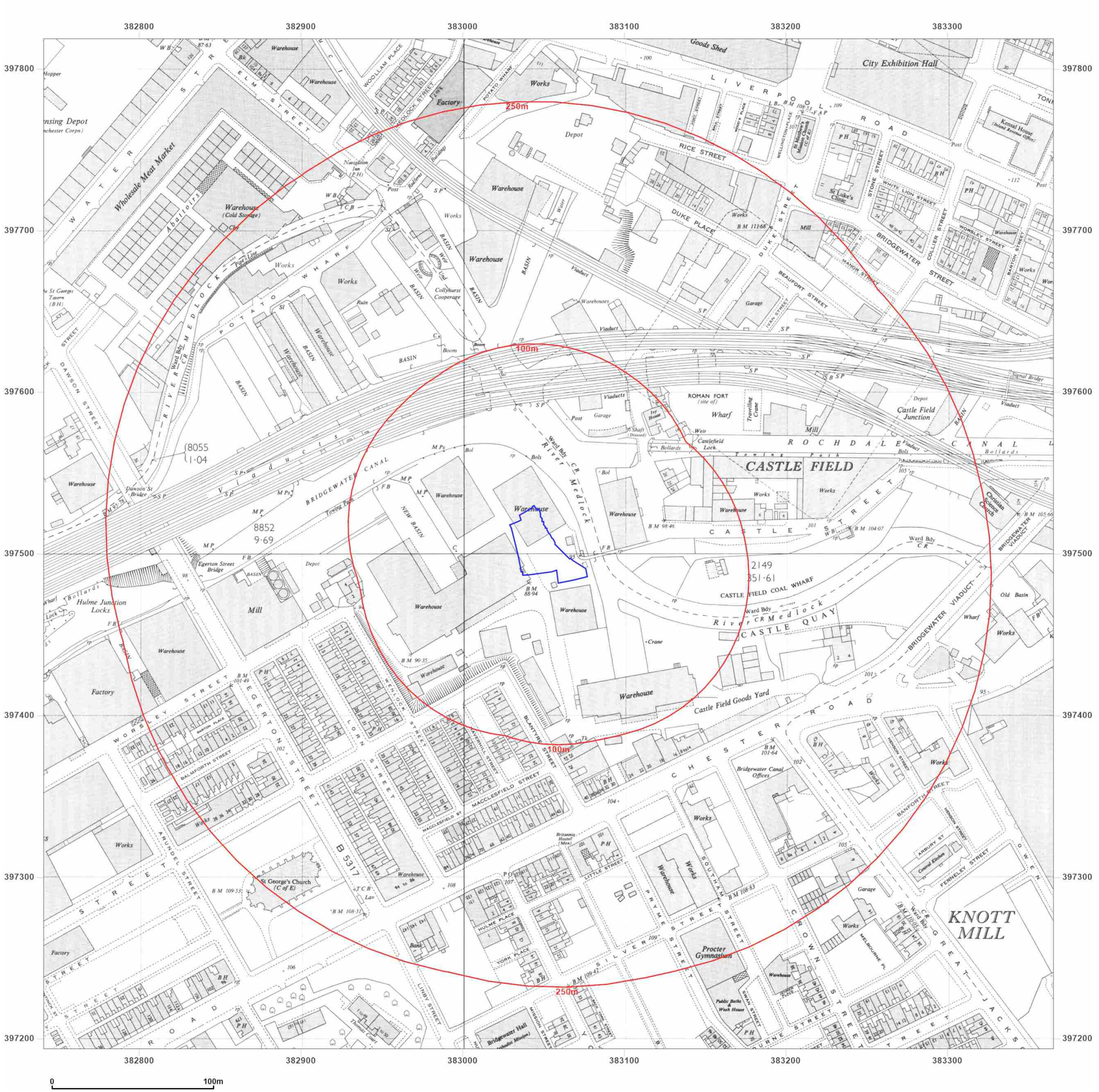
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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1963**

Scale: 1:2,500

Printed at: 1:2,500

N
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Surveyed 1963
Revised 1963
Edition N/A
Copyright 1965
Levelled 1958

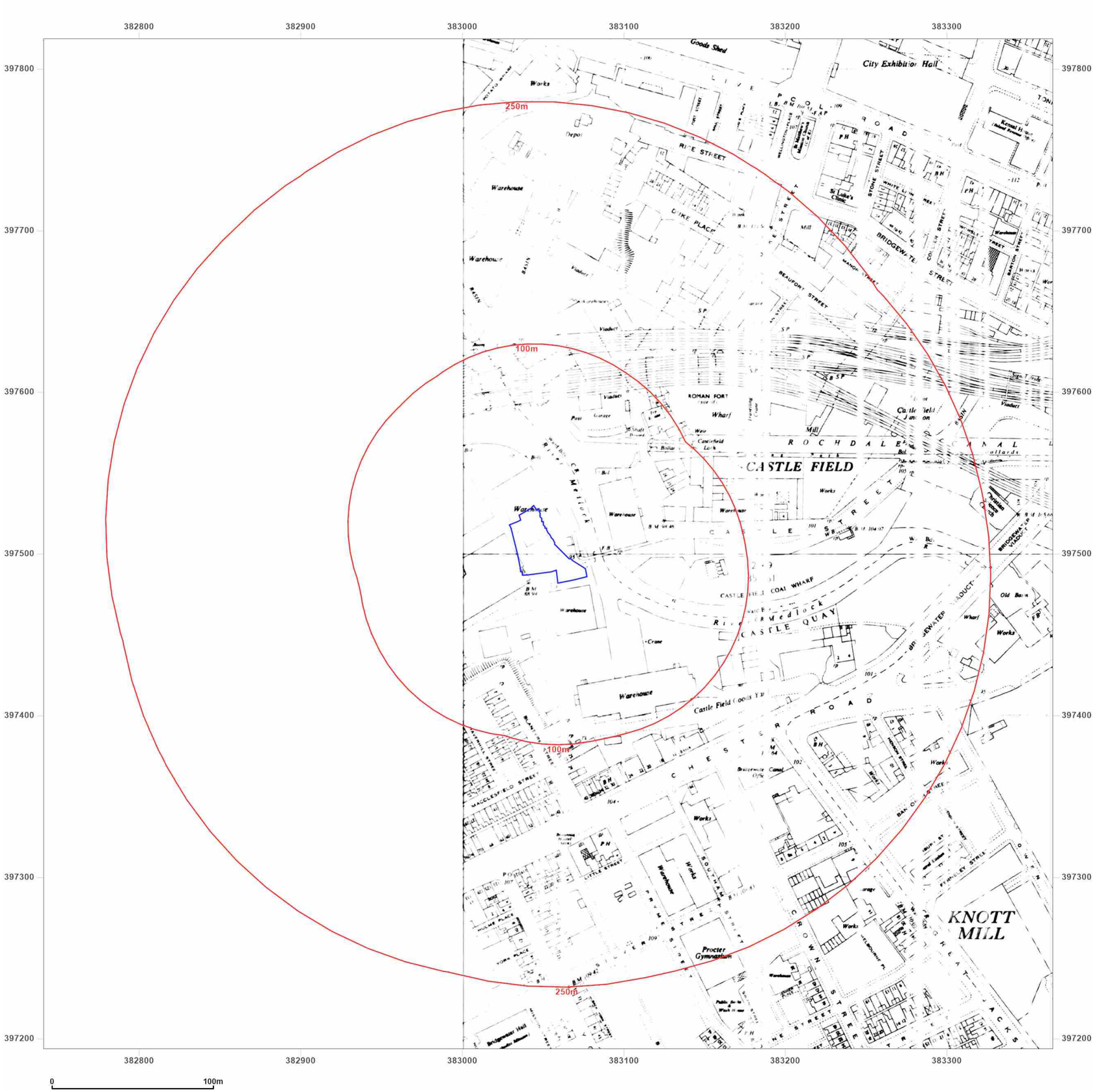
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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1964**

Scale: 1:2,500

Printed at: 1:2,500

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

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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

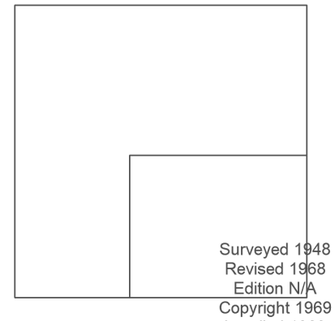
Map Name: National Grid

Map date: **1969**

Scale: 1:1,250

Printed at: 1:2,000

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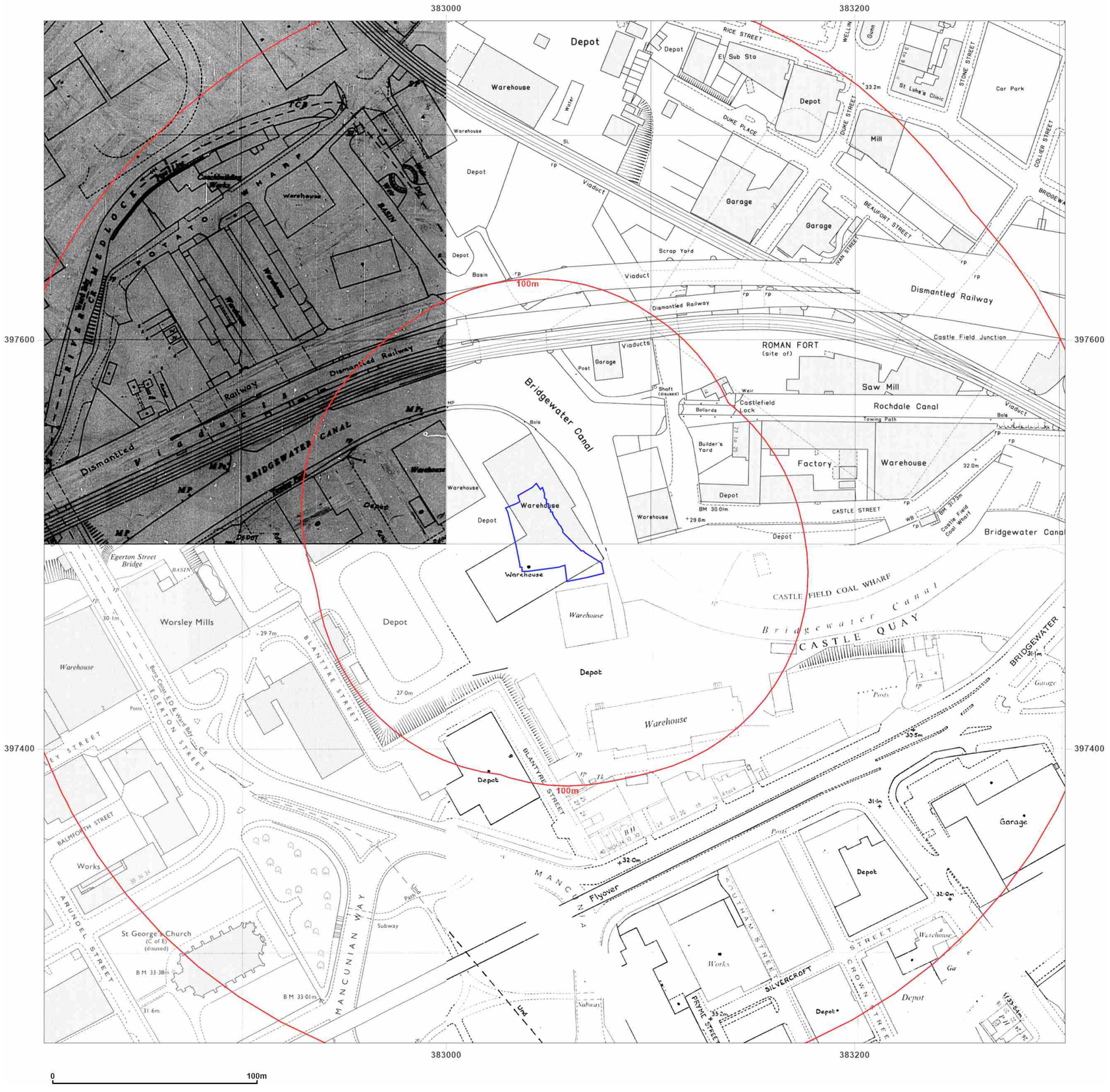
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Site Details:

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M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1977-1981**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed N/A
Revised N/A
Edition N/A
Copyright 1978
Levelled 1963

Surveyed 1948
Revised 1979
Edition N/A
Copyright 1981
Levelled 1963

Surveyed 1948
Revised 1976
Edition N/A
Copyright 1977
Levelled 1963

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1980
Levelled 1963

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Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1980-1982**

Scale: 1:1,250

Printed at: 1:2,000

N
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Surveyed 1949
Revised 1979
Edition N/A
Copyright 1980
Levelled 1963

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1982
Levelled 1963

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1980
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Site Details:

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M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

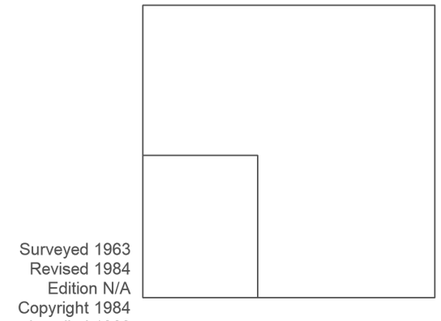
Map Name: National Grid

Map date: **1984**

Scale: 1:1,250

Printed at: 1:2,000

N
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Surveyed 1963
Revised 1984
Edition N/A
Copyright 1984
Levelled 1963

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Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid
Map date: **1982-1986**
Scale: 1:1,250
Printed at: 1:2,000

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

Surveyed 1963
Revised 1986
Edition N/A
Copyright 1986
Levelled 1963

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1982
Levelled 1963

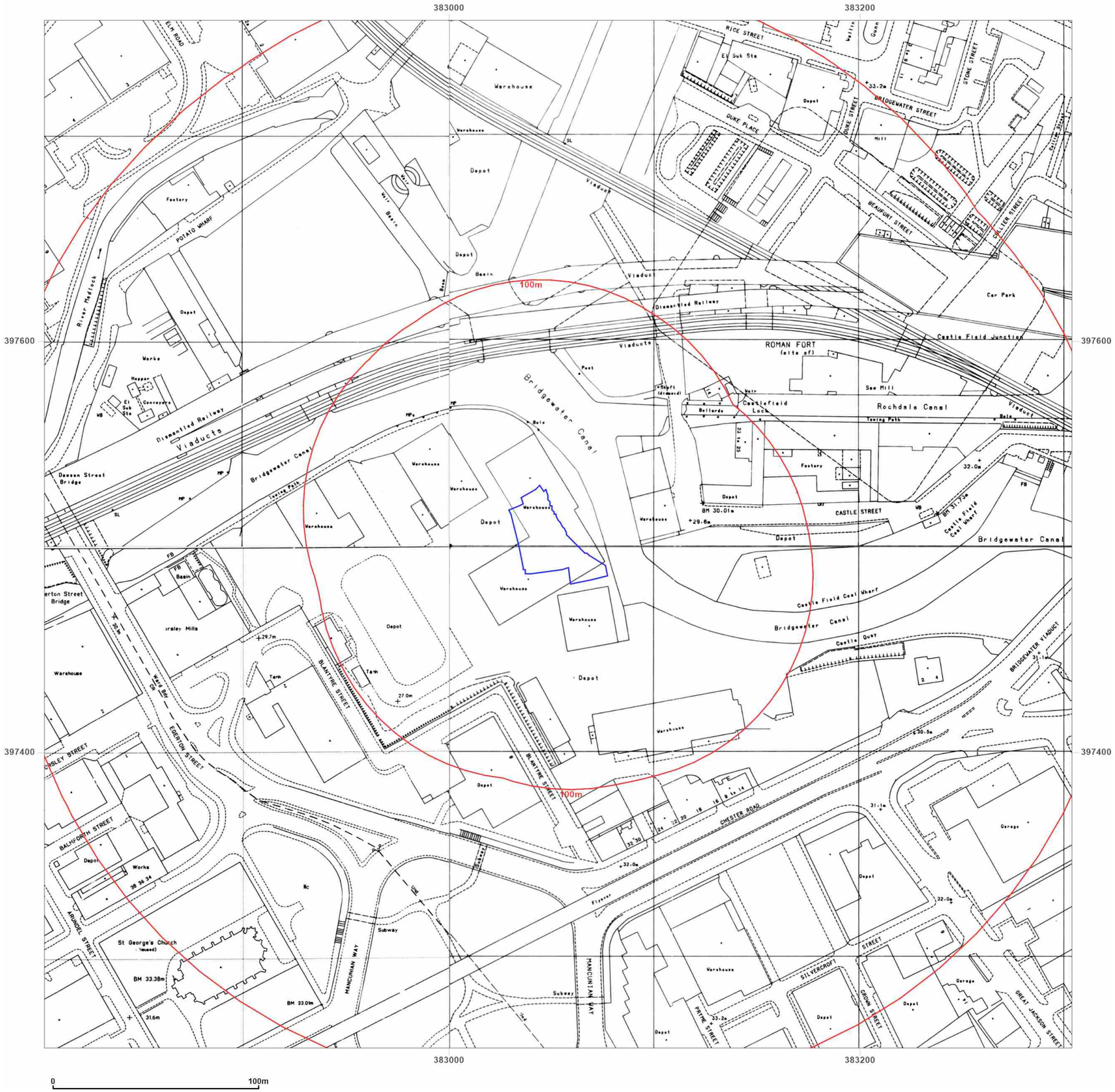
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Site Details:

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M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1990-1992**

Scale: 1:1,250

Printed at: 1:2,000

N
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Surveyed 1949 Revised 1979 Edition N/A Copyright 1990 Levelled N/A	Surveyed 1948 Revised 1979 Edition N/A Copyright 1990 Levelled N/A
Surveyed N/A Revised N/A Edition N/A Copyright 1992 Levelled N/A	Surveyed 1968 Revised 1968 Edition N/A Copyright 1990 Levelled N/A

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M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

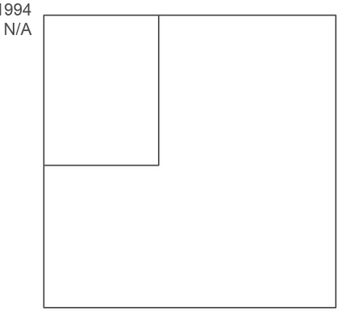
Map date: **1994**

Scale: 1:1,250

Printed at: 1:2,000

N
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Revised 1994
Edition N/A
Copyright 1994
Levelled N/A



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M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1990-1995**

Scale: 1:1,250

Printed at: 1:2,000

N
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Surveyed 1979 Revised 1979 Edition N/A Copyright 1990 Levelled N/A	Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A
Surveyed N/A Revised N/A Edition N/A Copyright 1995 Levelled N/A	Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A

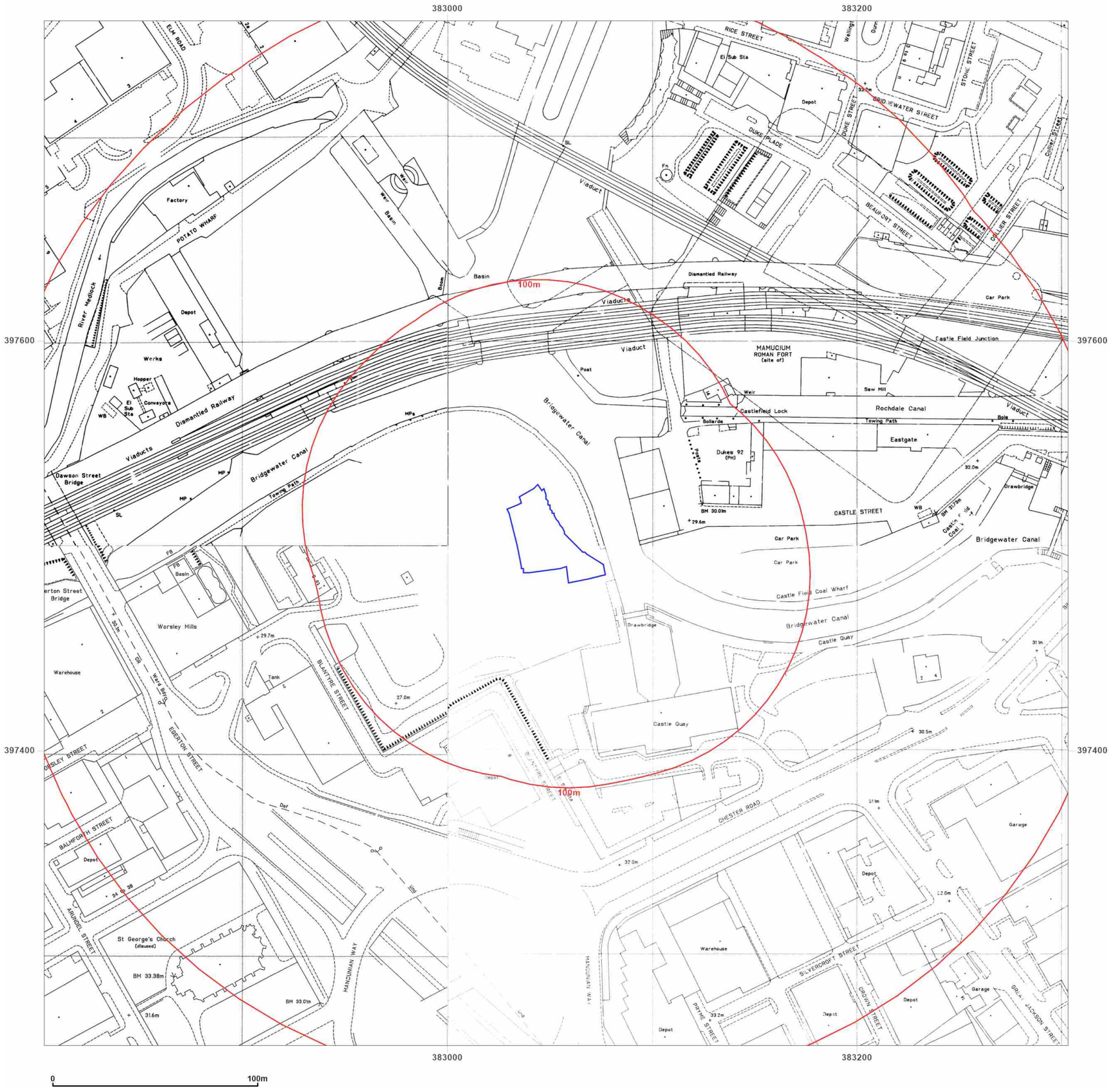
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Site Details:

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M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid
Map date: **1992-1995**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed N/A Revised N/A Edition N/A Copyright 1992 Levelled N/A	Surveyed 1994 Revised 1994 Edition N/A Copyright 1994 Levelled N/A
Surveyed N/A Revised 1993 Edition N/A Copyright 1995 Levelled N/A	Surveyed 1995 Revised 1995 Edition N/A Copyright 1995 Levelled N/A

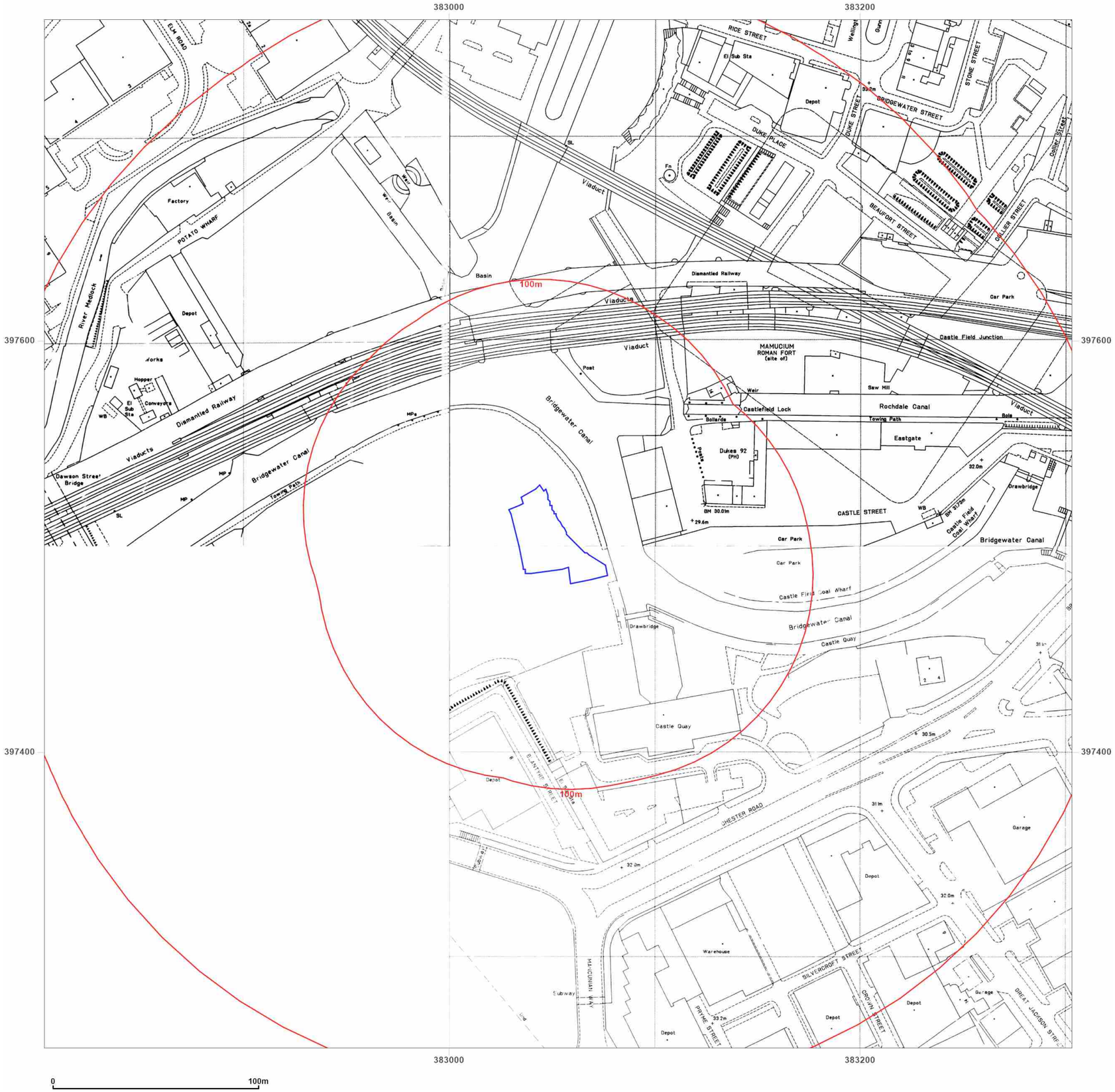
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Site Details:

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M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1993-1995**

Scale: 1:1,250

Printed at: 1:2,000

N
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Surveyed N/A
Revised N/A
Edition N/A
Copyright 1993
Levelled N/A

Surveyed 1994
Revised 1994
Edition N/A
Copyright 1994
Levelled N/A

Surveyed 1995
Revised 1995
Edition N/A
Copyright 1995
Levelled N/A

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Site Details:

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M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

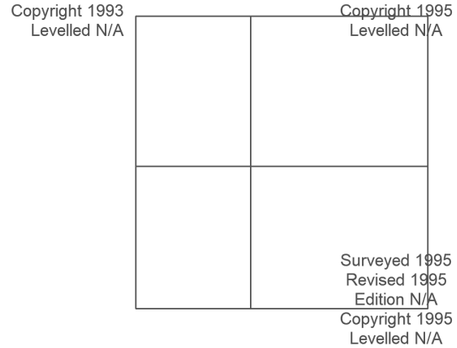
Map Name: National Grid

Map date: **1993-1995**

Scale: 1:1,250

Printed at: 1:2,000

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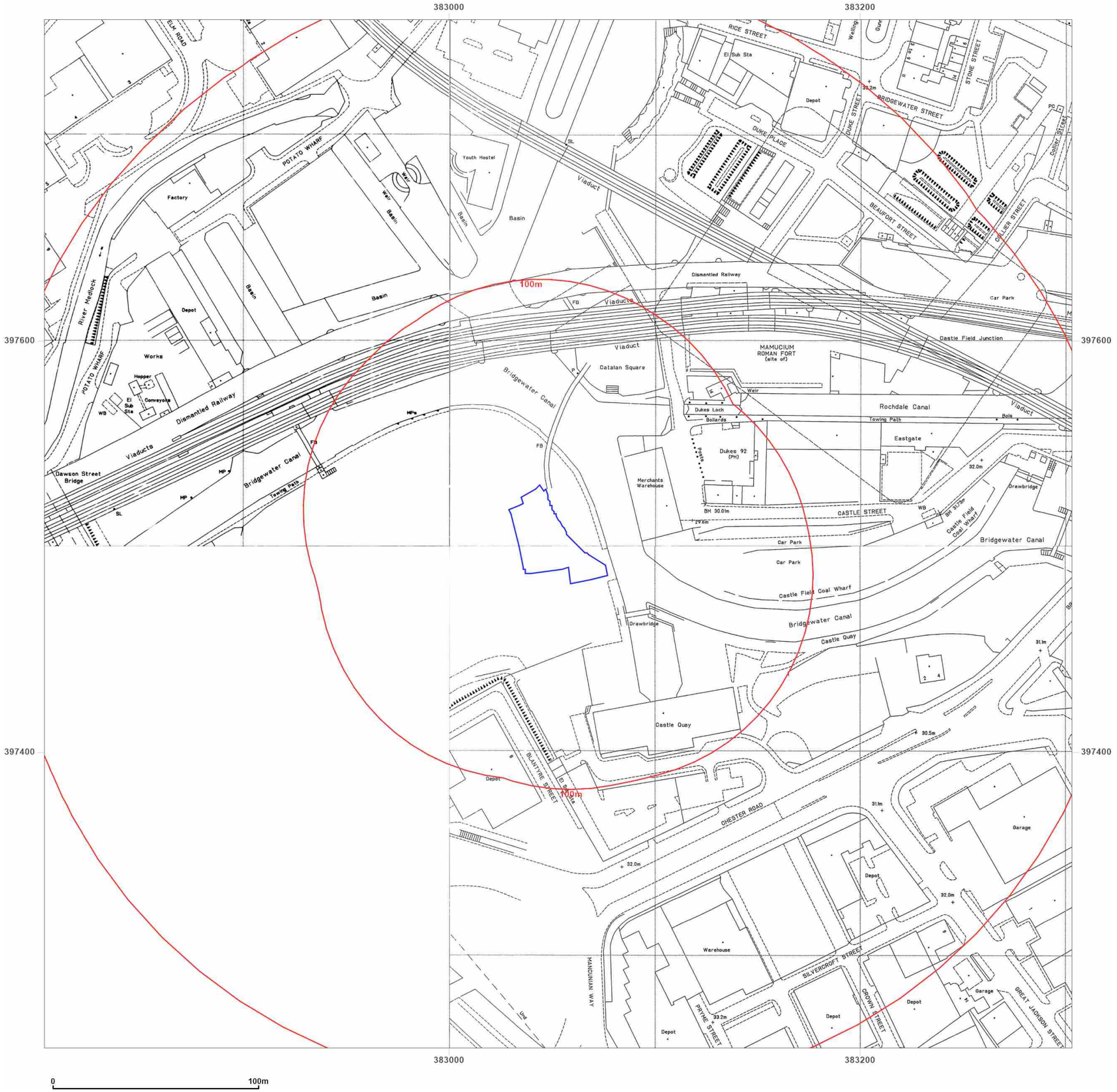
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Site Details:

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M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1994-1995**

Scale: 1:1,250

Printed at: 1:2,000

N
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Surveyed N/A
Revised N/A
Edition N/A
Copyright 1994
Levelled N/A

Surveyed 1995
Revised 1995
Edition N/A
Copyright 1995
Levelled N/A

Surveyed 1995
Revised 1995
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Site Details:

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Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

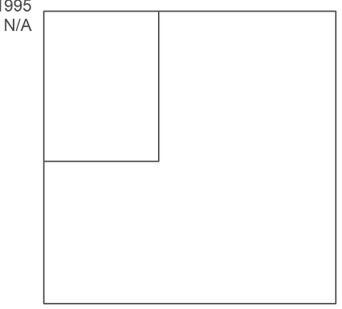
Map date: **1995**

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Printed at: 1:2,000

N
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Surveyed N/A
Revised N/A
Edition N/A
Copyright 1995
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Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

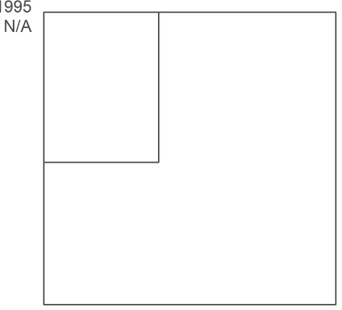
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Printed at: 1:2,000

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Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

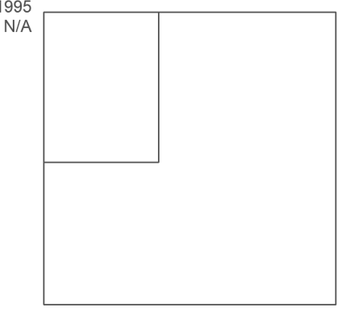
Map date: **1995**

Scale: 1:1,250

Printed at: 1:2,000

N
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Revised 1995
Edition N/A
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Site Details:

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M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

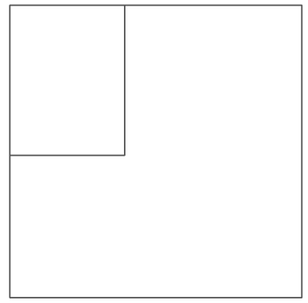
Map date: **1995**

Scale: 1:1,250

Printed at: 1:2,000

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



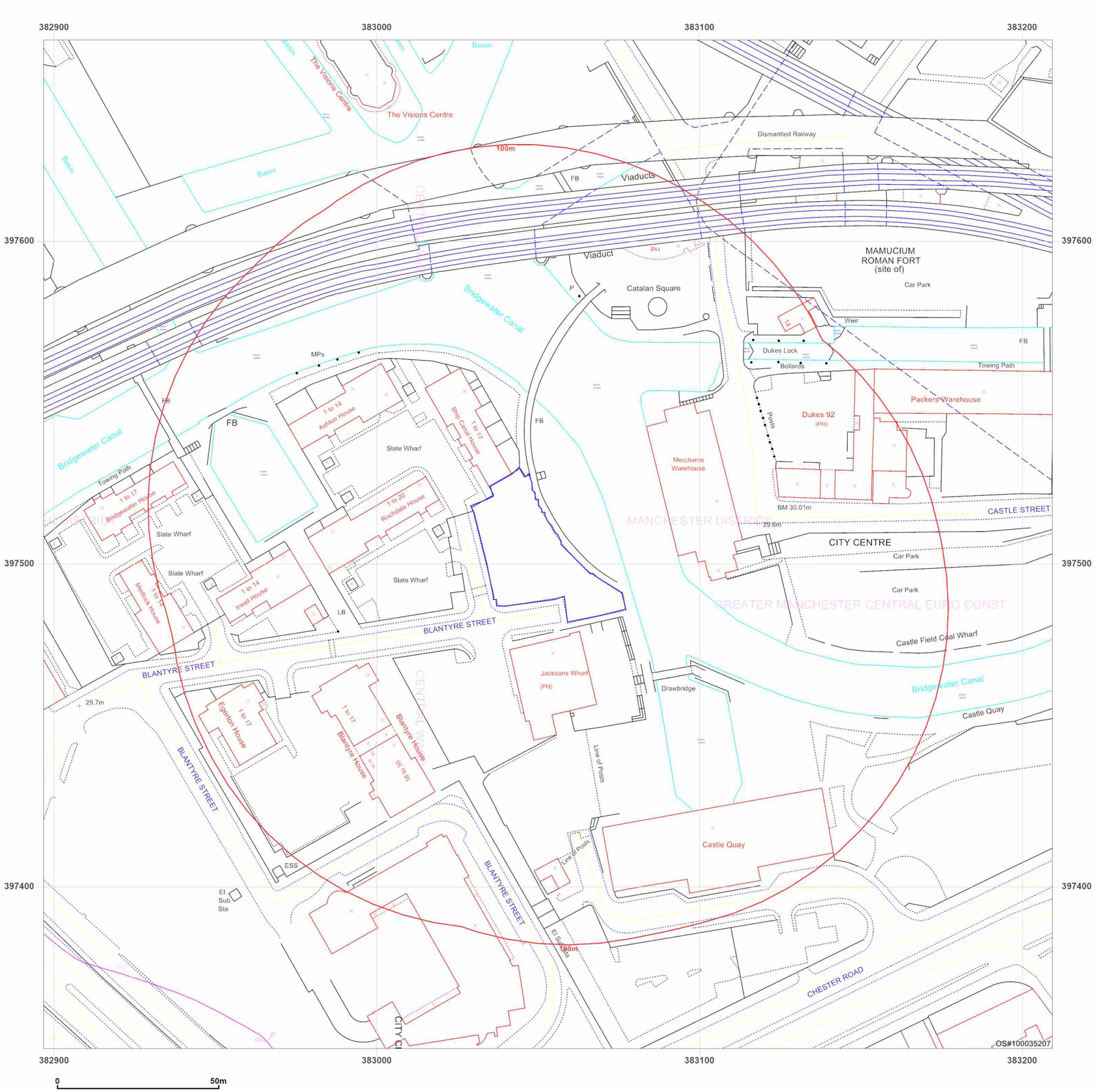
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Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: LandLine
Map date: **2003**
Scale: 1:1,250
Printed at: 1:1,250

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2003

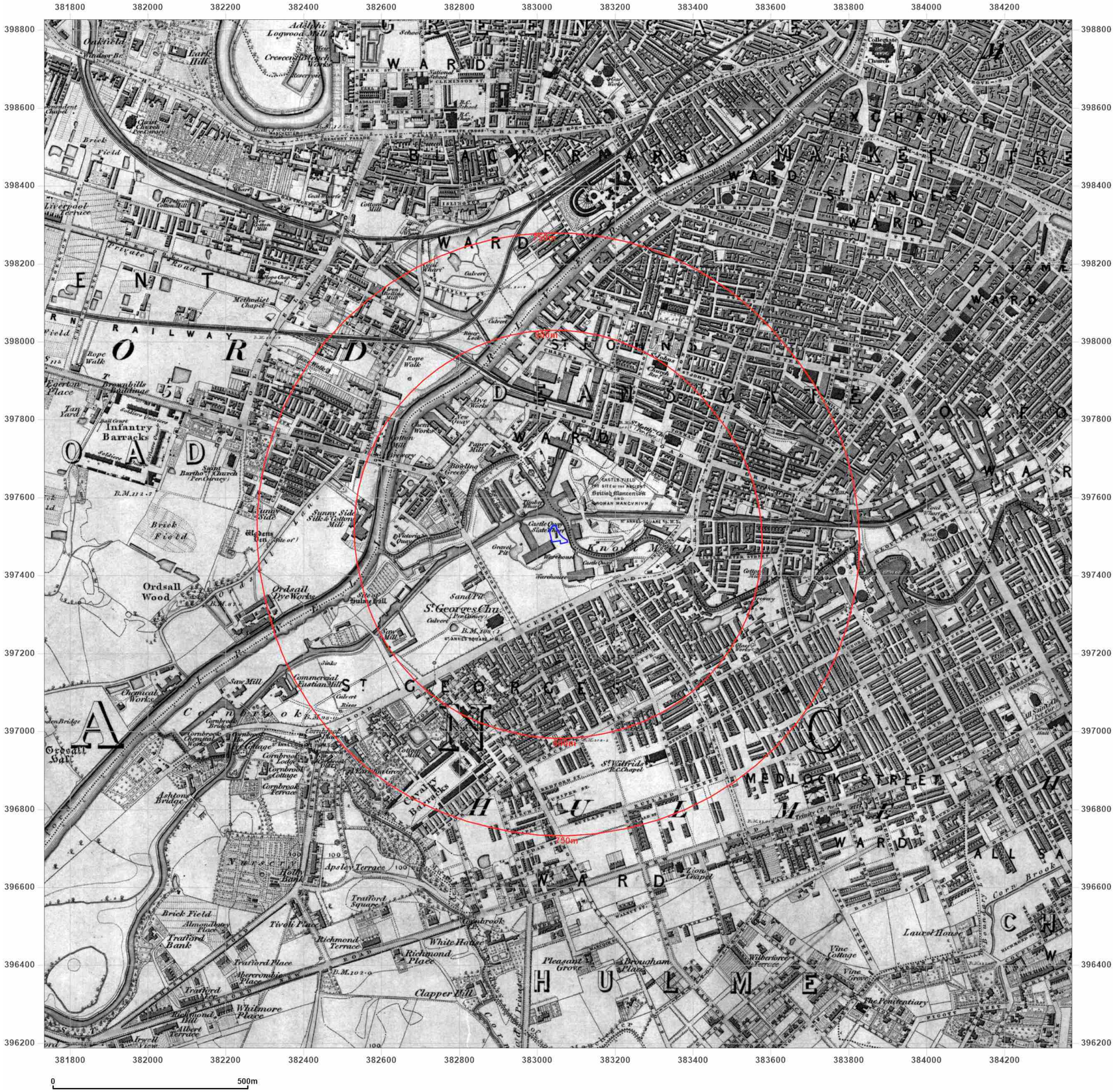
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Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: County Series

Map date: **1848**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1845
Revised N/A
Edition 1848
Copyright N/A
Levelled N/A

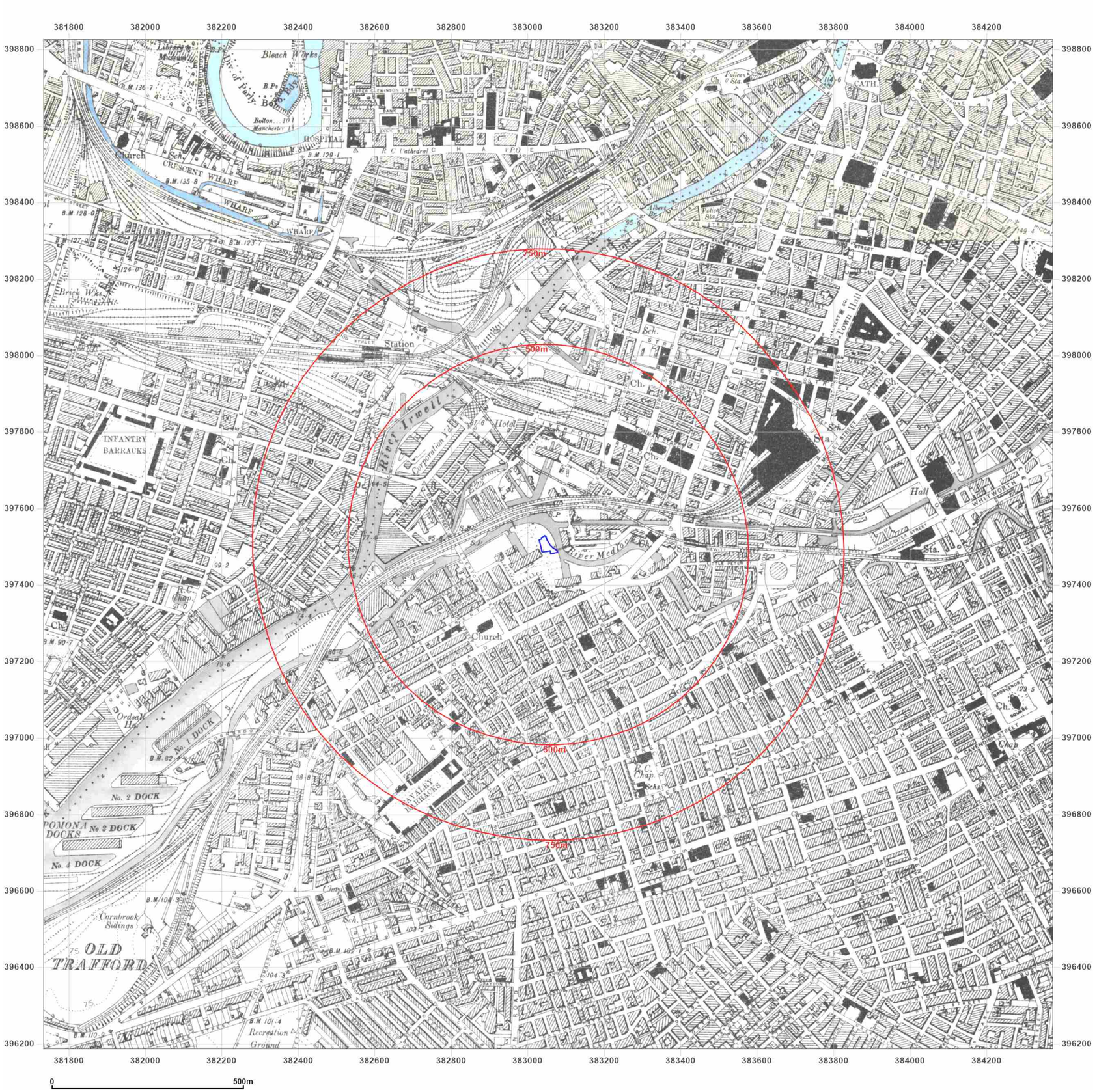
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Site Details:

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Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: County Series

Map date: **1894-1896**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1889
Revised 1889
Edition 1894
Copyright N/A
Levelled N/A

Surveyed 1894
Revised 1896
Edition 1896
Copyright N/A
Levelled N/A

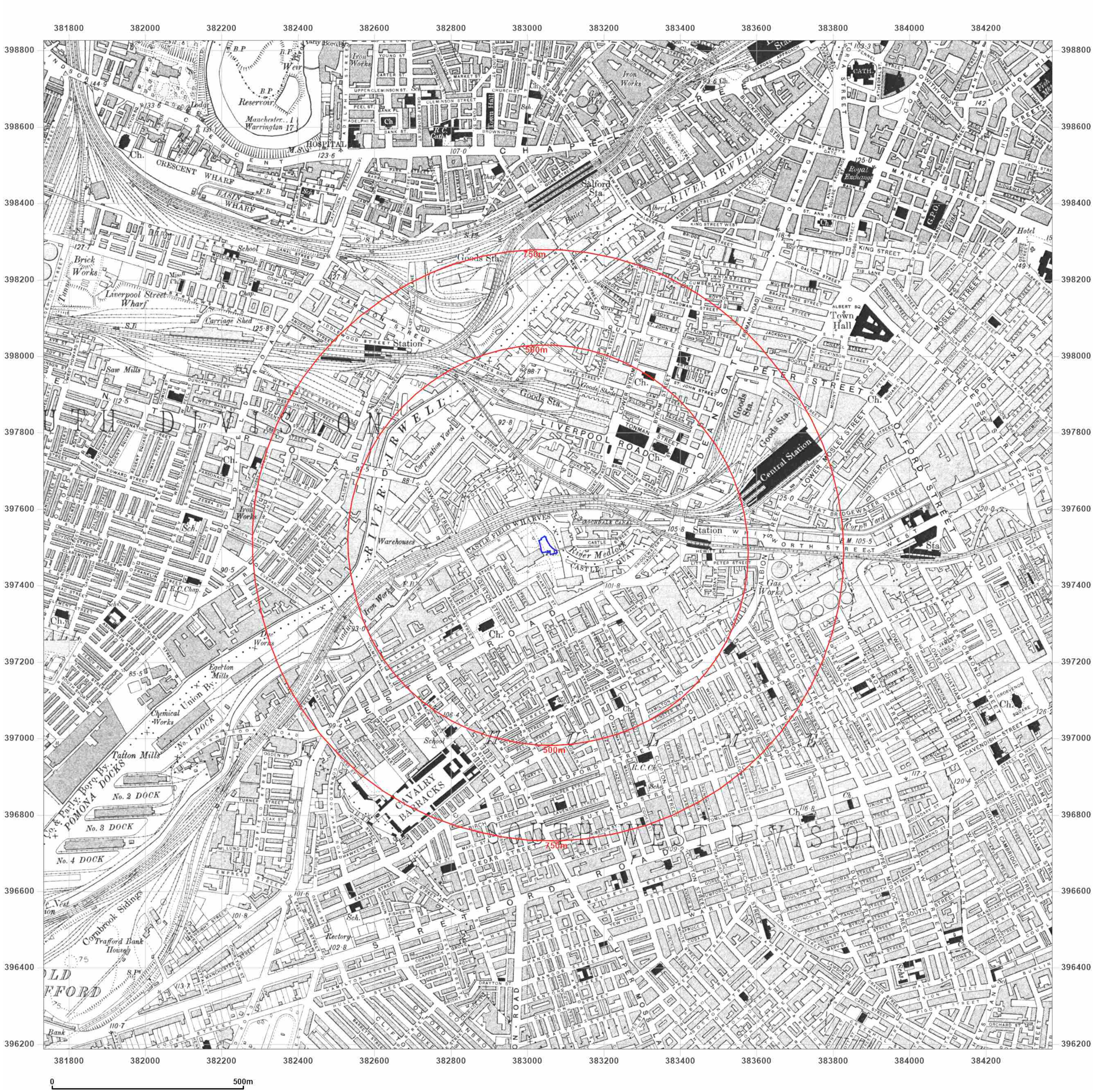
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M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: County Series

Map date: **1905-1906**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1844
Revised 1906
Edition 1906
Copyright N/A
Levelled N/A

Surveyed 1844
Revised 1905
Edition 1905
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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: County Series

Map date: **1923**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1844
Revised 1916
Edition 1923
Copyright N/A
Levelled 1915

Surveyed 1844
Revised 1916
Edition 1923
Copyright N/A
Levelled 1915

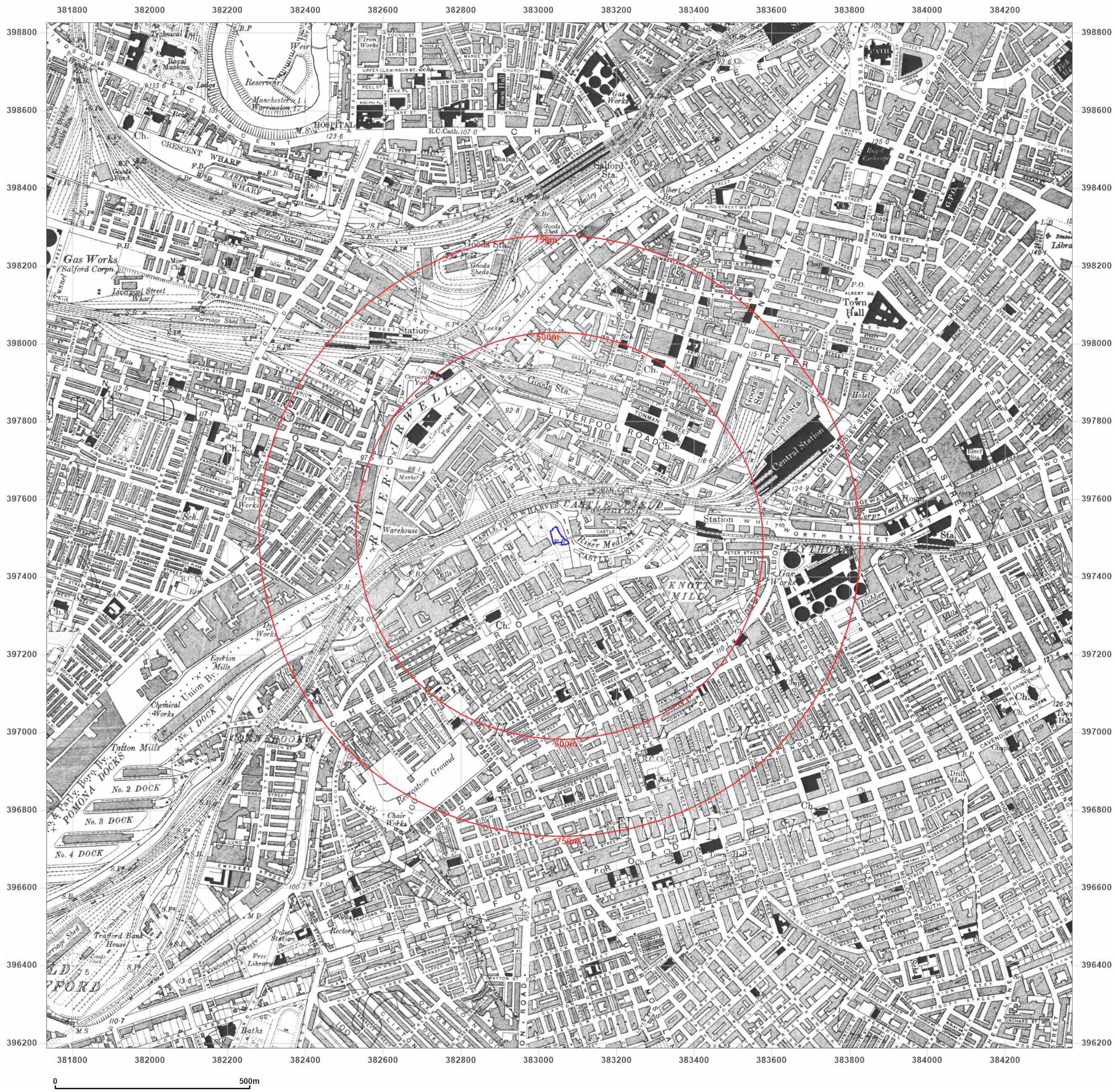
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Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: County Series

Map date: **1923**

Scale: 1:10,560

Printed at: 1:10,560

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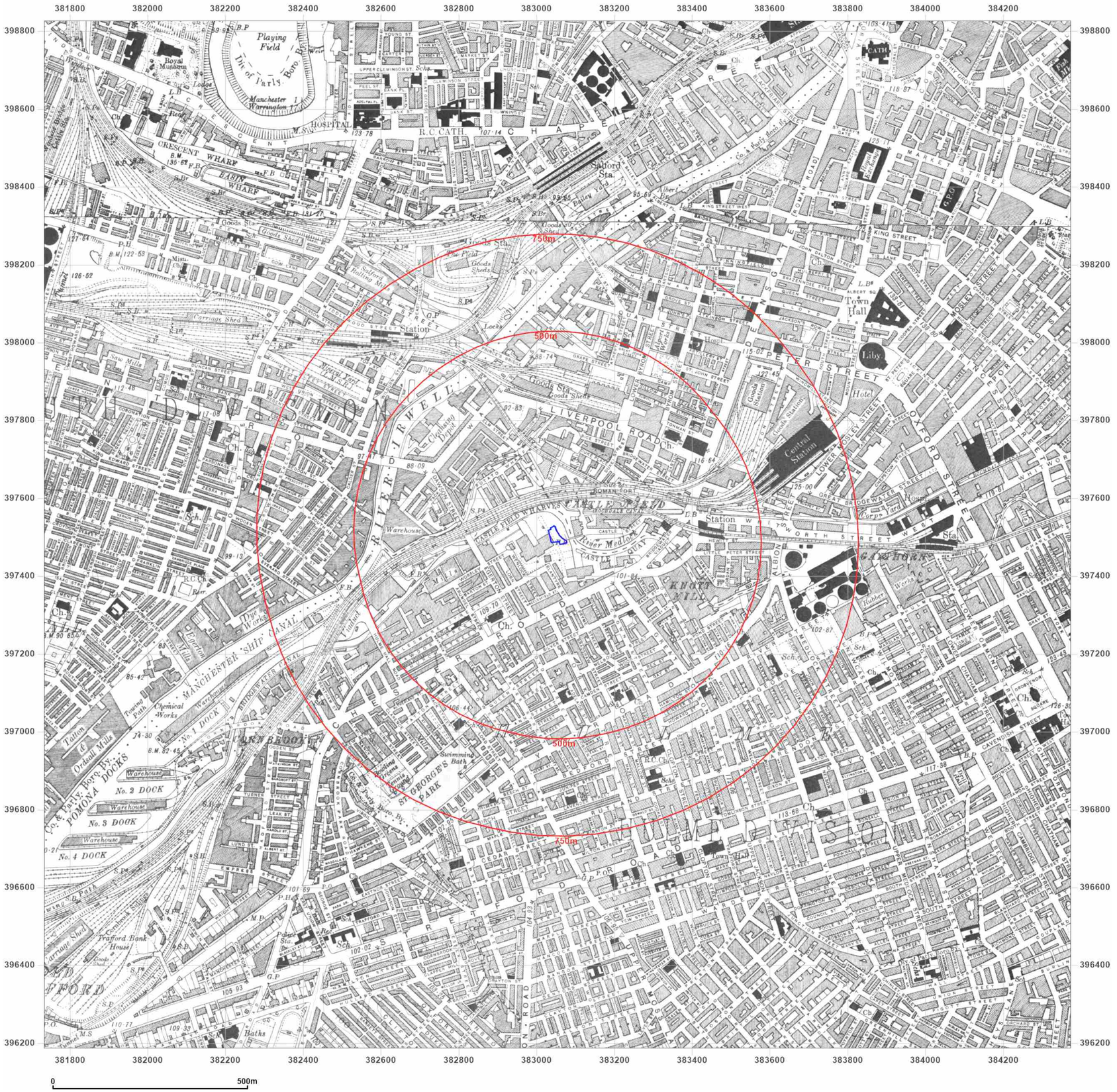
Surveyed 1844
Revised 1916
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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: County Series

Map date: **1931-1932**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1844
Revised 1931
Edition 1931
Copyright N/A
Levelled 1927

Surveyed 1844
Revised 1932
Edition 1932
Copyright N/A
Levelled 1927

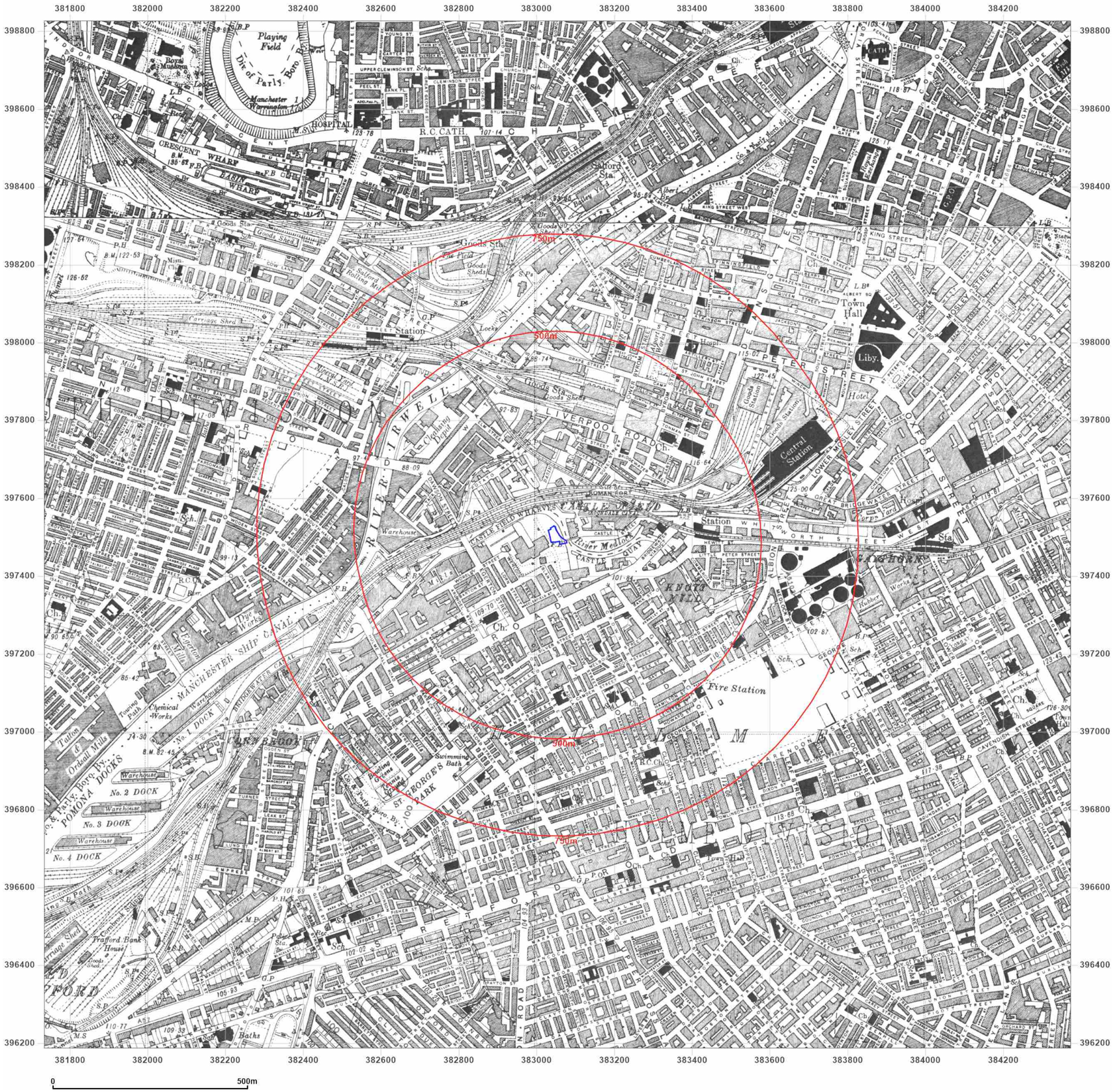
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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1844
Revised 1938
Edition 1938
Copyright N/A
Levelled 1927

Surveyed 1844
Revised 1938
Edition 1938
Copyright N/A
Levelled 1927

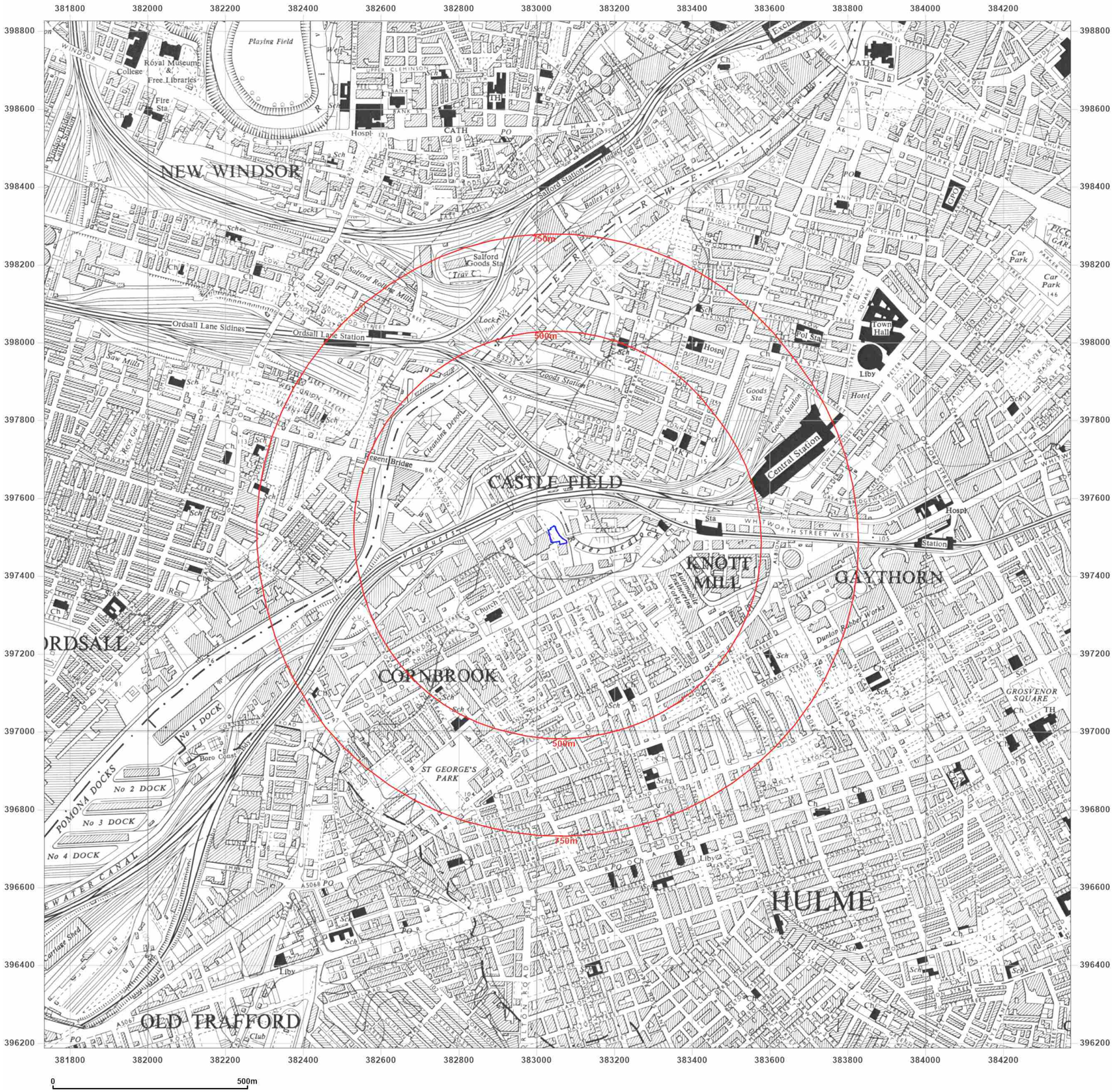
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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: Provisional

Map date: **1956**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1956
Revised 1956
Edition N/A
Copyright 1956
Levelled N/A

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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1972**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1971
Revised 1972
Edition N/A
Copyright 1972
Levelled 1972

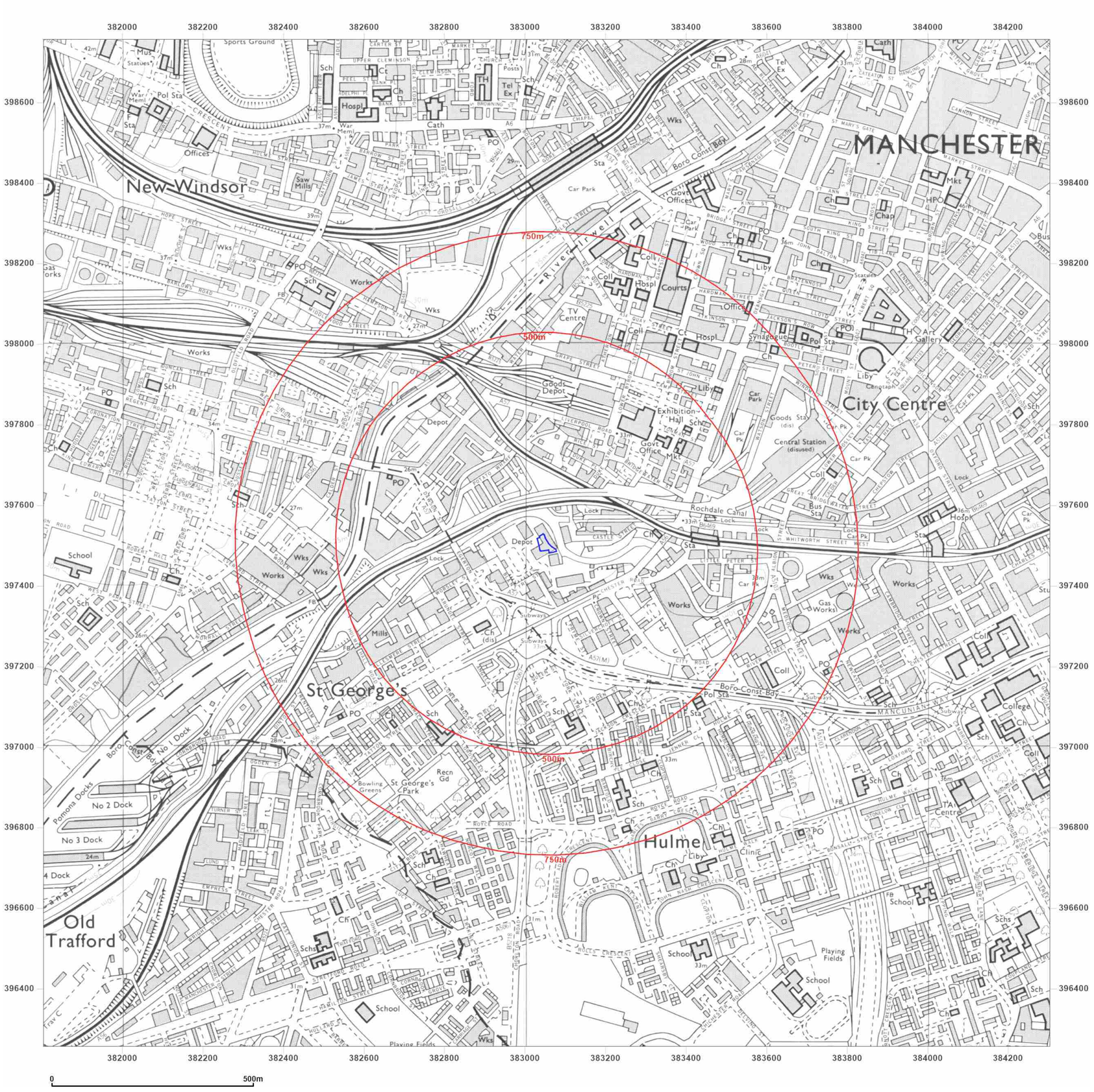
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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1980**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1976
Revised 1980
Edition N/A
Copyright 1980
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Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1985**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
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Surveyed 1983
Revised 1985
Edition N/A
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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER,
M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1988**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
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Surveyed 1986
Revised 1988
Edition N/A
Copyright 1988
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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **1994**

Scale: 1:10,000

Printed at: 1:10,000

N
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Surveyed 1986
Revised 1994
Edition N/A
Copyright 1994
Levelled 1981

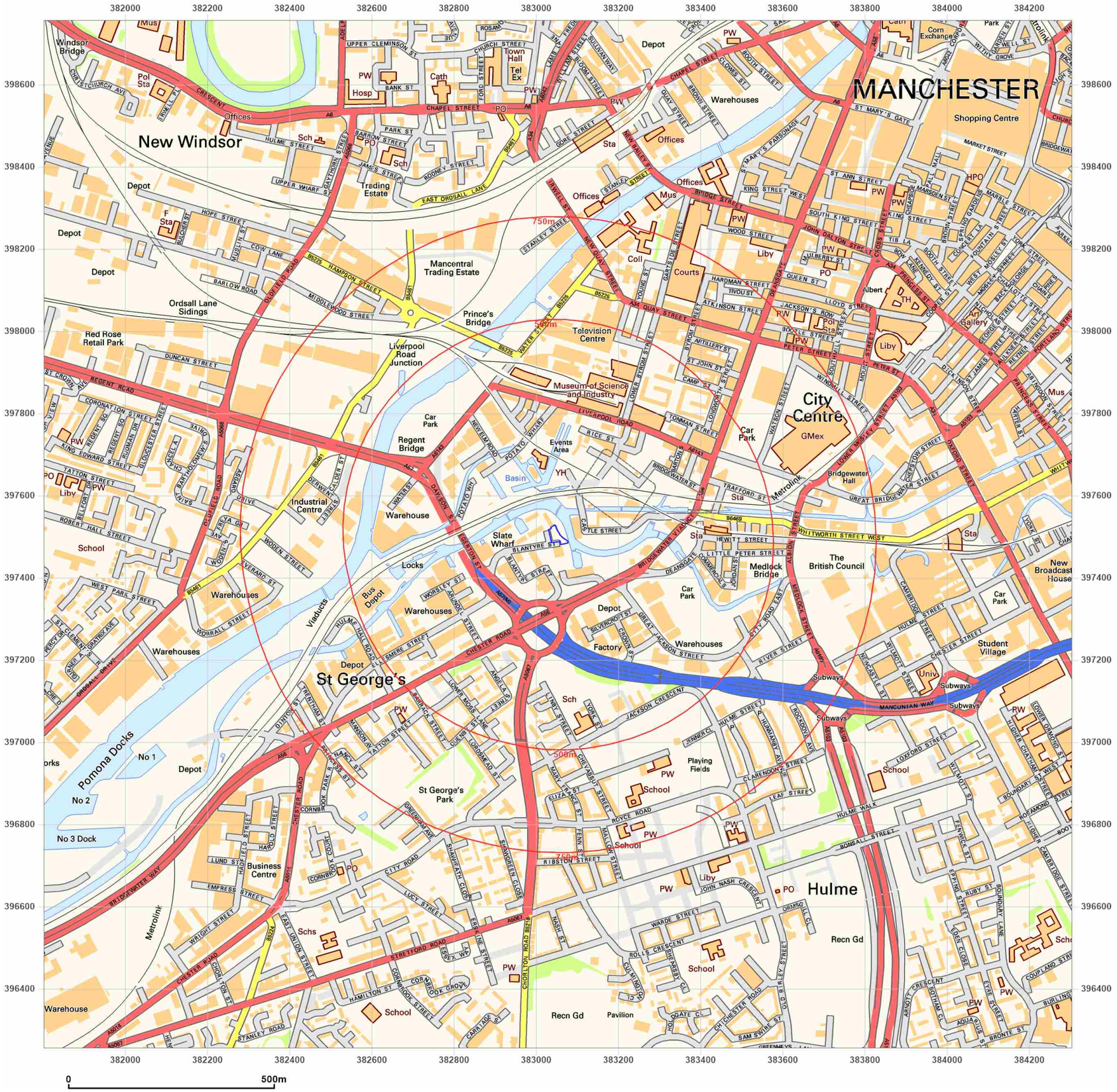
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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **2001**

Scale: 1:10,000

Printed at: 1:10,000

N W E S

2001

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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid

Map date: **2010**

Scale: 1:10,000

Printed at: 1:10,000

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2010

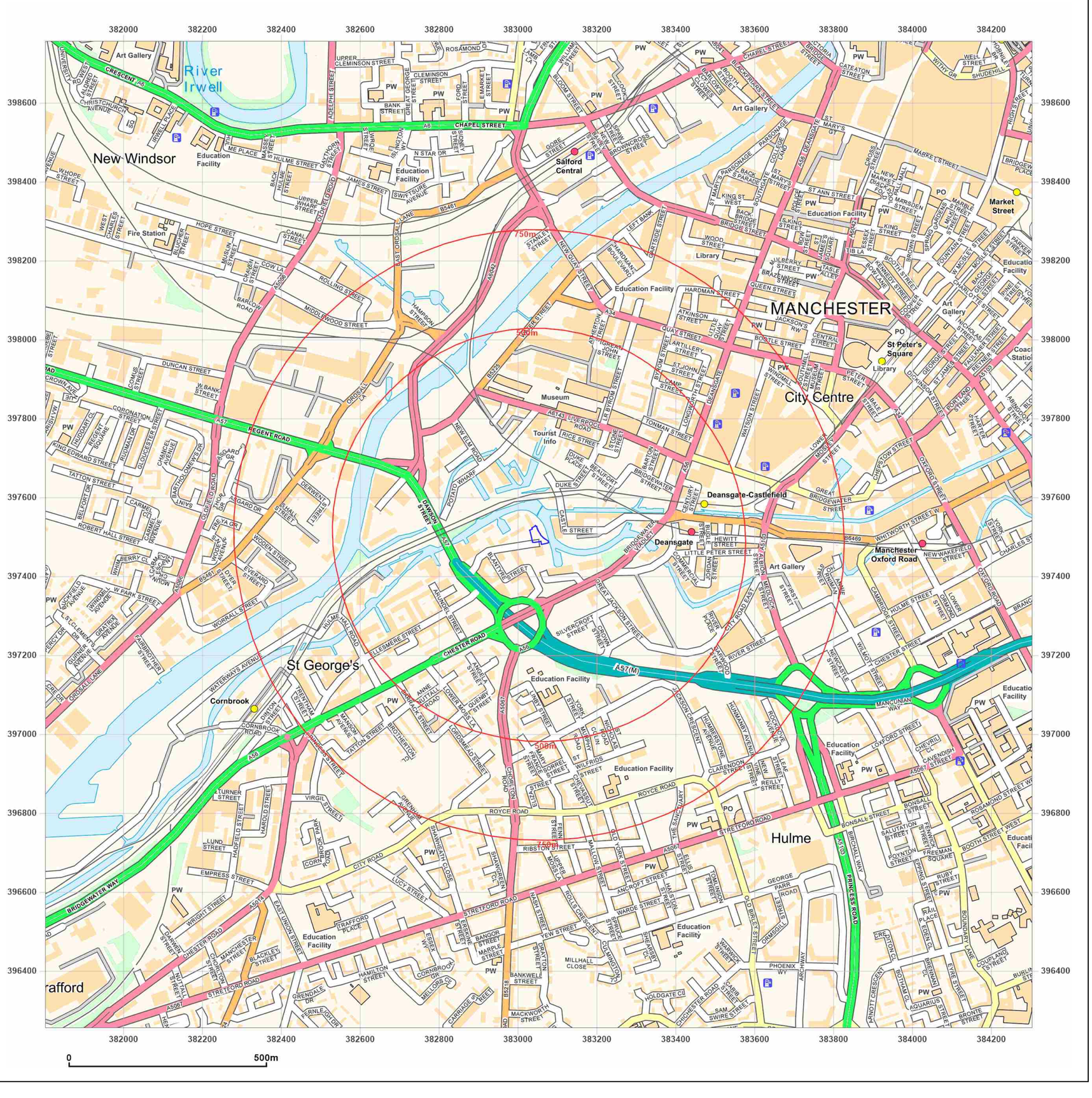
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Groundsure INSIGHTS

Site Details:

SLATE WHARF, MANCHESTER, M15 4ST

Client Ref: 3548
Report Ref: GS-7846918
Grid Ref: 383053, 397506

Map Name: National Grid
Map date: 2021
Scale: 1:10,000
Printed at: 1:10,000

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2021

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APPENDIX 4

GROUNDSURE COMBINED ENVIRO AND GEO INSIGHT REPORT

Groundsure
LOCATION INTELLIGENCE

Enviro+Geo Insight

SLATE WHARF, MANCHESTER, M15 4ST

Order Details

Date: 12/05/2021

Your ref: 3548

Our Ref: GS-7846919

Client: IGE Consulting

Site Details

Location: 383052 397497

Area: 0.11 ha

Authority: Manchester City Council



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Summary of findings p. 2

OS MasterMap site plan p.12

Aerial image p. 8

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info@groundsure.com
08444 159 000

Summary of findings

Page	Section	Past land use	On site	0-50m	50-250m	250-500m	500-2000m
13	1.1	Historical industrial land uses	4	3	37	119	-
19	1.2	Historical tanks	0	0	11	36	-
21	1.3	Historical energy features	0	0	10	16	-
23	1.4	Historical petrol stations	0	0	0	0	-
23	1.5	Historical garages	0	0	21	22	-
25	1.6	Historical military land	0	0	0	0	-
Page	Section	Past land use - un-grouped	On site	0-50m	50-250m	250-500m	500-2000m
26	2.1	Historical industrial land uses	7	3	60	184	-
36	2.2	Historical tanks	0	0	17	74	-
39	2.3	Historical energy features	0	0	23	68	-
43	2.4	Historical petrol stations	0	0	0	0	-
43	2.5	Historical garages	0	0	40	49	-
Page	Section	Waste and landfill	On site	0-50m	50-250m	250-500m	500-2000m
47	3.1	Active or recent landfill	0	0	0	0	-
47	3.2	Historical landfill (BGS records)	0	0	0	0	-
48	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
48	3.4	Historical landfill (EA/NRW records)	0	0	0	1	-
48	3.5	Historical waste sites	0	0	5	30	-
53	3.6	Licensed waste sites	0	0	0	3	-
54	3.7	Waste exemptions	0	0	3	20	-
Page	Section	Current industrial land use	On site	0-50m	50-250m	250-500m	500-2000m
57	4.1	Recent industrial land uses	0	2	20	-	-
59	4.2	Current or recent petrol stations	0	0	1	1	-
59	4.3	Electricity cables	0	0	0	0	-
59	4.4	Gas pipelines	0	0	0	0	-
59	4.5	Sites determined as Contaminated Land	0	0	0	0	-

59	4.6	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
60	4.7	Regulated explosive sites	0	0	0	0	-
60	4.8	Hazardous substance storage/usage	0	0	0	0	-
60	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-
60	4.10	Licensed industrial activities (Part A(1))	0	0	0	0	-
60	**4.11**	**Licensed pollutant release (Part A(2)/B)**	0	0	2	1	-
61	4.12	Radioactive Substance Authorisations	0	0	0	0	-
61	**4.13**	**Licensed Discharges to controlled waters**	0	0	19	14	-
66	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
67	4.15	Pollutant release to public sewer	0	0	0	0	-
67	4.16	List 1 Dangerous Substances	0	0	0	0	-
67	4.17	List 2 Dangerous Substances	0	0	0	0	-
67	**4.18**	**Pollution Incidents (EA/NRW)**	0	0	0	3	-
68	4.19	Pollution inventory substances	0	0	0	0	-
68	4.20	Pollution inventory waste transfers	0	0	0	0	-
68	4.21	Pollution inventory radioactive waste	0	0	0	0	-

Page	Section	Hydrogeology	On site	0-50m	50-250m	250-500m	500-2000m
69	**5.1**	**Superficial aquifer**	Identified (within 500m)				
71	**5.2**	**Bedrock aquifer**	Identified (within 500m)				
72	**5.3**	**Groundwater vulnerability**	Identified (within 50m)				
73	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
73	5.5	Groundwater vulnerability- local information	None (within 0m)				
74	**5.6**	**Groundwater abstractions**	0	0	0	1	46
86	**5.7**	**Surface water abstractions**	0	0	0	0	5
88	**5.8**	**Potable abstractions**	0	0	0	0	9
90	5.9	Source Protection Zones	0	0	0	0	-
91	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-

Page	Section	Hydrology	On site	0-50m	50-250m	250-500m	500-2000m
92	**6.1**	**Water Network (OS MasterMap)**	0	3	24	-	-

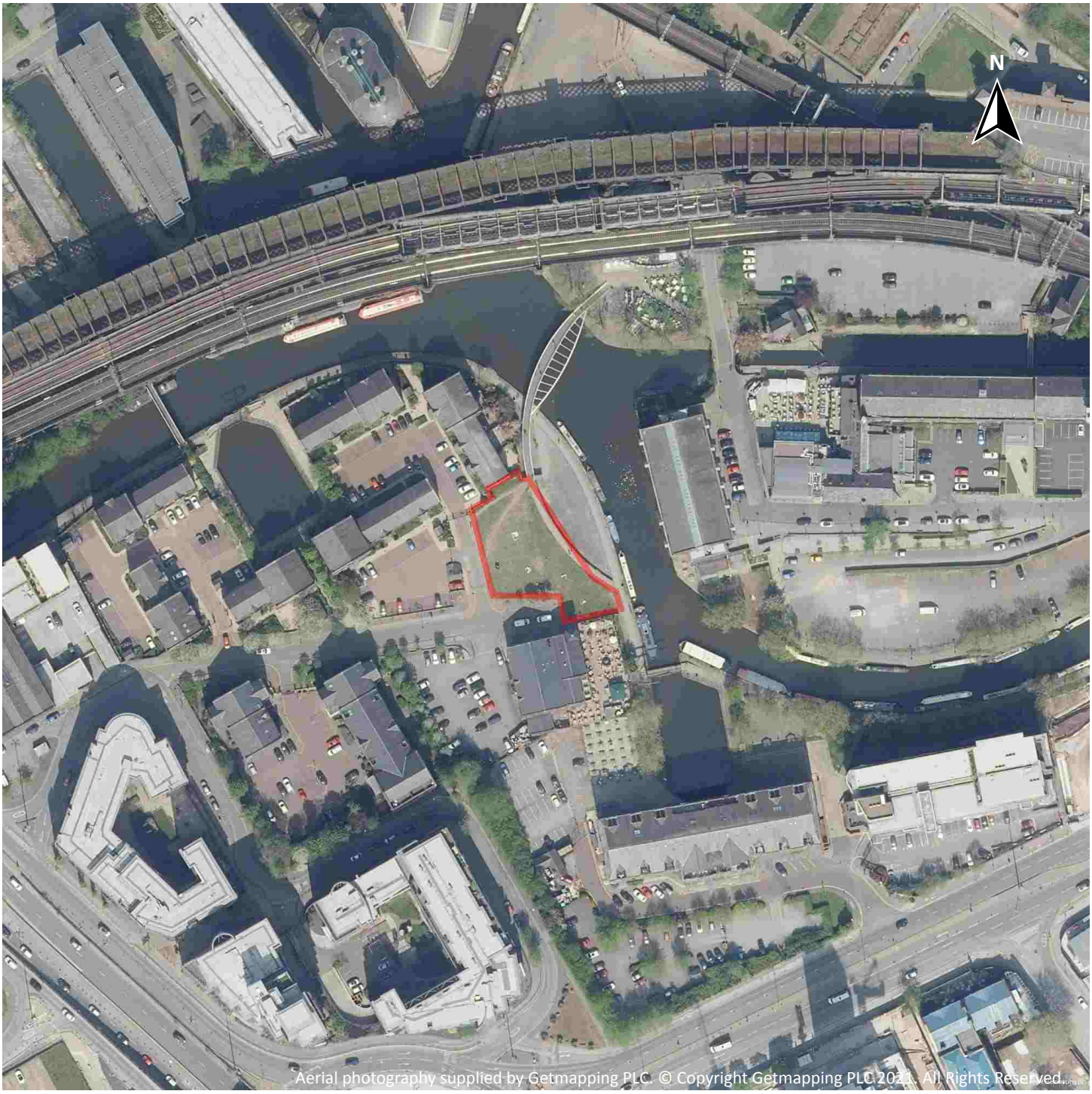
95	6.2	Surface water features	0	2	10	-	-
95	6.3	WFD Surface water body catchments	1	-	-	-	-
95	6.4	WFD Surface water bodies	0	2	1	-	-
96	6.5	WFD Groundwater bodies	1	-	-	-	-
Page	Section	River and coastal flooding	On site	0-50m	50-250m	250-500m	500-2000m
97	7.1	Risk of Flooding from Rivers and Sea (RoFRaS)	High (within 50m)				
98	7.2	Historical Flood Events	0	0	1	-	-
98	7.3	Flood Defences	0	0	0	-	-
98	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
99	7.5	Flood Storage Areas	0	0	0	-	-
100	7.6	Flood Zone 2	Identified (within 50m)				
101	7.7	Flood Zone 3	Identified (within 50m)				
Page	Section	Surface water flooding					
102	8.1	Surface water flooding	1 in 30 year, 0.1m - 0.3m (within 50m)				
Page	Section	Groundwater flooding					
104	9.1	Groundwater flooding	High (within 50m)				
Page	Section	Environmental designations	On site	0-50m	50-250m	250-500m	500-2000m
105	10.1	Sites of Special Scientific Interest (SSSI)	0	0	0	0	0
105	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
105	10.3	Special Areas of Conservation (SAC)	0	0	0	0	0
105	10.4	Special Protection Areas (SPA)	0	0	0	0	0
106	10.5	National Nature Reserves (NNR)	0	0	0	0	0
106	10.6	Local Nature Reserves (LNR)	0	0	0	0	0
106	10.7	Designated Ancient Woodland	0	0	0	0	0
106	10.8	Biosphere Reserves	0	0	0	0	0
107	10.9	Forest Parks	0	0	0	0	0
107	10.10	Marine Conservation Zones	0	0	0	0	0
107	10.11	Green Belt	0	0	0	0	0
107	10.12	Proposed Ramsar sites	0	0	0	0	0

107	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
108	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
108	10.15	Nitrate Sensitive Areas	0	0	0	0	0
108	**10.16**	**Nitrate Vulnerable Zones**	0	0	0	0	3
109	**10.17**	**SSSI Impact Risk Zones**	1	-	-	-	-
110	10.18	SSSI Units	0	0	0	0	0
Page	Section	Visual and cultural designations	On site	0-50m	50-250m	250-500m	500-2000m
111	11.1	World Heritage Sites	0	0	0	-	-
112	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
112	11.3	National Parks	0	0	0	-	-
112	**11.4**	**Listed Buildings**	0	1	9	-	-
113	**11.5**	**Conservation Areas**	1	0	0	-	-
113	**11.6**	**Scheduled Ancient Monuments**	0	0	1	-	-
114	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations	On site	0-50m	50-250m	250-500m	500-2000m
115	**12.1**	**Agricultural Land Classification**	Urban (within 250m)				
116	12.2	Open Access Land	0	0	0	-	-
116	12.3	Tree Felling Licences	0	0	0	-	-
116	12.4	Environmental Stewardship Schemes	0	0	0	-	-
116	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
117	13.1	Priority Habitat Inventory	0	0	0	-	-
117	13.2	Habitat Networks	0	0	0	-	-
117	13.3	Open Mosaic Habitat	0	0	0	-	-
117	13.4	Limestone Pavement Orders	0	0	0	-	-
Page	Section	Geology 1:10,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
118	**14.1**	**10k Availability**	Identified (within 500m)				
119	**14.2**	**Artificial and made ground (10k)**	0	0	2	4	-
121	**14.3**	**Superficial geology (10k)**	0	1	1	2	-

122	14.4	Landslip (10k)	0	0	0	0	-
123	**14.5**	**Bedrock geology (10k)**	1	0	0	0	-
124	**14.6**	**Bedrock faults and other linear features (10k)**	0	0	0	1	-
Page	Section	Geology 1:50,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
125	**15.1**	**50k Availability**	Identified (within 500m)				
126	**15.2**	**Artificial and made ground (50k)**	0	0	0	2	-
127	15.3	Artificial ground permeability (50k)	0	0	-	-	-
128	**15.4**	**Superficial geology (50k)**	0	1	1	2	-
129	**15.5**	**Superficial permeability (50k)**	Identified (within 50m)				
129	15.6	Landslip (50k)	0	0	0	0	-
129	15.7	Landslip permeability (50k)	None (within 50m)				
130	**15.8**	**Bedrock geology (50k)**	1	0	0	0	-
131	**15.9**	**Bedrock permeability (50k)**	Identified (within 50m)				
131	**15.10**	**Bedrock faults and other linear features (50k)**	0	0	0	1	-
Page	Section	Boreholes	On site	0-50m	50-250m	250-500m	500-2000m
132	**16.1**	**BGS Boreholes**	1	4	122	-	-
Page	Section	Natural ground subsidence					
138	**17.1**	**Shrink swell clays**	Very low (within 50m)				
139	**17.2**	**Running sands**	Low (within 50m)				
141	**17.3**	**Compressible deposits**	Negligible (within 50m)				
142	**17.4**	**Collapsible deposits**	Very low (within 50m)				
143	**17.5**	**Landslides**	Very low (within 50m)				
144	**17.6**	**Ground dissolution of soluble rocks**	Negligible (within 50m)				
Page	Section	Mining, ground workings and natural cavities	On site	0-50m	50-250m	250-500m	500-2000m
146	18.1	Natural cavities	0	0	0	0	-
147	18.2	BritPits	0	0	0	0	-
147	**18.3**	**Surface ground workings**	2	14	14	-	-
148	18.4	Underground workings	0	0	0	0	0
148	18.5	Historical Mineral Planning Areas	0	0	0	0	-

149	18.6	Non-coal mining	0	0	0	0	0
149	**18.7**	**Mining cavities**	0	0	0	0	1
149	**18.8**	**JPB mining areas**	Identified (within 0m)				
150	**18.9**	**Coal mining**	Identified (within 0m)				
150	18.10	Brine areas	None (within 0m)				
150	18.11	Gypsum areas	None (within 0m)				
151	18.12	Tin mining	None (within 0m)				
151	18.13	Clay mining	None (within 0m)				
Page	Section	Radon					
152	**19.1**	**Radon**	Less than 1% (within 0m)				
Page	Section	Soil chemistry	On site	0-50m	50-250m	250-500m	500-2000m
153	**20.1**	**BGS Estimated Background Soil Chemistry**	2	2	-	-	-
153	**20.2**	**BGS Estimated Urban Soil Chemistry**	2	4	-	-	-
154	20.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-
Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
155	21.1	Underground railways (London)	0	0	0	-	-
155	21.2	Underground railways (Non-London)	0	0	0	-	-
156	**21.3**	**Railway tunnels**	0	0	1	-	-
156	**21.4**	**Historical railway and tunnel features**	0	3	25	-	-
157	21.5	Royal Mail tunnels	0	0	0	-	-
157	**21.6**	**Historical railways**	0	0	3	-	-
158	**21.7**	**Railways**	0	0	24	-	-
159	21.8	Crossrail 1	0	0	0	0	-
159	21.9	Crossrail 2	0	0	0	0	-
159	21.10	HS2	0	0	0	0	-

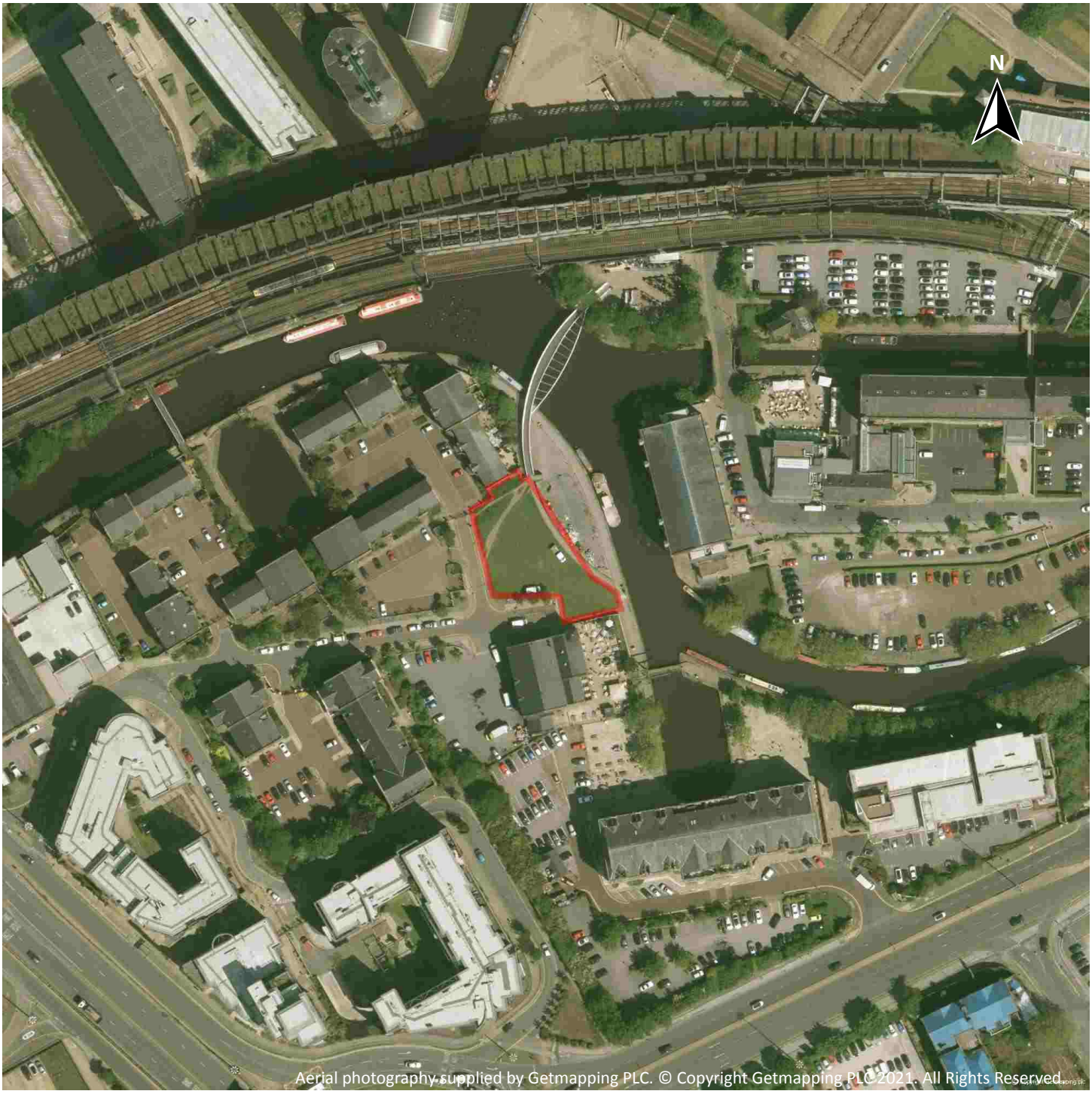
Recent aerial photograph



Capture Date: 22/04/2019

Site Area: 0.11ha

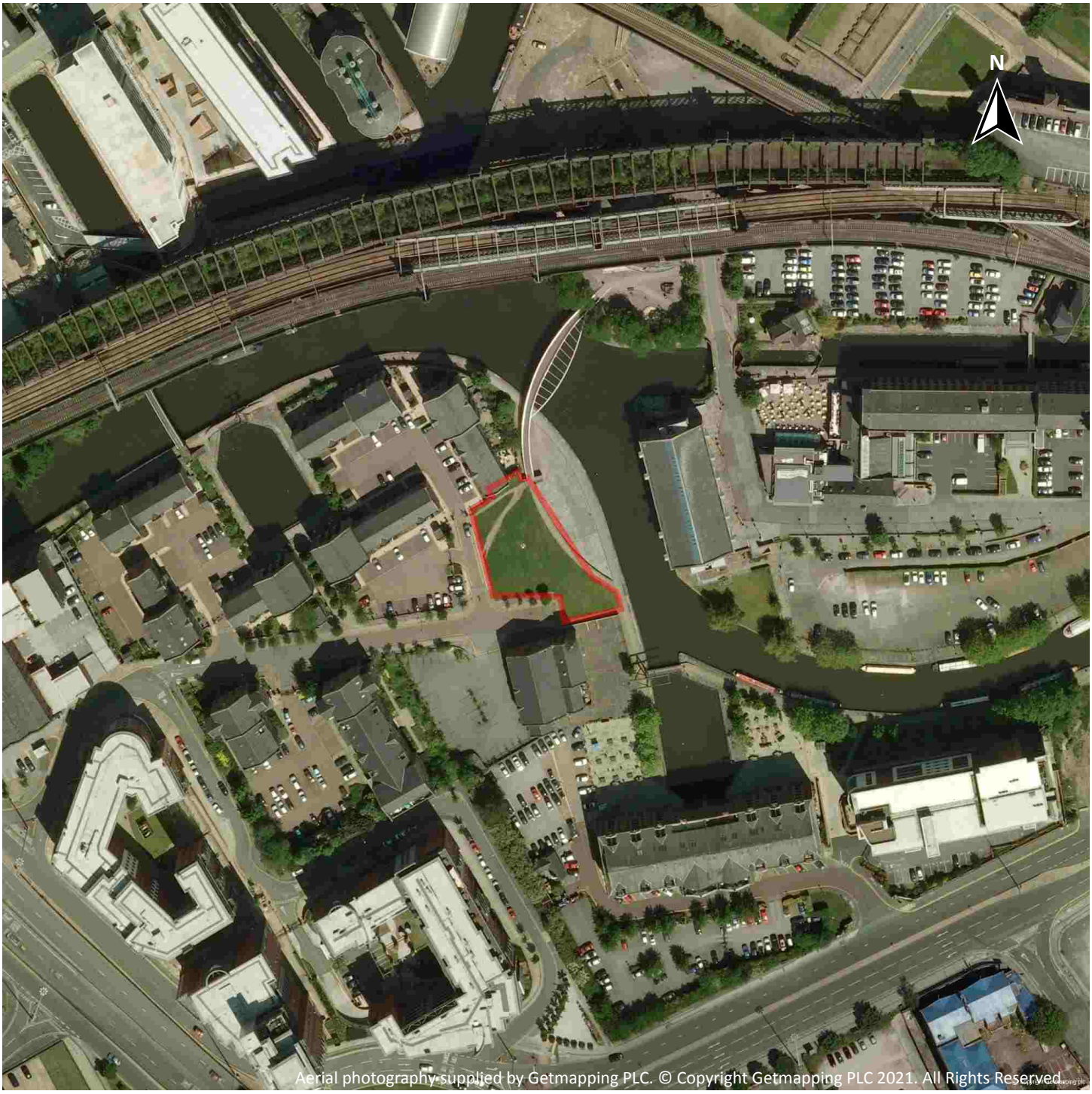
Recent site history - 2015 aerial photograph



Capture Date: 11/06/2015

Site Area: 0.11ha

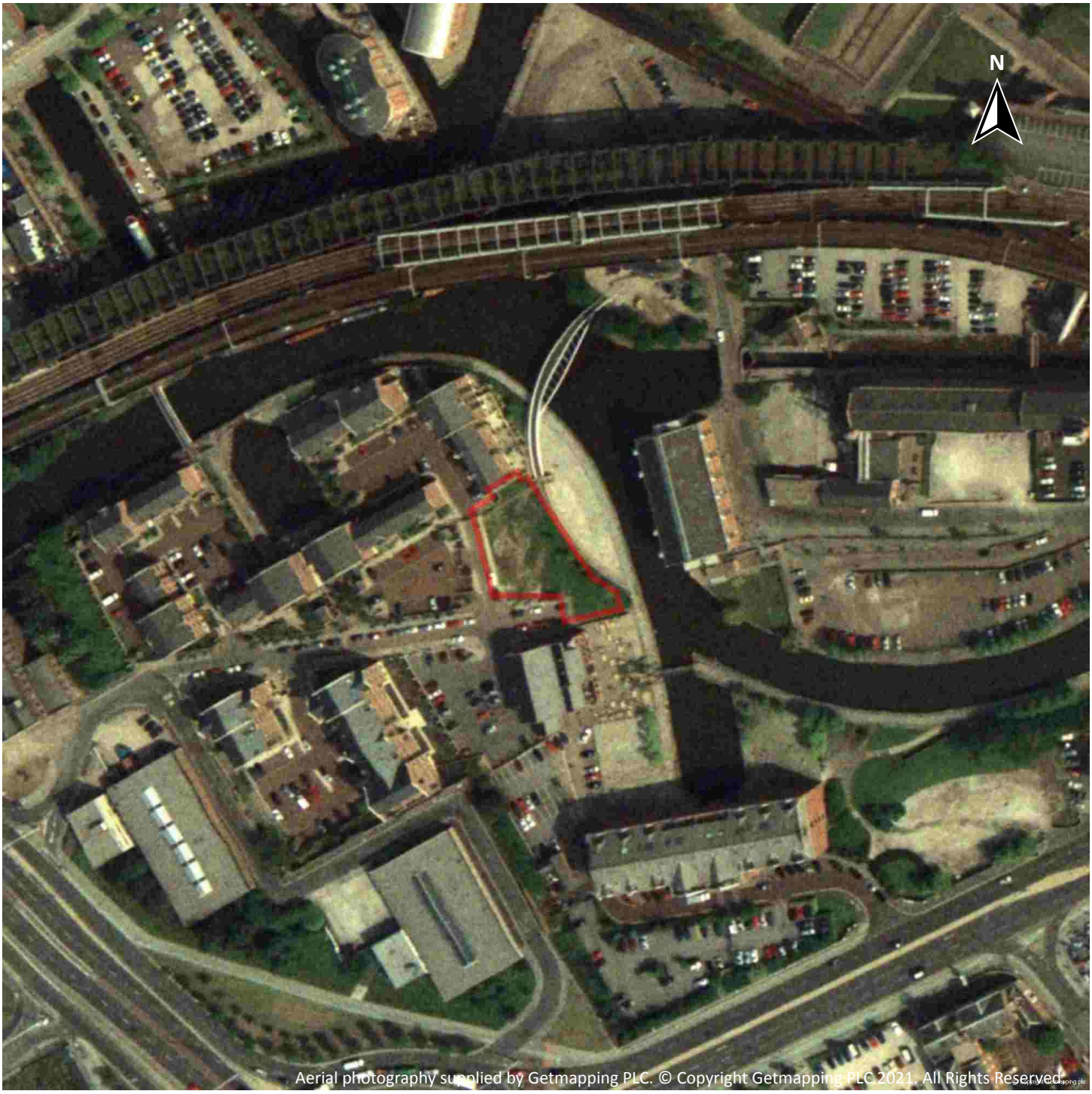
Recent site history - 2009 aerial photograph



Capture Date: 02/06/2009

Site Area: 0.11ha

Recent site history - 2000 aerial photograph



Capture Date: 27/06/2000

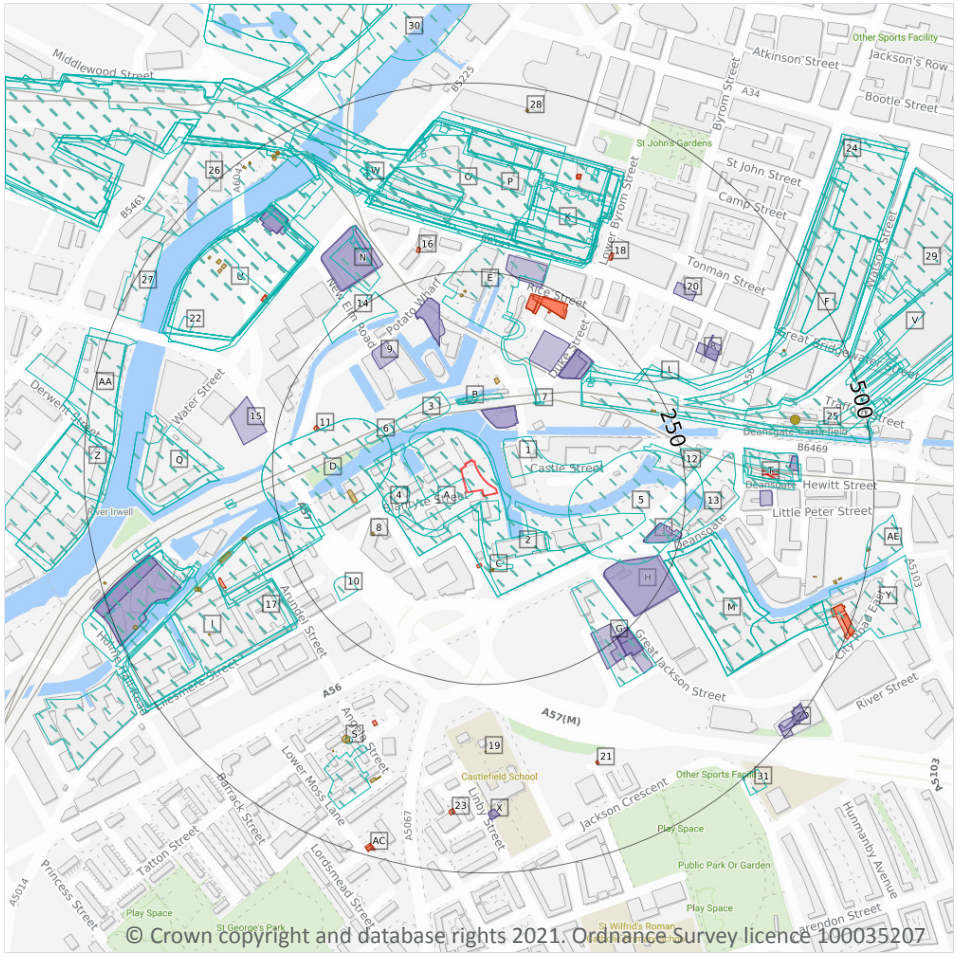
Site Area: 0.11ha

OS MasterMap site plan



Site Area: 0.11ha

1 Past land use



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1.1 Historical industrial land uses

Records within 500m	163

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 1:10,560 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
A	**On site**	**Warehouse**	**1851**	**837277**

ID	Location	Land use	Dates present	Group ID
A	**On site**	**Quay**	**1851**	**846276**
A	**On site**	**Unspecified Depot**	**1978**	**853404**
A	**On site**	**Unspecified Depot**	**1985 - 1994**	**921090**
A	7m S	Unspecified Warehouses	1971	812727
A	9m SW	Unspecified Ground Workings	1851	800608
1	26m NE	Slate Wharf	1851	837258
2	62m S	Warehouse	1851	837278
3	71m NW	Timber Wharf	1851	811392
4	74m W	Gravel Pit	1851	807881
B	74m N	Railway Building	1916 - 1923	906988
B	77m N	Railway Buildings	1905	833631
B	77m N	Railway Building	1932 - 1938	878526
D	93m W	Unspecified Wharves	1905 - 1916	881666
D	93m W	Unspecified Wharves	1932 - 1938	937403
5	97m E	Quay	1905 - 1938	872988
6	103m NW	Wharf	1851	831113
7	110m NE	Railway Building	1905 - 1923	846298
B	112m NE	Unspecified Ground Workings	1851	800610
F	158m NE	Railway Sidings	1923	923309
G	161m SE	Unspecified Depot	1971	818414
F	163m NE	Railway Sidings	1905 - 1916	871753
F	163m NE	Railway Sidings	1932 - 1938	982150
E	166m N	Unspecified Depot	1985 - 1988	896077
B	180m NE	Railway Building	1923	820260
B	182m NE	Railway Building	1932 - 1938	982027
B	186m NE	Railway Building	1916	972538
F	188m NE	Railway Sidings	1956	917334
10	193m SW	Sand Pit	1851	797576

ID	Location	Land use	Dates present	Group ID
I	197m W	Unspecified Commercial/Industrial	1956 - 1971	923803
I	201m W	Unspecified Commercial/Industrial	1905	894637
I	201m W	Unspecified Mills	1916 - 1938	928073
12	203m E	Unspecified Commercial/Industrial	1851	796720
13	207m E	Unspecified Commercial/Industrial	1851	796718
14	221m NW	Paper Mill	1851	833296
L	234m NE	Railway Buildings	1905 - 1938	962263
M	239m E	Unspecified Commercial/Industrial	1923	846058
M	239m E	Unspecified Mill	1932 - 1938	877197
M	239m E	Unspecified Commercial/Industrial	1905	896875
M	239m E	Unspecified Mill	1916	904261
M	240m E	Automobile Works	1956	813191
M	240m E	Unspecified Works	1978	940175
M	240m E	Unspecified Works	1971	948531
I	245m W	Unspecified Commercial/Industrial	1896	861626
N	262m NW	Unspecified Commercial/Industrial	1923	796721
I	282m SW	Unspecified Mills	1978	870292
O	284m N	Railway Sidings	1923	921834
K	287m N	Railway Buildings	1896	833656
O	287m N	Railway Sidings	1896	979167
K	289m N	Goods Sheds	1905 - 1938	958104
O	289m N	Railway Sidings	1916 - 1938	893253
O	289m N	Railway Sidings	1894	920471
O	289m N	Railway Sidings	1932	936526
O	289m N	Railway Sidings	1905	984895
I	291m SW	Unspecified Commercial/Industrial	1923	965943
P	295m N	Goods Depot	1978	893922
P	295m N	Goods Depot	1971	912312

ID	Location	Land use	Dates present	Group ID
K	295m N	Railway Building	1978	848652
K	295m N	Railway Building	1971	911620
K	295m N	Railway Building	1985	938373
K	296m N	Railway Sidings	1956	951082
O	296m N	Railway Sidings	1956	956450
P	302m N	Unspecified Commercial/Industrial	1851	796722
I	302m W	Railway Building	1923	820273
O	304m N	Railway Sidings	1971	888837
O	304m N	Railway Sidings	1985	891167
O	304m N	Railway Sidings	1978	944715
I	305m W	Railway Building	1932 - 1938	912895
P	307m N	Railway Sidings	1988 - 1994	962023
P	308m N	Railway Building	1905 - 1916	858395
P	308m N	Railway Building	1932 - 1938	966518
N	310m NW	Refuse Heap	1851	829086
P	312m N	Railway Buildings	1896	833655
Q	314m W	Quay	1851	808069
P	318m N	Railway Sidings	1851	921813
Q	321m W	Unspecified Warehouses	1905	812726
Q	321m W	Unspecified Warehouse	1916 - 1938	867773
T	327m E	Railway Station	1905 - 1938	975016
P	327m N	Goods Station	1905 - 1938	920947
T	329m E	Railway Station	1896	899988
T	331m E	Railway Station	1978	855265
T	331m E	Railway Station	1956 - 1971	962338
P	333m N	Railway Building	1985 - 1994	858030
P	333m N	Railway Building	1956 - 1971	893290
P	333m N	Railway Building	1978	963323

ID	Location	Land use	Dates present	Group ID
U	336m NW	Corporation Yard	1896	896211
T	337m E	Railway Station	1985 - 1994	880682
U	338m NW	Chemical Works	1851	834546
U	339m NW	Unspecified Depot	1978	848064
U	339m NW	Unspecified Depot	1985	873557
U	339m NW	Unspecified Depot	1988	876447
U	339m NW	Unspecified Depot	1971	889604
U	339m NW	Cleansing Depot	1956	901006
U	340m NW	Quay	1851	808070
K	340m NE	Goods Sheds	1905 - 1938	880509
U	341m NW	Corporation Yard	1916	987793
U	341m NW	Corporation Yard	1923	899229
U	341m NW	Corporation Yard	1905	974049
V	341m E	Railway Sidings	1896	975593
U	343m NW	Cleansing Depot	1932 - 1938	902946
K	346m N	Railway Building	1978	907268
K	346m N	Railway Building	1985	923295
K	346m N	Railway Building	1971	983624
K	347m N	Goods Station	1956	821661
S	360m SW	Unspecified Tank	1971	825226
S	363m S	Dye Works	1851	833956
I	370m W	Unspecified Commercial/Industrial	1896	974596
I	376m W	Iron Works	1905	822792
I	376m W	Unspecified Commercial/Industrial	1916 - 1923	850018
F	385m NE	Railway Sidings	1971	946450
F	385m NE	Railway Sidings	1985	958621
F	385m NE	Railway Sidings	1978	989903
O	389m NW	Dye Works	1851	833958

ID	Location	Land use	Dates present	Group ID
P	391m N	Goods Sheds	1905 - 1938	895888
P	393m N	Railway Building	1896	878088
W	394m N	Railway Building	1923	969528
P	394m N	Railway Building	1956 - 1971	913293
P	394m N	Railway Building	1985	916120
P	394m N	Railway Building	1978	967702
W	399m N	Railway Building	1956	820442
W	401m N	Railway Building	1932 - 1938	903707
W	401m N	Railway Building	1905 - 1916	865666
22	403m NW	Brewery	1851	822705
K	404m NE	Railway Buildings	1932 - 1938	921932
P	405m N	Railway Buildings	1923	925398
P	406m N	Railway Building	1923	820441
O	410m NW	Refuse Heap	1851	829085
I	411m W	Railway Buildings	1923	833632
P	411m N	Railway Buildings	1905 - 1916	876717
P	411m N	Railway Buildings	1932 - 1938	894881
I	412m W	Railway Building	1932 - 1938	920704
K	412m NE	Railway Building	1905 - 1923	869326
I	417m SW	Sawmill	1851	808364
F	417m NE	Railway Building	1923	820272
24	425m NE	Railway Buildings	1923	833657
W	430m N	Railway Building	1923	820443
P	435m N	Railway Building	1916 - 1923	854882
25	437m E	Railway Building	1905 - 1938	978111
W	441m N	Railway Building	1956	820440
Y	441m E	Brewery	1851	822706
I	442m W	Railway Building	1932 - 1938	845151

ID	Location	Land use	Dates present	Group ID
Z	455m W	Silk and Cotton Mill	1851	810085
V	460m E	Disused Station	1978	925495
Z	460m W	Unspecified Commercial/Industrial	1956 - 1971	941987
26	461m NW	Corporation Yard	1916 - 1923	939407
AA	462m W	Unspecified Commercial/Industrial	1916 - 1938	919087
AA	462m W	Unspecified Commercial/Industrial	1905	980628
27	465m NW	Cotton Mill	1851	797895
AB	465m W	Iron Works	1916 - 1923	873229
AB	465m W	Unspecified Commercial/Industrial	1932 - 1938	846750
AB	465m W	Unspecified Commercial/Industrial	1905	870019
O	467m NW	Railway Sidings	1851	861529
O	469m NW	Railway Building	1923	855519
O	477m NW	Railway Building	1905 - 1916	930060
O	477m NW	Railway Building	1932 - 1938	946353
V	485m E	Railway Station	1905 - 1938	896284
V	494m E	Railway Station	1956	888631
29	494m E	Railway Station	1896	915817
O	495m NW	Railway Building	1932 - 1938	895977
O	495m NW	Railway Building	1905 - 1916	903757
AE	496m E	Cotton Mill	1851	797881
30	497m N	Unspecified Wharf	1916 - 1923	884372
31	498m SE	Fire Station	1938	891974

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m	**47**

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or

succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
C	97m S	Unspecified Tank	1980	132153
C	97m S	Unspecified Tank	1980	143849
C	97m S	Unspecified Tank	1960	123914
C	97m S	Unspecified Tank	1969	143958
C	98m S	Unspecified Tank	1963	141829
B	106m N	Unspecified Tank	1922	115648
8	135m SW	Unspecified Tank	1995 - 1998	132953
D	144m W	Tanks	1963	148559
E	217m N	Unspecified Tank	1963	131255
E	223m N	Unspecified Tank	1963	133635
L	230m NE	Unspecified Tank	1932	115649
I	298m W	Tanks	1949	140617
I	299m W	Tanks	1948 - 1998	149178
17	313m SW	Unspecified Tank	1891	115659
I	323m W	Unspecified Tank	1948 - 1949	123558
19	339m S	Unspecified Tank	1891	115663
S	360m SW	Unspecified Tank	1963	127413
I	375m W	Unspecified Tank	1908	125058
I	378m W	Unspecified Tank	1893 - 1922	147499
S	386m SW	Unspecified Tank	1891	115662
I	390m SW	Unspecified Tank	1891	115660
S	394m S	Unspecified Tank	1949	135351
S	398m S	Unspecified Tank	1948 - 1954	126405
U	412m NW	Unspecified Tank	1949 - 1963	128766
U	412m NW	Unspecified Tank	1932	115639
U	421m NW	Unspecified Tank	1949 - 1963	136050

ID	Location	Land use	Dates present	Group ID
F	423m NE	Unspecified Tank	1979	134110
F	423m NE	Unspecified Tank	1979	148049
Y	434m E	Unspecified Tank	1891	115779
U	434m NW	Unspecified Tank	1932	115634
Y	461m E	Tanks	1948	107130
Y	467m E	Tanks	1948	106777
28	467m N	Unspecified Tank	1891	115647
I	472m SW	Unspecified Tank	1982 - 1998	122775
O	475m NW	Unspecified Tank	1908	131064
O	479m NW	Unspecified Tank	1893 - 1922	126917
O	479m NW	Unspecified Tank	1980	135020
O	480m NW	Unspecified Tank	1990	144767
O	480m NW	Unspecified Tank	1992 - 1997	125308
O	488m NW	Unspecified Tank	1932	115640
O	489m NW	Unspecified Tank	1953	133553
O	490m NW	Unspecified Tank	1949	129333
O	490m NW	Unspecified Tank	1963	130189
O	490m NW	Unspecified Tank	1949	137879
O	490m NW	Unspecified Tank	1949	146026
I	493m W	Unspecified Tank	1948 - 1963	128267
AE	496m E	Unspecified Tank	1891	115954

This data is sourced from Ordnance Survey / Groundsure.

1.3 Historical energy features

Records within 500m	26

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
C	89m S	Electricity Substation	1995 - 1997	72564
11	195m W	Electricity Substation	1980 - 1997	78864
K	211m NE	Electricity Substation	1986	67819
K	211m NE	Electricity Substation	1990	69796
K	213m N	Electricity Substation	1981	80246
K	213m N	Electricity Substation	1994 - 1995	83961
K	220m NE	Electricity Substation	1948	82720
K	223m NE	Electricity Substation	1995	82695
K	223m NE	Electricity Substation	1948 - 1979	80738
K	224m NE	Electricity Substation	1979	77417
16	284m N	Electricity Substation	1994 - 1997	81653
18	321m NE	Electricity Substation	1948 - 1995	75611
S	327m S	Electricity Substation	1977 - 1998	77866
U	343m NW	Electricity Substation	1992 - 1997	73642
U	343m NW	Electricity Substation	1990	78385
I	344m W	Electricity Substation	1948 - 1949	73349
21	379m S	Electricity Substation	1997	65434
K	397m N	Electricity Substation	1986 - 1995	67220
K	399m N	Electricity Substation	1994 - 1995	65816
23	416m S	Electricity Substation	1969 - 1997	71174
Y	468m E	Electricity Substation	1998	73868
Y	471m E	Electricity Transformers	1969 - 1985	83603
AC	483m S	Electricity Substation	1995 - 1998	83750
AC	485m S	Electricity Substation	1982 - 1995	68671
Y	485m E	Electricity Substation	1969 - 1990	82938
Y	485m E	Electricity Substation	1948 - 1979	78830

This data is sourced from Ordnance Survey / Groundsure.

1.4 Historical petrol stations

Records within 500m	0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

1.5 Historical garages

Records within 500m	43

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
B	53m NE	Garage	1986	21682
B	54m NE	Garage	1963 - 1981	25923
B	153m NE	Garage	1981	20293
E	157m N	Boat Repair Yard	1949 - 1953	27284
E	158m N	Boat Repair Yard	1948 - 1949	26540
B	158m NE	Garage	1981 - 1986	26958
B	159m NE	Garage	1963	21869
B	159m NE	Garage	1963	21949
9	168m NW	Garage	1990	20295
H	176m SE	Garage	1995 - 1997	27082
H	177m SE	Garage	1980 - 1990	25615
J	204m E	Garage	1969	22918
J	205m E	Garage	1980	25490
G	224m SE	Garage	1979	23209

ID	Location	Land use	Dates present	Group ID
G	243m SE	Garage	1980 - 1990	24581
K	246m N	Garage	1981 - 1990	24611
G	246m SE	Garage	1959	23792
G	247m SE	Garage	1995 - 1997	24964
G	248m SE	Garage	1960 - 1969	25973
G	248m SE	Garage	1963	21028
G	248m SE	Garage	1980	21660
15	262m W	Garage	1978 - 1980	27283
N	280m NW	Garage	1992 - 1997	27064
N	282m NW	Garage	1990	24593
R	322m NE	Garage	1995	20992
R	329m NE	Garage	1981 - 1990	24287
R	329m NE	Garage	1994 - 1995	24725
20	346m NE	Garage	1981	20294
T	349m E	Garage	1960 - 1969	25290
U	389m NW	Garage	1949 - 1963	24553
T	389m E	Garage	1986 - 1990	26912
T	390m E	Garage	1963 - 1981	26858
U	394m NW	Garage	1953	22545
U	395m NW	Garage	1949	25081
I	399m W	Omnibus Garage	1977	21743
I	400m W	Bus Garage	1982 - 1984	27058
X	415m S	Garage	1959	22973
X	415m S	Garage	1960 - 1979	27867
I	421m W	Omnibus Garage	1949 - 1963	25395
I	421m W	Omnibus Garage	1948 - 1963	24746
AD	484m SE	Garage	1979	22408
AD	486m SE	Garage	1960 - 1963	24336

ID	Location	Land use	Dates present	Group ID
AD	493m SE	Garage	1959	21005

This data is sourced from Ordnance Survey / Groundsure.

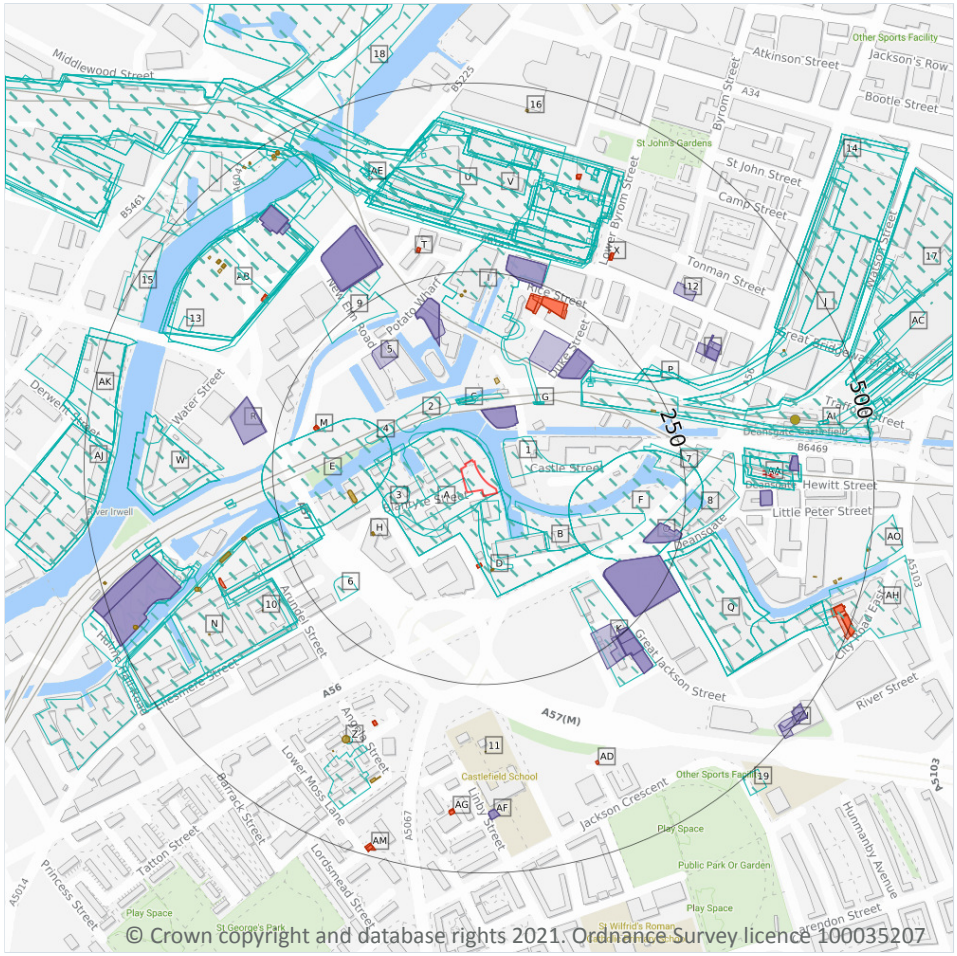
1.6 Historical military land

Records within 500m	**0**

Areas of military land digitised from multiple sources including the National Archives, local records, MOD records and verified other sources, intelligently grouped into contiguous features.

This data is sourced from Ordnance Survey / Groundsure / other sources.

2 Past land use - un-grouped



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2.1 Historical industrial land uses

Records within 500m	254

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 10,560 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 26**

ID	Location	Land Use	Date	Group ID
A	**On site**	**Warehouse**	**1851**	**837277**
A	**On site**	**Quay**	**1851**	**846276**
A	**On site**	**Unspecified Depot**	**1988**	**921090**

ID	Location	Land Use	Date	Group ID
A	**On site**	**Unspecified Depot**	**1978**	**853404**
A	**On site**	**Unspecified Depot**	**1985**	**921090**
A	**On site**	**Unspecified Depot**	**1994**	**921090**
B	**On site**	**Quay**	**1851**	**846276**
A	7m S	Unspecified Warehouses	1971	812727
A	9m SW	Unspecified Ground Workings	1851	800608
1	26m NE	Slate Wharf	1851	837258
B	62m S	Warehouse	1851	837278
2	71m NW	Timber Wharf	1851	811392
3	74m W	Gravel Pit	1851	807881
C	74m N	Railway Building	1923	906988
C	77m N	Railway Buildings	1905	833631
C	77m N	Railway Building	1938	878526
C	77m N	Railway Building	1932	878526
C	77m N	Railway Building	1916	906988
E	93m W	Unspecified Wharves	1938	937403
E	93m W	Unspecified Wharves	1932	937403
E	93m W	Unspecified Wharves	1916	881666
E	93m W	Unspecified Wharves	1905	881666
F	97m E	Quay	1938	872988
F	97m E	Quay	1932	872988
F	97m E	Quay	1916	872988
F	97m E	Quay	1905	872988
F	97m E	Quay	1923	872988
4	103m NW	Wharf	1851	831113
G	110m NE	Railway Building	1916	846298
G	110m NE	Railway Building	1905	846298
G	110m NE	Railway Building	1923	846298

ID	Location	Land Use	Date	Group ID
C	112m NE	Unspecified Ground Workings	1851	800610
J	158m NE	Railway Sidings	1923	923309
K	161m SE	Unspecified Depot	1971	818414
J	163m NE	Railway Sidings	1938	982150
J	163m NE	Railway Sidings	1932	982150
J	163m NE	Railway Sidings	1916	871753
J	163m NE	Railway Sidings	1905	871753
I	166m N	Unspecified Depot	1988	896077
I	166m N	Unspecified Depot	1985	896077
C	180m NE	Railway Building	1923	820260
C	182m NE	Railway Building	1938	982027
C	182m NE	Railway Building	1932	982027
C	186m NE	Railway Building	1916	972538
J	188m NE	Railway Sidings	1956	917334
6	193m SW	Sand Pit	1851	797576
N	197m W	Unspecified Commercial/Industrial	1971	923803
N	197m W	Unspecified Commercial/Industrial	1956	923803
N	201m W	Unspecified Mills	1938	928073
N	201m W	Unspecified Mills	1932	928073
N	201m W	Unspecified Mills	1916	928073
N	201m W	Unspecified Commercial/Industrial	1905	894637
N	201m W	Unspecified Mills	1923	928073
7	203m E	Unspecified Commercial/Industrial	1851	796720
8	207m E	Unspecified Commercial/Industrial	1851	796718
9	221m NW	Paper Mill	1851	833296
P	234m NE	Railway Buildings	1938	962263
P	234m NE	Railway Buildings	1932	962263
P	234m NE	Railway Buildings	1916	962263

ID	Location	Land Use	Date	Group ID
P	234m NE	Railway Buildings	1905	962263
P	234m NE	Railway Buildings	1923	962263
Q	239m E	Unspecified Mill	1938	877197
Q	239m E	Unspecified Mill	1932	877197
Q	239m E	Unspecified Mill	1916	904261
Q	239m E	Unspecified Commercial/Industrial	1905	896875
Q	239m E	Unspecified Commercial/Industrial	1923	846058
Q	240m E	Unspecified Works	1971	948531
Q	240m E	Automobile Works	1956	813191
Q	240m E	Unspecified Works	1978	940175
N	245m W	Unspecified Commercial/Industrial	1896	861626
S	262m NW	Unspecified Commercial/Industrial	1923	796721
N	282m SW	Unspecified Mills	1978	870292
U	284m N	Railway Sidings	1923	921834
I	287m N	Railway Buildings	1896	833656
U	287m N	Railway Sidings	1896	979167
I	289m N	Goods Sheds	1938	958104
I	289m N	Goods Sheds	1932	958104
I	289m N	Goods Sheds	1916	958104
I	289m N	Goods Sheds	1905	958104
I	289m N	Goods Sheds	1923	958104
U	289m N	Railway Sidings	1938	893253
U	289m N	Railway Sidings	1932	936526
U	289m N	Railway Sidings	1916	893253
U	289m N	Railway Sidings	1905	984895
N	291m SW	Unspecified Commercial/Industrial	1923	965943
V	295m N	Goods Depot	1971	912312
V	295m N	Goods Depot	1978	893922

ID	Location	Land Use	Date	Group ID
I	295m N	Railway Building	1971	911620
I	295m N	Railway Building	1978	848652
I	295m N	Railway Building	1985	938373
I	296m N	Railway Sidings	1956	951082
U	296m N	Railway Sidings	1956	956450
V	302m N	Unspecified Commercial/Industrial	1851	796722
N	302m W	Railway Building	1923	820273
U	304m N	Railway Sidings	1971	888837
U	304m N	Railway Sidings	1978	944715
U	304m N	Railway Sidings	1985	891167
N	305m W	Railway Building	1938	912895
N	305m W	Railway Building	1932	912895
V	307m N	Railway Sidings	1988	962023
V	307m N	Railway Sidings	1994	962023
V	308m N	Railway Building	1938	966518
V	308m N	Railway Building	1932	966518
V	308m N	Railway Building	1916	858395
V	308m N	Railway Building	1905	858395
S	310m NW	Refuse Heap	1851	829086
V	312m N	Railway Buildings	1896	833655
W	314m W	Quay	1851	808069
V	318m N	Railway Sidings	1851	921813
W	321m W	Unspecified Warehouses	1905	812726
W	321m W	Unspecified Warehouse	1938	867773
W	321m W	Unspecified Warehouse	1932	867773
W	321m W	Unspecified Warehouse	1916	867773
W	321m W	Unspecified Warehouse	1923	867773
AA	327m E	Railway Station	1938	975016

ID	Location	Land Use	Date	Group ID
AA	327m E	Railway Station	1932	975016
AA	327m E	Railway Station	1916	975016
AA	327m E	Railway Station	1905	975016
AA	327m E	Railway Station	1923	975016
V	327m N	Goods Station	1938	920947
V	327m N	Goods Station	1932	920947
V	327m N	Goods Station	1916	920947
V	327m N	Goods Station	1905	920947
V	327m N	Goods Station	1923	920947
AA	329m E	Railway Station	1896	899988
AA	331m E	Railway Station	1971	962338
AA	331m E	Railway Station	1956	962338
AA	331m E	Railway Station	1978	855265
V	333m N	Railway Building	1971	893290
V	333m N	Railway Building	1956	893290
V	333m N	Railway Building	1988	858030
V	333m N	Railway Building	1978	963323
V	333m N	Railway Building	1985	858030
V	333m N	Railway Building	1994	858030
AB	336m NW	Corporation Yard	1896	896211
AA	337m E	Railway Station	1988	880682
AA	337m E	Railway Station	1985	880682
AA	337m E	Railway Station	1994	880682
AB	338m NW	Chemical Works	1851	834546
AB	339m NW	Unspecified Depot	1971	889604
AB	339m NW	Cleansing Depot	1956	901006
AB	339m NW	Unspecified Depot	1988	876447
AB	339m NW	Unspecified Depot	1978	848064

ID	Location	Land Use	Date	Group ID
AB	339m NW	Unspecified Depot	1985	873557
AB	340m NW	Quay	1851	808070
I	340m NE	Goods Sheds	1938	880509
I	340m NE	Goods Sheds	1932	880509
I	340m NE	Goods Sheds	1916	880509
I	340m NE	Goods Sheds	1905	880509
I	340m NE	Goods Sheds	1923	880509
AB	341m NW	Corporation Yard	1916	987793
AB	341m NW	Corporation Yard	1905	974049
AB	341m NW	Corporation Yard	1923	899229
AC	341m E	Railway Sidings	1896	975593
AB	343m NW	Cleansing Depot	1938	902946
AB	343m NW	Cleansing Depot	1932	902946
I	346m N	Railway Building	1971	983624
I	346m N	Railway Building	1978	907268
I	346m N	Railway Building	1985	923295
I	347m N	Goods Station	1956	821661
Z	360m SW	Unspecified Tank	1971	825226
Z	363m S	Dye Works	1851	833956
N	370m W	Unspecified Commercial/Industrial	1896	974596
N	376m W	Unspecified Commercial/Industrial	1916	850018
N	376m W	Iron Works	1905	822792
N	376m W	Unspecified Commercial/Industrial	1923	850018
J	385m NE	Railway Sidings	1971	946450
J	385m NE	Railway Sidings	1978	989903
J	385m NE	Railway Sidings	1985	958621
U	389m NW	Dye Works	1851	833958
V	391m N	Goods Sheds	1938	895888

ID	Location	Land Use	Date	Group ID
V	391m N	Goods Sheds	1932	895888
V	391m N	Goods Sheds	1916	895888
V	391m N	Goods Sheds	1905	895888
V	391m N	Goods Sheds	1923	895888
V	393m N	Railway Building	1896	878088
AE	394m N	Railway Building	1923	969528
V	394m N	Railway Building	1971	913293
V	394m N	Railway Building	1978	967702
V	394m N	Railway Building	1985	916120
V	396m N	Railway Building	1956	913293
AE	399m N	Railway Building	1956	820442
AE	401m N	Railway Building	1938	903707
AE	401m N	Railway Building	1932	903707
AE	401m N	Railway Building	1916	865666
AE	401m N	Railway Building	1905	865666
13	403m NW	Brewery	1851	822705
I	404m NE	Railway Buildings	1938	921932
I	404m NE	Railway Buildings	1932	921932
V	405m N	Railway Buildings	1923	925398
V	406m N	Railway Building	1923	820441
U	410m NW	Refuse Heap	1851	829085
N	411m W	Railway Buildings	1923	833632
V	411m N	Railway Buildings	1938	894881
V	411m N	Railway Buildings	1932	894881
V	411m N	Railway Buildings	1916	876717
V	411m N	Railway Buildings	1905	876717
I	412m NE	Railway Building	1916	869326
I	412m NE	Railway Building	1905	869326

ID	Location	Land Use	Date	Group ID
I	412m NE	Railway Building	1923	869326
N	412m W	Railway Building	1938	920704
N	412m W	Railway Building	1932	920704
N	417m SW	Sawmill	1851	808364
J	417m NE	Railway Building	1923	820272
14	425m NE	Railway Buildings	1923	833657
AE	430m N	Railway Building	1923	820443
V	435m N	Railway Building	1923	854882
AI	437m E	Railway Building	1938	978111
AI	437m E	Railway Building	1932	978111
AI	437m E	Railway Building	1916	978111
AI	437m E	Railway Building	1905	978111
AI	437m E	Railway Building	1923	978111
V	441m N	Railway Building	1916	854882
AE	441m N	Railway Building	1956	820440
AH	441m E	Brewery	1851	822706
N	442m W	Railway Building	1938	845151
N	442m W	Railway Building	1932	845151
AJ	455m W	Silk and Cotton Mill	1851	810085
AC	460m E	Disused Station	1978	925495
AJ	460m W	Unspecified Commercial/Industrial	1971	941987
AJ	460m W	Unspecified Commercial/Industrial	1956	941987
U	461m NW	Corporation Yard	1923	939407
AK	462m W	Unspecified Commercial/Industrial	1938	919087
AK	462m W	Unspecified Commercial/Industrial	1932	919087
AK	462m W	Unspecified Commercial/Industrial	1916	919087
AK	462m W	Unspecified Commercial/Industrial	1905	980628
AK	462m W	Unspecified Commercial/Industrial	1923	919087

ID	Location	Land Use	Date	Group ID
15	465m NW	Cotton Mill	1851	797895
AL	465m W	Unspecified Commercial/Industrial	1938	846750
AL	465m W	Unspecified Commercial/Industrial	1932	846750
AL	465m W	Iron Works	1916	873229
AL	465m W	Unspecified Commercial/Industrial	1905	870019
AL	465m W	Iron Works	1923	873229
U	465m NW	Corporation Yard	1916	939407
U	467m NW	Railway Sidings	1851	861529
U	469m NW	Railway Building	1923	855519
U	477m NW	Railway Building	1938	946353
U	477m NW	Railway Building	1932	946353
U	477m NW	Railway Building	1916	930060
U	477m NW	Railway Building	1905	930060
AC	485m E	Railway Station	1938	896284
AC	485m E	Railway Station	1932	896284
AC	485m E	Railway Station	1916	896284
AC	485m E	Railway Station	1905	896284
AC	485m E	Railway Station	1923	896284
AC	494m E	Railway Station	1956	888631
17	494m E	Railway Station	1896	915817
U	495m NW	Railway Building	1938	895977
U	495m NW	Railway Building	1932	895977
U	495m NW	Railway Building	1916	903757
U	495m NW	Railway Building	1905	903757
AO	496m E	Cotton Mill	1851	797881
18	497m N	Unspecified Wharf	1923	884372
19	498m SE	Fire Station	1938	891974

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m	**91**

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 26**

ID	Location	Land Use	Date	Group ID
D	97m S	Unspecified Tank	1980	132153
D	97m S	Unspecified Tank	1980	143849
D	97m S	Unspecified Tank	1960	123914
D	97m S	Unspecified Tank	1969	143958
D	98m S	Unspecified Tank	1963	141829
C	106m N	Unspecified Tank	1922	115648
H	135m SW	Unspecified Tank	1997	132953
H	135m SW	Unspecified Tank	1995	132953
H	135m SW	Unspecified Tank	1998	132953
H	135m SW	Unspecified Tank	1995	132953
E	144m W	Tanks	1963	148559
E	144m W	Tanks	1963	148559
I	217m N	Unspecified Tank	1963	131255
I	217m N	Unspecified Tank	1963	131255
I	223m N	Unspecified Tank	1963	133635
I	223m N	Unspecified Tank	1963	133635
P	230m NE	Unspecified Tank	1932	115649
N	298m W	Tanks	1949	140617
N	299m W	Tanks	1954	149178
N	299m W	Tanks	1977	149178
N	299m W	Tanks	1963	149178
N	299m W	Tanks	1948	149178
N	299m W	Tanks	1995	149178

ID	Location	Land Use	Date	Group ID
N	299m W	Tanks	1998	149178
N	299m W	Tanks	1995	149178
N	300m W	Tanks	1984	149178
N	300m W	Tanks	1982	149178
N	300m W	Tanks	1982	149178
10	313m SW	Unspecified Tank	1891	115659
N	323m W	Unspecified Tank	1949	123558
N	323m W	Unspecified Tank	1948	123558
11	339m S	Unspecified Tank	1891	115663
Z	360m SW	Unspecified Tank	1963	127413
Z	361m SW	Unspecified Tank	1963	127413
N	375m W	Unspecified Tank	1908	125058
N	378m W	Unspecified Tank	1893	147499
N	378m W	Unspecified Tank	1922	147499
Z	386m SW	Unspecified Tank	1891	115662
N	390m SW	Unspecified Tank	1891	115660
Z	394m S	Unspecified Tank	1949	135351
Z	398m S	Unspecified Tank	1954	126405
Z	398m S	Unspecified Tank	1948	126405
AB	412m NW	Unspecified Tank	1953	128766
AB	412m NW	Unspecified Tank	1932	115639
AB	413m NW	Unspecified Tank	1963	128766
AB	413m NW	Unspecified Tank	1949	128766
AB	413m NW	Unspecified Tank	1949	128766
AB	413m NW	Unspecified Tank	1949	128766
AB	421m NW	Unspecified Tank	1953	136050
AB	421m NW	Unspecified Tank	1963	136050
AB	421m NW	Unspecified Tank	1949	136050

ID	Location	Land Use	Date	Group ID
AB	422m NW	Unspecified Tank	1949	136050
AB	422m NW	Unspecified Tank	1949	136050
J	423m NE	Unspecified Tank	1979	134110
J	423m NE	Unspecified Tank	1979	148049
AH	434m E	Unspecified Tank	1891	115779
AB	434m NW	Unspecified Tank	1932	115634
AH	461m E	Tanks	1948	107130
AH	467m E	Tanks	1948	106777
16	467m N	Unspecified Tank	1891	115647
N	472m SW	Unspecified Tank	1997	122775
N	472m SW	Unspecified Tank	1995	122775
N	472m SW	Unspecified Tank	1998	122775
N	472m SW	Unspecified Tank	1995	122775
N	473m SW	Unspecified Tank	1984	122775
N	473m SW	Unspecified Tank	1982	122775
N	473m SW	Unspecified Tank	1982	122775
U	475m NW	Unspecified Tank	1908	131064
U	479m NW	Unspecified Tank	1980	135020
U	479m NW	Unspecified Tank	1893	126917
U	479m NW	Unspecified Tank	1922	126917
U	480m NW	Unspecified Tank	1990	144767
U	480m NW	Unspecified Tank	1990	144767
U	480m NW	Unspecified Tank	1995	125308
U	480m NW	Unspecified Tank	1994	125308
U	480m NW	Unspecified Tank	1993	125308
U	480m NW	Unspecified Tank	1997	125308
U	480m NW	Unspecified Tank	1995	125308
U	480m NW	Unspecified Tank	1992	125308

ID	Location	Land Use	Date	Group ID
U	488m NW	Unspecified Tank	1932	115640
U	489m NW	Unspecified Tank	1953	133553
U	490m NW	Unspecified Tank	1963	130189
U	490m NW	Unspecified Tank	1949	129333
U	490m NW	Unspecified Tank	1949	146026
U	490m NW	Unspecified Tank	1949	137879
N	493m W	Unspecified Tank	1963	128267
N	493m W	Unspecified Tank	1949	128267
N	493m W	Unspecified Tank	1954	128267
N	493m W	Unspecified Tank	1963	128267
N	493m W	Unspecified Tank	1948	128267
AO	496m E	Unspecified Tank	1891	115954

This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m	**91**

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 26**

ID	Location	Land Use	Date	Group ID
D	89m S	Electricity Substation	1995	72564
D	89m S	Electricity Substation	1997	72564
D	89m S	Electricity Substation	1995	72564
D	89m S	Electricity Substation	1997	72564
M	195m W	Electricity Substation	1980	78864
M	196m W	Electricity Substation	1995	78864
M	196m W	Electricity Substation	1994	78864
M	196m W	Electricity Substation	1993	78864

ID	Location	Land Use	Date	Group ID
M	196m W	Electricity Substation	1997	78864
M	196m W	Electricity Substation	1995	78864
M	196m W	Electricity Substation	1992	78864
M	197m W	Electricity Substation	1990	78864
M	197m W	Electricity Substation	1990	78864
I	211m NE	Electricity Substation	1986	67819
I	211m NE	Electricity Substation	1990	69796
I	213m N	Electricity Substation	1981	80246
I	213m N	Electricity Substation	1995	83961
I	213m N	Electricity Substation	1994	83961
I	220m NE	Electricity Substation	1948	82720
I	223m NE	Electricity Substation	1995	82695
I	223m NE	Electricity Substation	1979	80738
I	224m NE	Electricity Substation	1979	77417
I	224m NE	Electricity Substation	1948	80738
T	284m N	Electricity Substation	1997	81653
T	285m N	Electricity Substation	1995	81653
T	286m N	Electricity Substation	1995	81653
T	286m N	Electricity Substation	1994	81653
X	321m NE	Electricity Substation	1986	75611
X	321m NE	Electricity Substation	1990	75611
X	322m NE	Electricity Substation	1981	75611
X	322m NE	Electricity Substation	1979	75611
X	322m NE	Electricity Substation	1948	75611
X	323m NE	Electricity Substation	1979	75611
X	323m NE	Electricity Substation	1948	75611
X	323m NE	Electricity Substation	1995	75611
X	323m NE	Electricity Substation	1994	75611

ID	Location	Land Use	Date	Group ID
X	323m NE	Electricity Substation	1995	75611
Z	327m S	Electricity Substation	1977	77866
Z	327m S	Electricity Substation	1984	77866
Z	327m S	Electricity Substation	1982	77866
Z	327m S	Electricity Substation	1982	77866
Z	328m S	Electricity Substation	1997	77866
Z	328m S	Electricity Substation	1995	77866
Z	328m S	Electricity Substation	1998	77866
Z	328m S	Electricity Substation	1995	77866
AB	343m NW	Electricity Substation	1995	73642
AB	343m NW	Electricity Substation	1994	73642
AB	343m NW	Electricity Substation	1993	73642
AB	343m NW	Electricity Substation	1997	73642
AB	343m NW	Electricity Substation	1995	73642
AB	343m NW	Electricity Substation	1992	73642
AB	343m NW	Electricity Substation	1990	78385
N	344m W	Electricity Substation	1948	73349
N	344m W	Electricity Substation	1949	73349
AD	379m S	Electricity Substation	1997	65434
AD	379m S	Electricity Substation	1997	65434
I	397m N	Electricity Substation	1986	67220
I	397m N	Electricity Substation	1990	67220
I	398m N	Electricity Substation	1995	67220
I	399m N	Electricity Substation	1995	65816
I	399m N	Electricity Substation	1994	65816
AG	416m S	Electricity Substation	1969	71174
AG	417m S	Electricity Substation	1980	71174
AG	417m S	Electricity Substation	1980	71174

ID	Location	Land Use	Date	Group ID
AG	417m S	Electricity Substation	1990	71174
AG	418m S	Electricity Substation	1995	71174
AG	418m S	Electricity Substation	1997	71174
AG	418m S	Electricity Substation	1995	71174
AG	418m S	Electricity Substation	1997	71174
AH	468m E	Electricity Substation	1998	73868
AH	471m E	Electricity Transformers	1969	83603
AH	472m E	Electricity Transformers	1980	83603
AH	472m E	Electricity Transformers	1980	83603
AH	472m E	Electricity Transformers	1985	83603
AM	483m S	Electricity Substation	1997	83750
AM	483m S	Electricity Substation	1995	83750
AM	483m S	Electricity Substation	1998	83750
AM	485m S	Electricity Substation	1984	68671
AM	485m S	Electricity Substation	1982	68671
AM	485m S	Electricity Substation	1982	68671
AH	485m E	Electricity Substation	1969	82938
AM	485m S	Electricity Substation	1995	68671
AH	485m E	Electricity Substation	1953	78830
AH	486m E	Electricity Substation	1979	78830
AH	486m E	Electricity Substation	1948	78830
AH	486m E	Electricity Substation	1980	82938
AH	486m E	Electricity Substation	1980	82938
AH	486m E	Electricity Substation	1985	82938
AH	486m E	Electricity Substation	1987	82938
AH	486m E	Electricity Substation	1987	82938
AH	486m E	Electricity Substation	1990	82938

This data is sourced from Ordnance Survey / Groundsure.

2.4 Historical petrol stations

Records within 500m	0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

2.5 Historical garages

Records within 500m	89

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 26**

ID	Location	Land Use	Date	Group ID
C	53m NE	Garage	1986	21682
C	54m NE	Garage	1963	25923
C	54m NE	Garage	1981	25923
C	54m NE	Garage	1963	25923
C	153m NE	Garage	1981	20293
I	157m N	Boat Repair Yard	1949	27284
I	158m N	Boat Repair Yard	1949	26540
C	158m NE	Garage	1986	26958
C	159m NE	Garage	1963	21949
C	159m NE	Garage	1963	21869
C	159m NE	Garage	1981	26958
I	167m N	Boat Repair Yard	1953	27284
5	168m NW	Garage	1990	20295
I	168m N	Boat Repair Yard	1949	26540
I	169m N	Boat Repair Yard	1948	26540
L	176m SE	Garage	1995	27082

ID	Location	Land Use	Date	Group ID
L	176m SE	Garage	1997	27082
L	176m SE	Garage	1995	27082
L	176m SE	Garage	1997	27082
L	177m SE	Garage	1980	25615
L	177m SE	Garage	1980	25615
L	177m SE	Garage	1990	25615
O	204m E	Garage	1969	22918
O	205m E	Garage	1980	25490
O	205m E	Garage	1980	25490
K	224m SE	Garage	1979	23209
K	243m SE	Garage	1980	24581
K	243m SE	Garage	1990	24581
I	246m N	Garage	1986	24611
I	246m N	Garage	1990	24611
I	246m N	Garage	1981	24611
K	246m SE	Garage	1959	23792
K	247m SE	Garage	1995	24964
K	247m SE	Garage	1997	24964
K	247m SE	Garage	1995	24964
K	247m SE	Garage	1997	24964
K	248m SE	Garage	1960	25973
K	248m SE	Garage	1969	25973
K	248m SE	Garage	1963	21028
K	248m SE	Garage	1980	21660
R	262m W	Garage	1980	27283
R	264m W	Garage	1978	27283
S	280m NW	Garage	1995	27064
S	280m NW	Garage	1992	27064

ID	Location	Land Use	Date	Group ID
S	280m NW	Garage	1995	27064
S	280m NW	Garage	1994	27064
S	280m NW	Garage	1993	27064
S	280m NW	Garage	1997	27064
S	282m NW	Garage	1990	24593
S	282m NW	Garage	1990	24593
Y	322m NE	Garage	1995	20992
Y	329m NE	Garage	1986	24287
Y	329m NE	Garage	1990	24287
Y	329m NE	Garage	1995	24725
Y	329m NE	Garage	1994	24725
Y	330m NE	Garage	1981	24287
12	346m NE	Garage	1981	20294
AA	349m E	Garage	1960	25290
AA	349m E	Garage	1969	25290
AA	349m E	Garage	1963	25290
AB	389m NW	Garage	1963	24553
AB	389m NW	Garage	1949	24553
AA	389m E	Garage	1986	26912
AA	389m E	Garage	1990	26912
AA	390m E	Garage	1963	26858
AA	390m E	Garage	1981	26858
AA	390m E	Garage	1979	26858
AA	390m E	Garage	1979	26858
AA	390m E	Garage	1963	26858
AB	394m NW	Garage	1953	22545
AB	395m NW	Garage	1949	25081
AB	395m NW	Garage	1949	25081

ID	Location	Land Use	Date	Group ID
N	399m W	Omnibus Garage	1977	21743
N	400m W	Bus Garage	1984	27058
N	400m W	Bus Garage	1982	27058
N	400m W	Bus Garage	1982	27058
AF	415m S	Garage	1960	27867
AF	415m S	Garage	1959	22973
AF	416m S	Garage	1979	27867
AF	416m S	Garage	1963	27867
N	421m W	Omnibus Garage	1963	25395
N	421m W	Omnibus Garage	1949	25395
N	421m W	Omnibus Garage	1954	24746
N	421m W	Omnibus Garage	1963	24746
N	421m W	Omnibus Garage	1948	24746
AN	484m SE	Garage	1979	22408
AN	486m SE	Garage	1963	24336
AN	493m SE	Garage	1960	24336
AN	493m SE	Garage	1959	21005

This data is sourced from Ordnance Survey / Groundsure.

3 Waste and landfill



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Site Outline

Search buffers in metres (m)

Historical landfill (EA/NRW)

Historical waste sites

Licensed waste sites

Waste exemptions

3.1 Active or recent landfill

Records within 500m	0

Active or recently closed landfill sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.2 Historical landfill (BGS records)

Records within 500m	0

Landfill sites identified on a survey carried out on behalf of the DoE in 1973. These sites may have been closed or operational at this time.

This data is sourced from the British Geological Survey.

3.3 Historical landfill (LA/mapping records)

Records within 500m	0

Landfill sites identified from Local Authority records and high detail historical mapping.

This data is sourced from the Ordnance Survey/Groundsure and Local Authority records.

3.4 Historical landfill (EA/NRW records)

Records within 500m	1

Known historical (closed) landfill sites (e.g. sites where there is no PPC permit or waste management licence currently in force). This includes sites that existed before the waste licensing regime and sites that have been licensed in the past but where a licence has been revoked, ceased to exist or surrendered and a certificate of completion has been issued.

Features are displayed on the Waste and landfill map on **page 47**

ID	Location	Details		
I	469m NW	Site Address: Wilburn Street, Salford, Greater Manchester Licence Holder Address: -	Waste Licence: - Site Reference: E052 Waste Type: - Environmental Permitting Regulations (Waste) Reference: - Licence Issue: - Licence Surrender: -	Operator: - Licence Holder: - First Recorded - Last Recorded: -

This data is sourced from the Environment Agency and Natural Resources Wales.

3.5 Historical waste sites

Records within 500m	35

Waste site records derived from Local Authority planning records and high detail historical mapping.

Features are displayed on the Waste and landfill map on **page 47**

ID	Location	Address	Further Details	Date
1	113m E	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1948

ID	Location	Address	Further Details	Date
A	118m NE	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1986
A	119m NE	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1979
C	183m W	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1997
C	184m W	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1995
F	376m NW	Site Address: N/A	Type of Site: Refuse Destructors Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1932
F	376m NW	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1953
F	378m NW	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1952
F	378m NW	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1949
F	380m NW	Site Address: N/A	Type of Site: Refuse Destructors Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1978

ID	Location	Address	Further Details	Date
F	395m NW	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1979
F	397m NW	Site Address: N/A	Type of Site: Refuse Destructors Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1922
F	398m NW	Site Address: N/A	Type of Site: Refuse Destructors Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1932
F	399m NW	Site Address: N/A	Type of Site: Refuse Destructors Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1922
F	400m NW	Site Address: N/A	Type of Site: Refuse Destructors Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1949
F	400m NW	Site Address: N/A	Type of Site: Refuse Destructors Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1908
F	401m NW	Site Address: N/A	Type of Site: Refuse Destructors Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1908
H	427m E	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1995
H	427m E	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1997

ID	Location	Address	Further Details	Date
H	427m E	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1995
H	427m E	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1968
H	446m E	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1987
H	446m E	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1987
H	446m E	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1990
I	460m NW	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1908
I	465m NW	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1932
I	467m NW	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1908
I	468m NW	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1932

ID	Location	Address	Further Details	Date
I	470m NW	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1922
I	472m NW	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1953
I	472m NW	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1922
I	472m NW	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1908
I	474m NW	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1952
I	474m NW	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1949
I	474m NW	Site Address: N/A	Type of Site: Refuse Destructor Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1949

This data is sourced from Ordnance Survey/Groundsure and Local Authority records.

3.6 Licensed waste sites

Records within 500m	**3**

Active or recently closed waste sites under Environment Agency/Natural Resources Wales regulation.

Features are displayed on the Waste and landfill map on **page 47**

ID	Location	Details		
E	289m NW	Site Name: R E M Mobile Plant Site Address: Medlock House, New Elm Road, Manchester, M3 4JW Correspondence Address: 25, Barnes Wallis Road, Segensworth East, Fareham, PO15 5TT	Type of Site: Mobile Plant Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RES001 EPR reference: - Operator: Resource And Environmental Consultants Ltd Waste Management licence No: 50480 Annual Tonnage: 75000	Issue Date: 12/12/2006 Effective Date: - Modified:: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued
E	289m NW	Site Name: Rec Remediation Ltd - Mobile Plant Site Address: Medlock House, New Elm Road, Manchester, M3 4JW Correspondence Address: 25, Barnes Wallis Road, Segensworth East, Fareham, Hampshire, PO15 5TT	Type of Site: Mobile Plant Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RES001 EPR reference: - Operator: Rec Remediation Ltd Waste Management licence No: 50480 Annual Tonnage: 75000	Issue Date: 12/12/2006 Effective Date: - Modified:: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued
E	289m NW	Site Name: Mobile Plant Site Address: Mobile Plant Permi Correspondence Address: -	Type of Site: Mobile Plant Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SOI005 EPR reference: EA/EPR/GP3895SV/T001 Operator: Soil & Water Remediation Ltd Waste Management licence No: 50480 Annual Tonnage: 0	Issue Date: 12/12/2006 Effective Date: 20/05/2010 Modified:: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Transferred

This data is sourced from the Environment Agency and Natural Resources Wales.

3.7 Waste exemptions

Records within 500m	23

Activities involving the storage, treatment, use or disposal of waste that are exempt from needing a permit. Exemptions have specific limits and conditions that must be adhered to.

Features are displayed on the Waste and landfill map on **page 47**

ID	Location	Site	Reference	Category	Sub-Category	Description
B	128m NE	Bestway National Chemists LTD, BULK REGISTRATION for Bestway National Chemists Ltd (107 sites), M34LZ	NRW-WME036650	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
B	130m NE	Bestway Panacea Holdings Limited, BULK REGISTRATION for Bestway Panacea Holdings Limited for 108 sites, M34LZ	NRW-WME005755	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
2	150m SW	CITYGATE CENTRAL, UNIT 2, BLANTYRE STREET, MANCHESTER, M15 4SQ	WEX228851	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
D	273m NW	1 New Elm Road Manchester Manchester M3 4JH	EPR/EF0605VU/A001	Storing waste exemption	Non-Agricultural Waste Only	Storage of waste in a secure place
D	273m NW	1 New Elm Road Manchester Manchester M3 4JH	EPR/EF0605VU/A001	Treating waste exemption	Non-Agricultural Waste Only	Sorting mixed waste
D	273m NW	1 New Elm Road Manchester Manchester M3 4JH	EPR/EF0605VU/A001	Treating waste exemption	Non-Agricultural Waste Only	Screening and blending of waste
D	273m NW	1 New Elm Road Manchester Manchester M3 4JH	EPR/EF0605VU/A001	Using waste exemption	Non-Agricultural Waste Only	Use of waste in construction
F	385m NW	npa - Dawson Street Manchester Manchester M3 4JW	EPR/EF0604HZ/A001	Storing waste exemption	Non-Agricultural Waste Only	Storage of waste in secure containers

ID	Location	Site	Reference	Category	Sub-Category	Description
F	385m NW	npa - Dawson Street Manchester Manchester M3 4JW	EPR/EF0604HZ/A001	Storing waste exemption	Non-Agricultural Waste Only	Storage of waste in a secure place
F	385m NW	npa - Dawson Street Manchester Manchester M3 4JW	EPR/EF0604HZ/A001	Treating waste exemption	Non-Agricultural Waste Only	Screening and blending of waste
F	385m NW	npa - Dawson Street Manchester Manchester M3 4JW	EPR/EF0604HZ/A001	Treating waste exemption	Non-Agricultural Waste Only	Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising
F	385m NW	npa - Dawson Street Manchester Manchester M3 4JW	EPR/EF0604HZ/A001	Using waste exemption	Non-Agricultural Waste Only	Use of waste in construction
F	385m NW	npa - Dawson Street Manchester Manchester M3 4JW	EPR/EF0604HZ/A001	Using waste exemption	Non-Agricultural Waste Only	Spreading of plant matter to confer benefit
G	386m E	1, ALPHA PLACE, MANCHESTER, M15 4PP	WEX017965	Storing waste exemption	Not on a farm	Storage of waste in secure containers
G	386m E	1, ALPHA PLACE, MANCHESTER, M15 4PP	WEX017965	Storing waste exemption	Not on a farm	Storage of waste in a secure place
F	392m NW	npa - Car Park Bounded by Trinity Way A6042 and River Irwell Water Street Manchester Manchester M3 4JH	EPR/NF0907TJ/A001	Storing waste exemption	Non-Agricultural Waste Only	Storage of waste in secure containers
F	392m NW	npa - Car Park Bounded by Trinity Way A6042 and River Irwell Water Street Manchester Manchester M3 4JH	EPR/NF0907TJ/A001	Storing waste exemption	Non-Agricultural Waste Only	Storage of waste in a secure place
F	392m NW	npa - Car Park Bounded by Trinity Way A6042 and River Irwell Water Street Manchester Manchester M3 4JH	EPR/NF0907TJ/A001	Treating waste exemption	Non-Agricultural Waste Only	Screening and blending of waste

ID	Location	Site	Reference	Category	Sub-Category	Description
F	392m NW	npa - Car Park Bounded by Trinity Way A6042 and River Irwell Water Street Manchester Manchester M3 4JH	EPR/NF0907TJ/A001	Using waste exemption	Non-Agricultural Waste Only	Use of waste in construction
F	392m NW	npa - Car Park Bounded by Trinity Way A6042 and River Irwell Water Street Manchester Manchester M3 4JH	EPR/NF0907TJ/A001	Using waste exemption	Non-Agricultural Waste Only	Use of mulch
3	409m NW	Compound 2 Water Street Manchester M3 4JH	EPR/FF0709KU/A001	Using waste exemption	Non-Agricultural Waste Only	Use of waste in construction
J	488m SW	Former Excelsior Mill, Hulme Hall Road, Manchester, M15 4LA	WEX125363	Treating waste exemption	Not on a farm	Screening and blending of waste
J	488m SW	Former Excelsior Mill, Hulme Hall Road, Manchester, M15 4LA	WEX125363	Using waste exemption	Not on a farm	Use of waste in construction

This data is sourced from the Environment Agency and Natural Resources Wales.

4 Current industrial land use



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Site Outline

Search buffers in metres (m)

Recent industrial land uses

Current or recent petrol stations

Licensed pollutant release (Part A(2)/B)

Licensed Discharges to controlled waters

Pollution Incidents (EA/NRW)

4.1 Recent industrial land uses

Records within 250m	22

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 57**

ID	Location	Company	Address	Activity	Category
A	32m NW	Slate Wharf	Greater Manchester, M15	Moorings and Unloading Facilities	Water
1	42m NE	Merchants Warehouse	Greater Manchester, M3	Container and Storage	Transport, Storage and Delivery
A	67m NW	Slate Wharf	Greater Manchester, M15	Moorings and Unloading Facilities	Water

ID	Location	Company	Address	Activity	Category
B	73m S	Bauer	Unit 1, Castle Quay, Manchester, Greater Manchester, M15 4NJ	Published Goods	Industrial Products
B	78m S	Castle Quay	Greater Manchester, M15	Moorings and Unloading Facilities	Water
C	85m E	Castle Field Coal Wharf	Greater Manchester, M3	Moorings and Unloading Facilities	Water
2	96m S	Electricity Sub Station	Greater Manchester, M15	Electrical Features	Infrastructure and Facilities
D	99m W	Slate Wharf	Greater Manchester, M15	Moorings and Unloading Facilities	Water
3	106m SW	Electricity Sub Station	Greater Manchester, M15	Electrical Features	Infrastructure and Facilities
C	110m E	Castle Field Coal Wharf	Greater Manchester, M15	Moorings and Unloading Facilities	Water
4	121m NE	Bass Warehouse	Greater Manchester, M3	Container and Storage	Transport, Storage and Delivery
E	131m SW	Tank	Greater Manchester, M15	Tanks (Generic)	Industrial Features
D	145m W	Slate Wharf	Greater Manchester, M15	Moorings and Unloading Facilities	Water
G	178m W	Conveyors	Greater Manchester, M15	Conveyors	Industrial Features
G	182m NW	Depot	Greater Manchester, M3	Container and Storage	Transport, Storage and Delivery
6	184m SE	Depot	Greater Manchester, M15	Container and Storage	Transport, Storage and Delivery
G	186m W	Hopper	Greater Manchester, M15	Hoppers and Silos	Farming
G	192m W	Works	Greater Manchester, M15	Unspecified Works Or Factories	Industrial Features
G	200m W	Scrap Yard	Greater Manchester, M15	Scrap Metal Merchants	Recycling Services
7	208m NW	Electricity Sub Station	Greater Manchester, M3	Electrical Features	Infrastructure and Facilities
9	225m N	Electricity Sub Station	Greater Manchester, M3	Electrical Features	Infrastructure and Facilities
10	250m SW	Depot	Greater Manchester, M15	Container and Storage	Transport, Storage and Delivery

This data is sourced from Ordnance Survey.

4.2 Current or recent petrol stations

Records within 500m	2

Open, closed, under development and obsolete petrol stations.

Features are displayed on the Current industrial land use map on **page 57**

ID	Location	Company	Address	LPG	Status
E	139m W	OBSOLETE	Dawson Street, Manchester, Greater Manchester, M3 4JZ	Not Applicable	Obsolete
11	258m SE	OBSOLETE	14, Great Jackson Street, Castlefield, Manchester, Greater Manchester, M15 4NG	Not Applicable	Obsolete

This data is sourced from Experian.

4.3 Electricity cables

Records within 500m	0

High voltage underground electricity transmission cables.

This data is sourced from National Grid.

4.4 Gas pipelines

Records within 500m	0

High pressure underground gas transmission pipelines.

This data is sourced from National Grid.

4.5 Sites determined as Contaminated Land

Records within 500m	0

Contaminated Land Register of sites designated under Part 2a of the Environmental Protection Act 1990.

This data is sourced from Local Authority records.

4.6 Control of Major Accident Hazards (COMAH)

Records within 500m	0

Control of Major Accident Hazards (COMAH) sites. This data includes upper and lower tier sites, and includes a historical archive of COMAH sites and Notification of Installations Handling Hazardous Substances (NIHHS) records.

This data is sourced from the Health and Safety Executive.

4.7 Regulated explosive sites

Records within 500m	0

Sites registered and licensed by the Health and Safety Executive under the Manufacture and Storage of Explosives Regulations 2005 (MSER). The last update to this data was in April 2011.

This data is sourced from the Health and Safety Executive.

4.8 Hazardous substance storage/usage

Records within 500m	0

Consents granted for a site to hold certain quantities of hazardous substances at or above defined limits in accordance with the Planning (Hazardous Substances) Regulations 2015.

This data is sourced from Local Authority records.

4.9 Historical licensed industrial activities (IPC)

Records within 500m	0

Integrated Pollution Control (IPC) records of substance releases to air, land and water. This data represents a historical archive as the IPC regime has been superseded.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.10 Licensed industrial activities (Part A(1))

Records within 500m	0

Records of Part A(1) installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.11 Licensed pollutant release (Part A(2)/B)

Records within 500m	3

Records of Part A(2) and Part B installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

Features are displayed on the Current industrial land use map on **page 57**

ID	Location	Address	Details	
G	189m W	Hanson Aggregates, Potato Wharf, Off Liverpool Road, M3 4LE	Process: Use of Bulk Cement Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of enforcement: No Enforcement Notified Comment: No Enforcement Notified
I	244m W	Arc Northern, Potato Wharf, Liverpool Rd, M3 4NB	Process: Use of Bulk Cement Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of enforcement: No Enforcement Notified Comment: No Enforcement Notified
12	339m SE	Tom Garner Motors, A Branch of Robins & Day Ltd, Chester Rd, Manchester, M15 4GA	Process: Respraying of Road Vehicles Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of enforcement: No Enforcement Notified Comment: No Enforcement Notified

This data is sourced from Local Authority records.

4.12 Radioactive Substance Authorisations

Records within 500m	**0**

Records of the storage, use, accumulation and disposal of radioactive substances regulated under the Radioactive Substances Act 1993.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.13 Licensed Discharges to controlled waters

Records within 500m	**33**

Discharges of treated or untreated effluent to controlled waters under the Water Resources Act 1991.

Features are displayed on the Current industrial land use map on **page 57**

ID	Location	Address	Details	
F	176m N	TOPHAM RES DEVELOPMENT SWO, LIVERPOOL ROAD/POTATO WHARF, CASTLEFIELD	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: 016991276 Permit Version: 1 Receiving Water: BRIDGEWATER CANAL	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 18/05/1988 Revocation Date: 01/07/1991

ID	Location	Address	Details	
5	177m NE	RICE ST NEAR CASTLE ST, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - WATER COMPANY Permit Number: 01MAN0171 Permit Version: 1 Receiving Water: BRIDGEWATER CANAL	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 15/09/1993 Revocation Date: 15/09/1993
F	205m N	READY MIXED CONCRETE DEPOT, LIVERPOOL ROAD	Effluent Type: TRADE DISCHARGES - PROCESS EFFLUENT - NOT WATER COMPANY Permit Number: 016990275 Permit Version: 1 Receiving Water: BRIDGEWATER CANAL	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 10/03/1977 Revocation Date: 31/08/1989
8	221m S	MANCUNIAN WAY ROUNDABOUT, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0368 Permit Version: 1 Receiving Water: -	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: -
H	223m E	POTATO WHARF, OFF LIVERPOOL RD, MANCHESTER	Effluent Type: TRADE DISCHARGES - PROCESS EFFLUENT - NOT WATER COMPANY Permit Number: 0175/5 Permit Version: 1 Receiving Water: CROWTON BROOK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 20/01/1975 Revocation Date: 31/03/1991
H	223m E	POTATO WHARF, OFF LIVERPOOL RD, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: 0175/5 Permit Version: 1 Receiving Water: CROWTON BROOK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 20/01/1975 Revocation Date: 31/03/1991
H	223m E	POTATO WHARF, OFF LIVERPOOL RD, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: 0175/5 Permit Version: 2 Receiving Water: CROWTON BROOK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01/04/1991 Revocation Date: 31/12/1994

ID	Location	Address	Details	
H	223m E	POTATO WHARF, OFF LIVERPOOL RD, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: 0175/5 Permit Version: 3 Receiving Water: CROWTON BROOK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01/01/1995 Revocation Date: 30/06/1995
H	223m E	POTATO WHARF, OFF LIVERPOOL RD, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: 0175/5 Permit Version: 4 Receiving Water: CROWTON BROOK	Status: SURRENDERED UNDER EPR 2010 Issue date: - Effective Date: 01/07/1995 Revocation Date: 08/03/2016
G	238m W	EGERTON ST WORSLEY ST CSO, EGERTON ST AND WORSLEY ST, CORNBROOK, A57 M, MANCHESTER, M15 4LG	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016983277 Permit Version: 1 Receiving Water: THE RIVER MEDLOCK	Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 19/02/1999 Effective Date: 01/11/1999 Revocation Date: 31/03/2018
G	239m W	CHESTER RD AT YORK ST, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982720 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 30/09/1994 Revocation Date: 18/02/1999
G	239m W	CHESTER RD/YORK ST, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0279 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: 19/12/1999
G	239m W	EGERTON ST/ELESMERE ST, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0180 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: 12/08/1999
G	239m W	CHESTER RD AT YORK ST, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982720 Permit Version: 2 Receiving Water: RIVER MEDLOCK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 19/02/1999 Revocation Date: 14/07/2000

ID	Location	Address	Details	
G	242m W	EGERTON ST WORSLEY ST CSO, EGERTON ST AND WORSLEY ST, CORNBROOK, A57 M, MANCHESTER, M15 4LG	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016983277 Permit Version: 2 Receiving Water: THE RIVER MEDLOCK	Status: VARIED UNDER EPR 2010 Issue date: 12/03/2018 Effective Date: 01/04/2018 Revocation Date: -
I	243m W	POTATO WHARF, OFF LIVERPOOL RD, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: 0175/5 Permit Version: 2 Receiving Water: CROWTON BROOK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01/04/1991 Revocation Date: 31/12/1994
I	243m W	POTATO WHARF, OFF LIVERPOOL RD, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: 0175/5 Permit Version: 3 Receiving Water: CROWTON BROOK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01/01/1995 Revocation Date: 30/06/1995
I	243m W	POTATO WHARF, OFF LIVERPOOL RD, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: 0175/5 Permit Version: 4 Receiving Water: CROWTON BROOK	Status: SURRENDERED UNDER EPR 2010 Issue date: - Effective Date: 01/07/1995 Revocation Date: 08/03/2016
G	249m W	EGERTON ST/WORSLEY ST, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0181 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: CONSENT REVOKED OR REVISED - NEW CONSENT ISSUED (37(1)) Issue date: - Effective Date: 01/01/1995 Revocation Date: 01/01/1995
J	288m E	CHESTER RD AT OWEN ST, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982719 Permit Version: 2 Receiving Water: RIVER MEDLOCK	Status: MODIFIED - (WRA 91 SCHED 10 - AS AMENDED BY ENV ACT 1995) Issue date: - Effective Date: 01/12/1999 Revocation Date: -
J	288m E	CHESTER RD AT OWEN ST, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0276 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: CONSENT REVOKED OR REVISED - NEW CONSENT ISSUED (37(1)) Issue date: - Effective Date: 01/01/1995 Revocation Date: 01/12/1999

ID	Location	Address	Details	
J	294m E	DEANSGATE, L. PETER ST, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0157 Permit Version: 1 Receiving Water: TUNNEL TO MEDLOCK	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: 02/09/2010
J	294m E	DEANSGATE, L. PETER ST, MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0157 Permit Version: 2 Receiving Water: TUNNEL TO MEDLOCK	Status: SURRENDERED UNDER EPR 2010 Issue date: 03/09/2010 Effective Date: 03/09/2010 Revocation Date: 18/07/2014
14	375m SE	OWEN STREET, MANCHESTER, M15 4PZ	Effluent Type: TRADE DISCHARGES - SITE DRAINAGE Permit Number: EPRFB3091RH Permit Version: 1 Receiving Water: THE RIVER MEDLOCK	Status: SURRENDERED UNDER EPR 2010 Issue date: 04/10/2016 Effective Date: 04/10/2016 Revocation Date: 02/07/2018
K	424m NW	WATER STREET/LIVERPOOL ROAD CSO, WATER STREET, 133 LIVERPOOL ROAD, MANCHESTER, GREATER MANCHESTER, M3 4PU	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0169 Permit Version: 1 Receiving Water: RIVER IRWELL	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01/01/1995 Revocation Date: 25/10/1995
K	424m NW	WATER STREET/LIVERPOOL ROAD CSO, WATER STREET, 133 LIVERPOOL ROAD, MANCHESTER, GREATER MANCHESTER, M3 4PU	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016993597 Permit Version: 1 Receiving Water: RIVER IRWELL	Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 05/10/2004 Effective Date: 05/10/2004 Revocation Date: 30/08/2014
15	424m W	ST GEORGES ISLAND PROJECTS OFFICE, HULME HALL ROAD	Effluent Type: TRADE DISCHARGES - SITE DRAINAGE Permit Number: 016993598 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: CONSENT EXPIRED - TIME LIMIT Issue date: 14/09/2004 Effective Date: 14/09/2004 Revocation Date: 14/01/2005
K	426m NW	WATER STREET/LIVERPOOL ROAD CSO, WATER STREET, 133 LIVERPOOL ROAD, MANCHESTER, GREATER MANCHESTER, M3 4PU	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016993597 Permit Version: 3 Receiving Water: RIVER IRWELL	Status: VARIED UNDER EPR 2010 Issue date: 09/01/2020 Effective Date: 09/01/2020 Revocation Date: -

ID	Location	Address	Details	
K	429m NW	WATER STREET/LIVERPOOL ROAD CSO, WATER STREET, 133 LIVERPOOL ROAD, MANCHESTER, GREATER MANCHESTER, M3 4PU	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016993597 Permit Version: 2 Receiving Water: RIVER IRWELL	Status: MODIFIED - (WRA 91 SCHED 10 - AS AMENDED BY ENV ACT 1995) Issue date: 24/03/2014 Effective Date: 31/08/2014 Revocation Date: 08/01/2020
L	472m N	GRAPE STREET CSO, GRAPE STREET, MANCHESTER, GREATER MANCHESTER, M60 9EA	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0170 Permit Version: 1 Receiving Water: RIVER IRWELL	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: 02/09/2010
L	472m N	GRAPE STREET CSO, GRAPE STREET, MANCHESTER, GREATER MANCHESTER, M60 9EA	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0170 Permit Version: 2 Receiving Water: RIVER IRWELL	Status: VARIED UNDER EPR 2010 Issue date: 03/09/2010 Effective Date: 03/09/2010 Revocation Date: 10/01/2017
L	472m N	GRAPE STREET CSO, GRAPE STREET, MANCHESTER, GREATER MANCHESTER, M60 9EA	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0170 Permit Version: 3 Receiving Water: RIVER IRWELL	Status: VARIED UNDER EPR 2010 Issue date: 11/01/2017 Effective Date: 11/01/2017 Revocation Date: 31/03/2018
17	483m NW	J SAINSBURY PLC SWO, REGENT ROAD, END OF ORDSALL ALNE, SALFORD, GREATER MANCHESTER	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: 016991422 Permit Version: 1 Receiving Water: RIVER IRWELL	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01/11/1994 Revocation Date: 01/11/1994

This data is sourced from the Environment Agency and Natural Resources Wales.

4.14 Pollutant release to surface waters (Red List)

Records within 500m	**0**

Discharges of specified substances under the Environmental Protection (Prescribed Processes and Substances) Regulations 1991.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.15 Pollutant release to public sewer

Records within 500m	0

Discharges of Special Category Effluents to the public sewer.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.16 List 1 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List I of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.17 List 2 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List II of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.18 Pollution Incidents (EA/NRW)

Records within 500m	3

Records of substantiated pollution incidents. Since 2006 this data has only included category 1 (major) and 2 (significant) pollution incidents.

Features are displayed on the Current industrial land use map on **page 57**

ID	Location	Details	
13	342m NW	Incident Date: 12/06/2001 Incident Identification: 8739 Pollutant: Oils and Fuel Pollutant Description: Diesel	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
16	424m SW	Incident Date: 15/03/2001 Incident Identification: 362 Pollutant: Oils and Fuel Pollutant Description: Unidentified Oil	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)

ID	Location	Details	
18	488m SW	Incident Date: 06/06/2001 Incident Identification: 7808 Pollutant: Sewage Materials Pollutant Description: Process Effluent	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)

This data is sourced from the Environment Agency and Natural Resources Wales.

4.19 Pollution inventory substances

Records within 500m	**0**

The pollution inventory (substances) includes reporting on annual emissions of certain regulated substances to air, controlled waters and land. A reporting threshold for each substance is also included. Where emissions fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

4.20 Pollution inventory waste transfers

Records within 500m	**0**

The pollution inventory (waste transfers) includes reporting on annual transfers and recovery/disposal of controlled wastes from a site. A reporting threshold for each waste type is also included. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

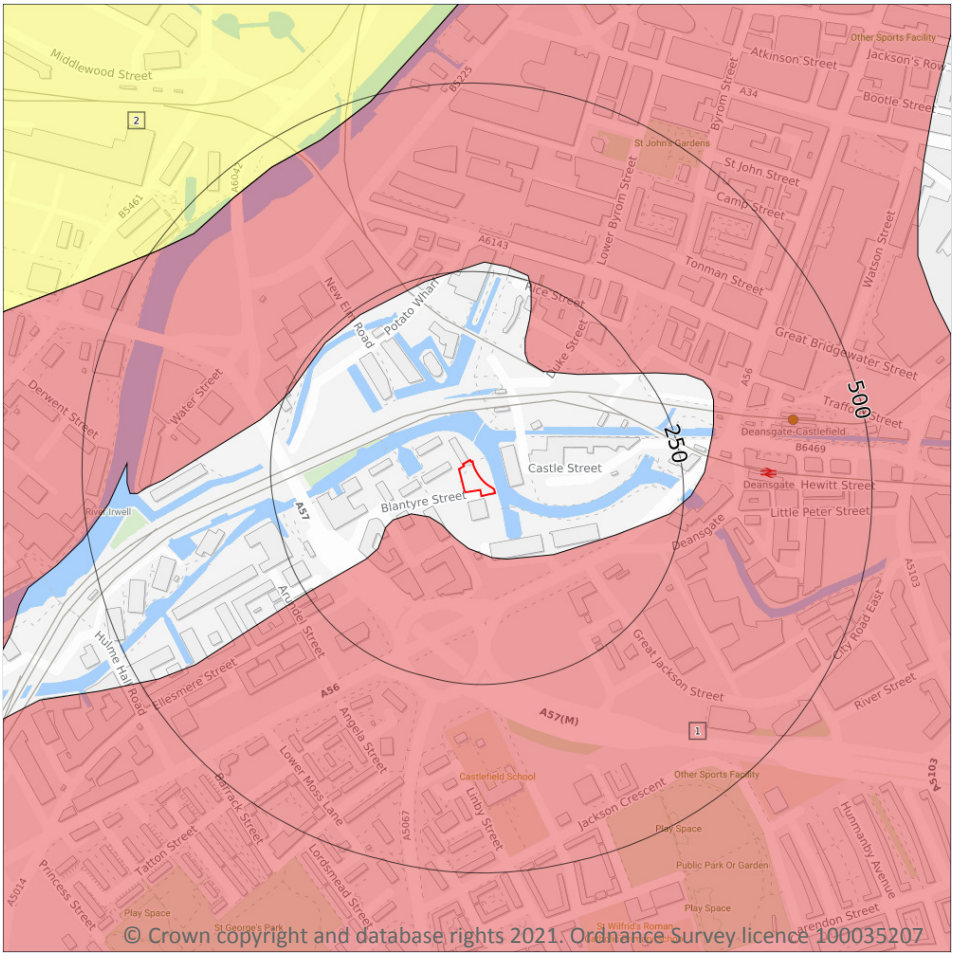
4.21 Pollution inventory radioactive waste

Records within 500m	**0**

The pollution inventory (radioactive wastes) includes reporting on annual releases of radioactive substances from a site, including the means of release. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

5 Hydrogeology - Superficial aquifer



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Site Outline

Search buffers in metres (m)

- Principal
- Secondary A
- Secondary B
- Secondary Undifferentiated
- Unproductive
- Unknown

5.1 Superficial aquifer

Records within 500m	2

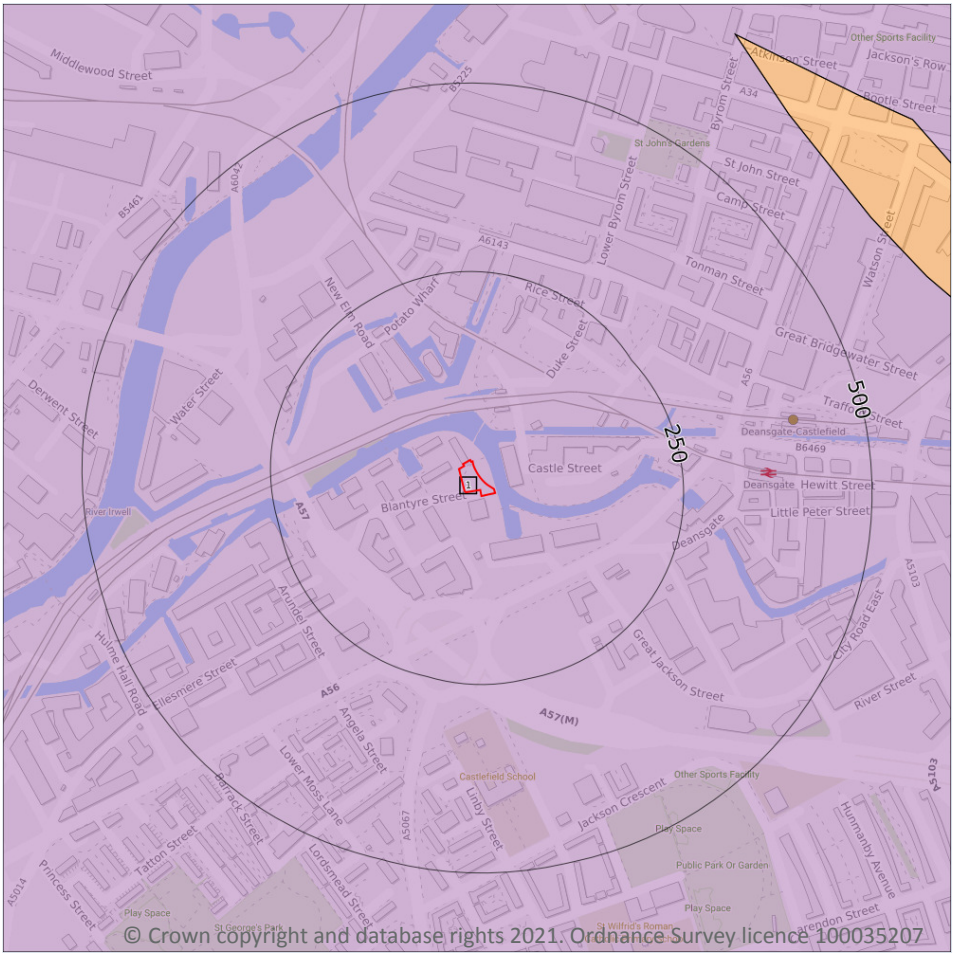
Aquifer status of groundwater held within superficial geology.

Features are displayed on the Hydrogeology map on **page 69**

ID	Location	Designation	Description
1	54m SW	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	466m NW	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

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

Bedrock aquifer



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Site Outline

Search buffers in metres (m)

- Principal
- Secondary A
- Secondary B
- Secondary Undifferentiated
- Unproductive

5.2 Bedrock aquifer

Records within 500m	1

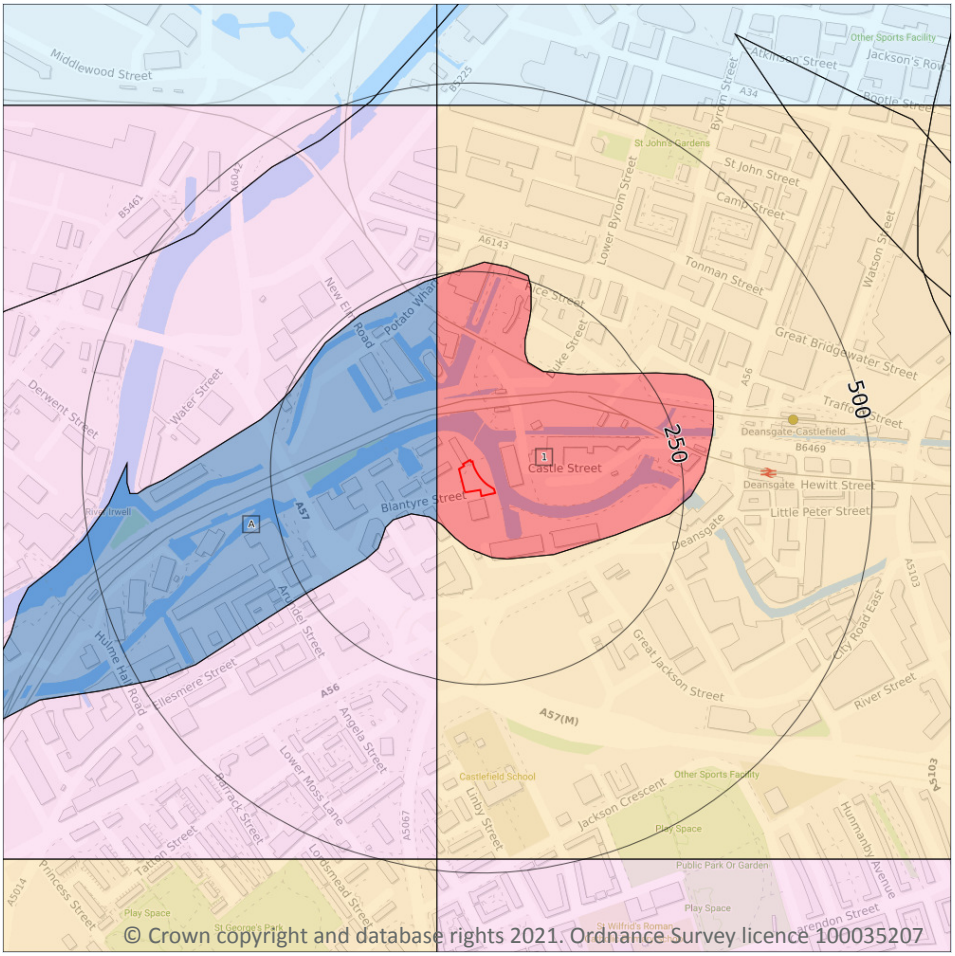
Aquifer status of groundwater held within bedrock geology.

Features are displayed on the Bedrock aquifer map on **page 71**

ID	Location	Designation	Description
1	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

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

Groundwater vulnerability



Site Outline

Search buffers in metres (m)

Superficial vulnerability

- Principal superficial aquifer, high vulnerability
- Secondary superficial aquifer, high vulnerability
- Principal superficial aquifer, medium vulnerability
- Secondary superficial aquifer, medium vulnerability
- Principal superficial aquifer, low vulnerability
- Secondary superficial aquifer, low vulnerability

Bedrock vulnerability

- Principal bedrock aquifer, high vulnerability
- Secondary bedrock aquifer, high vulnerability
- Principal bedrock aquifer, medium vulnerability
- Secondary bedrock aquifer, medium vulnerability
- Principal bedrock aquifer, low vulnerability
- Secondary bedrock aquifer, low vulnerability

Other information

- Unproductive aquifer
- Soluble rock risk
- Local information

5.3 Groundwater vulnerability

Records within 50m	2

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one kilometre square grid. Groundwater vulnerability is described as High, Medium or Low as follows:

- High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Medium - Intermediate between high and low vulnerability.
- Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

Features are displayed on the Groundwater vulnerability map on **page 72**

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
1	**On site**	**Summary Classification: Principal bedrock aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer**	**Leaching class: High Infiltration value: >70% Dilution value: 300-550mm/year**	**Vulnerability: - Aquifer type: - Thickness: 3-10m Patchiness value: <90% Recharge potential: High**	**Vulnerability: High Aquifer type: Principal Flow mechanism: Well connected fractures**
A	29m W	Summary Classification: Principal bedrock aquifer - Low Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer	Leaching class: High Infiltration value: <40% Dilution value: 300-550mm/year	Vulnerability: - Aquifer type: - Thickness: 3-10m Patchiness value: >90% Recharge potential: Low	Vulnerability: Low Aquifer type: Principal Flow mechanism: Mixed

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

5.4 Groundwater vulnerability- soluble rock risk

Records on site	**0**

This dataset identifies areas where solution features that enable rapid movement of a pollutant may be present within a 1km grid square.

This data is sourced from the British Geological Survey and the Environment Agency.

5.5 Groundwater vulnerability- local information

Records on site	**0**

This dataset identifies areas where additional local information affecting vulnerability is held by the Environment Agency. Further information can be obtained by contacting the Environment Agency local Area groundwater team through the Environment Agency National Customer Call Centre on 03798 506 506 or by email on enquiries@environment-agency.gov.uk.

This data is sourced from the British Geological Survey and the Environment Agency.

Abstractions and Source Protection Zones



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Site Outline

Search buffers in metres (m)

- Source Protection Zone 1 — Inner catchment
- Source Protection Zone 2 — Outer catchment
- Source Protection Zone 3 — Total catchment
- Source Protection Zone 4 — Zone of Special Interest
- Source Protection Zone 1c — Inner catchment - confined aquifer
- Source Protection Zone 2c — Outer catchment - confined aquifer
- Source Protection Zone 3c — Total catchment - confined aquifer
- Drinking water abstraction licences
- Drinking water abstraction licences — Polygon features
- Drinking water abstraction licences — Linear features
- Groundwater abstraction licence (point)
- Groundwater abstraction licence (area)
- Groundwater abstraction licence (linear)
- Surface Water Abstractions (point)
- Surface Water Abstractions (area)
- Surface Water Abstractions (linear)

5.6 Groundwater abstractions

Records within 2000m	47

Licensed groundwater abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, between two points (line data) or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 74**

ID	Location	Details	
1	464m N	Status: Historical Licence No: NW/069/0004/019 Details: Transfer Between Sources (Post Water Act 2003) Direct Source: Ground Water - North West Region Point: ST JOHNS MANCHESTER Data Type: Poly4 Name: Manchester Quays Development (MGY) Ltd Easting: 383094 Northing: 398099	Annual Volume (m^3): 543,120 Max Daily Volume (m^3): 1,488 Original Application No: - Original Start Date: 13/09/2019 Expiry Date: 31/12/2020 Issue No: 1 Version Start Date: 13/09/2019 Version End Date: -
-	684m N	Status: Historical Licence No: 2569007089 Details: Non-Evaporative Cooling Direct Source: Ground Water - North West Region Point: 2 BOREHOLES AT GARTSIDE STREET MANCHESTER Data Type: Line Name: HER MAJESTY'S COURT SERVICE Easting: 383335 Northing: 398310	Annual Volume (m^3): 200000 Max Daily Volume (m^3): 1179 Original Application No: - Original Start Date: 26/01/2005 Expiry Date: 31/03/2011 Issue No: 2 Version Start Date: 10/07/2008 Version End Date: -
-	976m SE	Status: Active Licence No: NW/069/0004/003 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT MANCHESTER METROPOLITAN UNIVERSITY Data Type: Point Name: Manchester Metropolitan University Easting: 383715 Northing: 396746	Annual Volume (m^3): 274,115 Max Daily Volume (m^3): 751 Original Application No: - Original Start Date: 20/09/2013 Expiry Date: 31/03/2027 Issue No: 1 Version Start Date: 01/01/2015 Version End Date: -
-	976m SE	Status: Active Licence No: NW/069/0004/003 Details: Heat Pump Direct Source: Ground Water - North West Region Point: BOREHOLE AT MANCHESTER METROPOLITAN UNIVERSITY Data Type: Point Name: Manchester Metropolitan University Easting: 383715 Northing: 396746	Annual Volume (m^3): 274,115 Max Daily Volume (m^3): 751 Original Application No: - Original Start Date: 20/09/2013 Expiry Date: 31/03/2027 Issue No: 1 Version Start Date: 01/01/2015 Version End Date: -

ID	Location	Details	
-	1143m NE	Status: Historical Licence No: 2569007069 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: "BOREHOLE AT GEORGE ST, MANCHESTER" Data Type: Point Name: BRITISH TELECOM Easting: 384100 Northing: 398000	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 27/01/1971 Expiry Date: - Issue No: 100 Version Start Date: 27/01/1971 Version End Date: -
-	1143m NE	Status: Historical Licence No: 2569007069 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT GEORGE ST, MANCHESTER Data Type: Point Name: BRITISH TELECOMMUNICATIONS PLC Easting: 384100 Northing: 398000	Annual Volume (m^3): 1100 Max Daily Volume (m^3): 860 Original Application No: - Original Start Date: 01/04/1984 Expiry Date: - Issue No: 100 Version Start Date: 01/04/2007 Version End Date: -
-	1167m NW	Status: Historical Licence No: 2569007085 Details: Process water Direct Source: Ground Water - North West Region Point: "BOREHOLE AT HOPE STREET, SALFORD, MANCHESTER" Data Type: Point Name: READY MIXED CONCRETE (NORTH WEST) LIMITED Easting: 382190 Northing: 398330	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 01/11/2000 Expiry Date: - Issue No: 1 Version Start Date: 01/11/2000 Version End Date: -
-	1167m NW	Status: Active Licence No: 2569007085 Details: Process Water Direct Source: Ground Water - North West Region Point: BOREHOLE AT HOPE STREET, SALFORD, MANCHESTER Data Type: Point Name: CEMEX UK MATERIALS LTD Easting: 382190 Northing: 398330	Annual Volume (m^3): 23,000 Max Daily Volume (m^3): 115 Original Application No: - Original Start Date: 01/11/2000 Expiry Date: - Issue No: 4 Version Start Date: 21/12/2018 Version End Date: -

ID	Location	Details	
-	1171m E	Status: Active Licence No: NW/069/0006/003 Details: Heat Pump Direct Source: Ground Water - North West Region Point: BOREHOLE 1 AT LOWER CHATHAM STREET Data Type: Point Name: Manchester Metropolitan University Easting: 384180 Northing: 397091	Annual Volume (m^3): 283,240 Max Daily Volume (m^3): 1,532 Original Application No: - Original Start Date: 04/04/2014 Expiry Date: 31/03/2027 Issue No: 2 Version Start Date: 04/04/2014 Version End Date: -
-	1171m E	Status: Active Licence No: NW/069/0006/003 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE 1 AT LOWER CHATHAM STREET Data Type: Point Name: Manchester Metropolitan University Easting: 384180 Northing: 397091	Annual Volume (m^3): 283,240 Max Daily Volume (m^3): 1,532 Original Application No: - Original Start Date: 04/04/2014 Expiry Date: 31/03/2027 Issue No: 2 Version Start Date: 04/04/2014 Version End Date: -
-	1324m E	Status: Historical Licence No: NW0690006001 Details: Non-Evaporative Cooling Direct Source: Ground Water - North West Region Point: BOREHOLES AT ORIGIN DEVELOPMENTS, MANCHESTER Data Type: Point Name: West Contracting Easting: 384378 Northing: 397733	Annual Volume (m^3): 139128 Max Daily Volume (m^3): 1010 Original Application No: - Original Start Date: 19/01/2009 Expiry Date: 31/03/2015 Issue No: 1 Version Start Date: 19/01/2009 Version End Date: -
-	1324m E	Status: Historical Licence No: NW/069/0006/001 Details: Non-Evaporative Cooling Direct Source: Ground Water - North West Region Point: BOREHOLES AT ORIGIN DEVELOPMENTS, MANCHESTER Data Type: Point Name: West Contracting Easting: 384378 Northing: 397733	Annual Volume (m^3): 139128 Max Daily Volume (m^3): 1010 Original Application No: - Original Start Date: 19/01/2009 Expiry Date: 31/03/2015 Issue No: 1 Version Start Date: 19/01/2009 Version End Date: -

ID	Location	Details	
-	1341m NE	Status: Historical Licence No: 2569007070 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: "BOREHOLE AT DIAL HOUSE, CHAPEL ST, SALFORD" Data Type: Point Name: BRITISH TELECOM Easting: 383700 Northing: 398700	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 27/01/1971 Expiry Date: - Issue No: 100 Version Start Date: 27/01/1971 Version End Date: -
-	1341m NE	Status: Historical Licence No: 2569007070 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT DIAL HOUSE, CHAPEL ST, SALFORD Data Type: Point Name: BRITISH TELECOMMUNICATIONS PLC Easting: 383700 Northing: 398700	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 27/01/1971 Expiry Date: - Issue No: 101 Version Start Date: 01/04/1984 Version End Date: -
-	1341m NE	Status: Active Licence No: 2569007070 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT DIAL HOUSE CHAPEL STREET SALFORD Data Type: Point Name: BRITISH TELECOMMUNICATIONS PLC Easting: 383700 Northing: 398700	Annual Volume (m^3): 45 Max Daily Volume (m^3): 30 Original Application No: - Original Start Date: 27/01/1971 Expiry Date: - Issue No: 101 Version Start Date: 01/04/2007 Version End Date: -
-	1638m SW	Status: Historical Licence No: 2569007002 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: "BOREHOLE AT 371 ORDSALL LANE, MANCHESTER 5" Data Type: Point Name: COLGATE PALMOLIVE LTD Easting: 381600 Northing: 396700	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 08/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 05/12/1985 Version End Date: -

ID	Location	Details	
-	1638m SW	Status: Historical Licence No: 2569007002 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT 371 ORDSALL LANE, MANCHESTER 5 Data Type: Point Name: Cerep III Investment R Sarl Easting: 381600 Northing: 396700	Annual Volume (m^3): 409140 Max Daily Volume (m^3): 1636.56 Original Application No: - Original Start Date: 08/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 29/10/2009 Version End Date: -
-	1639m S	Status: Historical Licence No: 2569007009 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: "BOREHOLE AT PREMISES, MOSS LANE WEST MANCHESTER" Data Type: Point Name: HYDES BREWERY LTD Easting: 383220 Northing: 395850	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 21/02/1966 Expiry Date: - Issue No: 101 Version Start Date: 07/10/2000 Version End Date: -
-	1639m S	Status: Historical Licence No: 2569007009 Details: Process water Direct Source: Ground Water - North West Region Point: "BOREHOLE AT PREMISES, MOSS LANE WEST MANCHESTER" Data Type: Point Name: HYDES BREWERY LTD Easting: 383220 Northing: 395850	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 21/02/1966 Expiry Date: - Issue No: 101 Version Start Date: 07/10/2000 Version End Date: -
-	1639m S	Status: Historical Licence No: 2569007009 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, MOSS LANE WEST MANCHESTER Data Type: Point Name: HYDES BREWERY LTD Easting: 383220 Northing: 395850	Annual Volume (m^3): 66826.2 Max Daily Volume (m^3): 372.772 Original Application No: - Original Start Date: 21/02/1966 Expiry Date: - Issue No: 101 Version Start Date: 07/10/2000 Version End Date: -

ID	Location	Details	
-	1639m S	Status: Historical Licence No: 2569007009 Details: Process Water Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, MOSS LANE WEST MANCHESTER Data Type: Point Name: HYDES BREWERY LTD Easting: 383220 Northing: 395850	Annual Volume (m^3): 66826.2 Max Daily Volume (m^3): 372.772 Original Application No: - Original Start Date: 21/02/1966 Expiry Date: - Issue No: 103 Version Start Date: 19/07/2018 Version End Date: -
-	1762m SE	Status: Active Licence No: 2569007007 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES MOSS SIDE MANCHESTER Data Type: Point Name: Heineken UK Ltd Easting: 383865 Northing: 395909	Annual Volume (m^3): 227,000 Max Daily Volume (m^3): 900 Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 103 Version Start Date: 08/05/2014 Version End Date: -
-	1762m SE	Status: Active Licence No: 2569007007 Details: Process Water Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES MOSS SIDE MANCHESTER Data Type: Point Name: Heineken UK Ltd Easting: 383865 Northing: 395909	Annual Volume (m^3): 227,000 Max Daily Volume (m^3): 900 Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 103 Version Start Date: 08/05/2014 Version End Date: -
-	1786m SE	Status: Historical Licence No: 2569007007 Details: Process water Direct Source: Ground Water - North West Region Point: "BOREHOLE AT PREMISES, MOSS SIDE, MANCHESTER" Data Type: Point Name: SCOTTISH COURAGE BREWING LTD Easting: 383900 Northing: 395900	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 16/08/1995 Version End Date: -

ID	Location	Details	
-	1786m SE	Status: Historical Licence No: 2569007007 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: "BOREHOLE AT PREMISES, MOSS SIDE, MANCHESTER" Data Type: Point Name: SCOTTISH COURAGE BREWING LTD Easting: 383900 Northing: 395900	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 16/08/1995 Version End Date: -
-	1786m SE	Status: Historical Licence No: 2569007007 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, MOSS SIDE, MANCHESTER Data Type: Point Name: SCOTTISH COURAGE BREWING LTD Easting: 383900 Northing: 395900	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 31/12/2003 Version End Date: -
-	1786m SE	Status: Historical Licence No: 2569007007 Details: Process water Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, MOSS SIDE, MANCHESTER Data Type: Point Name: SCOTTISH COURAGE BREWING LTD Easting: 383900 Northing: 395900	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 31/12/2003 Version End Date: -
-	1786m SE	Status: Historical Licence No: 2569007007 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES MOSS SIDE MANCHESTER Data Type: Point Name: Heineken UK Ltd Easting: 383900 Northing: 395900	Annual Volume (m^3): 227000 Max Daily Volume (m^3): 900 Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 23/11/2009 Version End Date: -

ID	Location	Details	
-	1786m SE	Status: Historical Licence No: 2569007007 Details: Process Water Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES MOSS SIDE MANCHESTER Data Type: Point Name: Heineken UK Ltd Easting: 383900 Northing: 395900	Annual Volume (m^3): 227000 Max Daily Volume (m^3): 900 Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 23/11/2009 Version End Date: -
-	1832m NE	Status: Historical Licence No: 2569004023 Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services" Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 2) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -
-	1832m NE	Status: Historical Licence No: 2569004023 Details: Process water Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 2) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -
-	1832m NE	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 2) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -

ID	Location	Details	
-	1832m NE	Status: Historical Licence No: 2569004023 Details: Process water Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 2) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1832m NE	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 2 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1832m NE	Status: Historical Licence No: 2569004023 Details: Process Water Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 2 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1864m NE	Status: Historical Licence No: 2569004023 Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services" Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 3) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -

ID	Location	Details	
-	1864m NE	Status: Historical Licence No: 2569004023 Details: Process water Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 3) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -
-	1864m NE	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 3) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1864m NE	Status: Historical Licence No: 2569004023 Details: Process water Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 3) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1864m NE	Status: Historical Licence No: 2569004023 Details: Process Water Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 3 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -

ID	Location	Details	
-	1864m NE	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 3 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1899m NE	Status: Historical Licence No: 2569004023 Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services" Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 1) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -
-	1899m NE	Status: Historical Licence No: 2569004023 Details: Process water Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 1) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -
-	1899m NE	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 1) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -

ID	Location	Details	
-	1899m NE	Status: Historical Licence No: 2569004023 Details: Process water Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 1) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1899m NE	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 1 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1899m NE	Status: Historical Licence No: 2569004023 Details: Process Water Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 1 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.7 Surface water abstractions

Records within 2000m	**5**

Licensed surface water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 74**

ID	Location	Details	
A	542m W	Status: Historical Licence No: 2569007053 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: "Surface, Non-Tidal - North West Region" Point: "R IRWELL AT IRWELL WORKS, ORDSALL LANE, SALFORD" Data Type: Point Name: CDS COMPUTER DESIGN SYSTEMS LTD Easting: 382500 Northing: 397400	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 22/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 01/11/1987 Version End Date: -
A	542m W	Status: Historical Licence No: 2569007053 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Surface, Non-Tidal - North West Region Point: R IRWELL AT IRWELL WORKS, ORDSALL LANE, SALFORD Data Type: Point Name: CDS COMPUTER DESIGN SYSTEMS LTD Easting: 382500 Northing: 397400	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 22/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 01/11/1987 Version End Date: -
-	1638m SW	Status: Historical Licence No: 2569007001 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: "Surface, Non-Tidal - North West Region" Point: "MANCHESTER SHIP CANAL AT PREMISES, ORDSALL LANE, MANCHESTER" Data Type: Point Name: COLGATE PALMOLIVE LTD Easting: 381600 Northing: 396700	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 27/04/1992 Version End Date: -
-	1638m SW	Status: Historical Licence No: 2569007001 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Surface, Non-Tidal - North West Region Point: MANCHESTER SHIP CANAL AT PREMISES, ORDSALL LANE, MANCHESTER Data Type: Point Name: COLGATE PALMOLIVE LTD Easting: 381600 Northing: 396700	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 27/04/1992 Version End Date: -

ID	Location	Details	
-	1638m SW	Status: Historical Licence No: 2569007001 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Surface, Non-Tidal - North West Region Point: MANCHESTER SHIP CANAL AT PREMISES ORDSALL LANE MANCHESTER Data Type: Point Name: Cerep III Investment R Sarl Easting: 381600 Northing: 396700	Annual Volume (m^3): 1,363,800 Max Daily Volume (m^3): 4909.68 Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 29/10/2009 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.8 Potable abstractions

Records within 2000m	**9**

Licensed potable water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 74**

ID	Location	Details	
-	1832m NE	Status: Historical Licence No: 2569004023 Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services" Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 2) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -
-	1832m NE	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 2) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -

ID	Location	Details	
-	1832m NE	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 2 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1864m NE	Status: Historical Licence No: 2569004023 Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services" Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 3) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -
-	1864m NE	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 3) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1864m NE	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 3 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -

ID	Location	Details	
-	1899m NE	Status: Historical Licence No: 2569004023 Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services" Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 1) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -
-	1899m NE	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 1) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1899m NE	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 1 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.9 Source Protection Zones

Records within 500m	**0**

Source Protection Zones define the sensitivity of an area around a potable abstraction site to contamination.

This data is sourced from the Environment Agency and Natural Resources Wales.

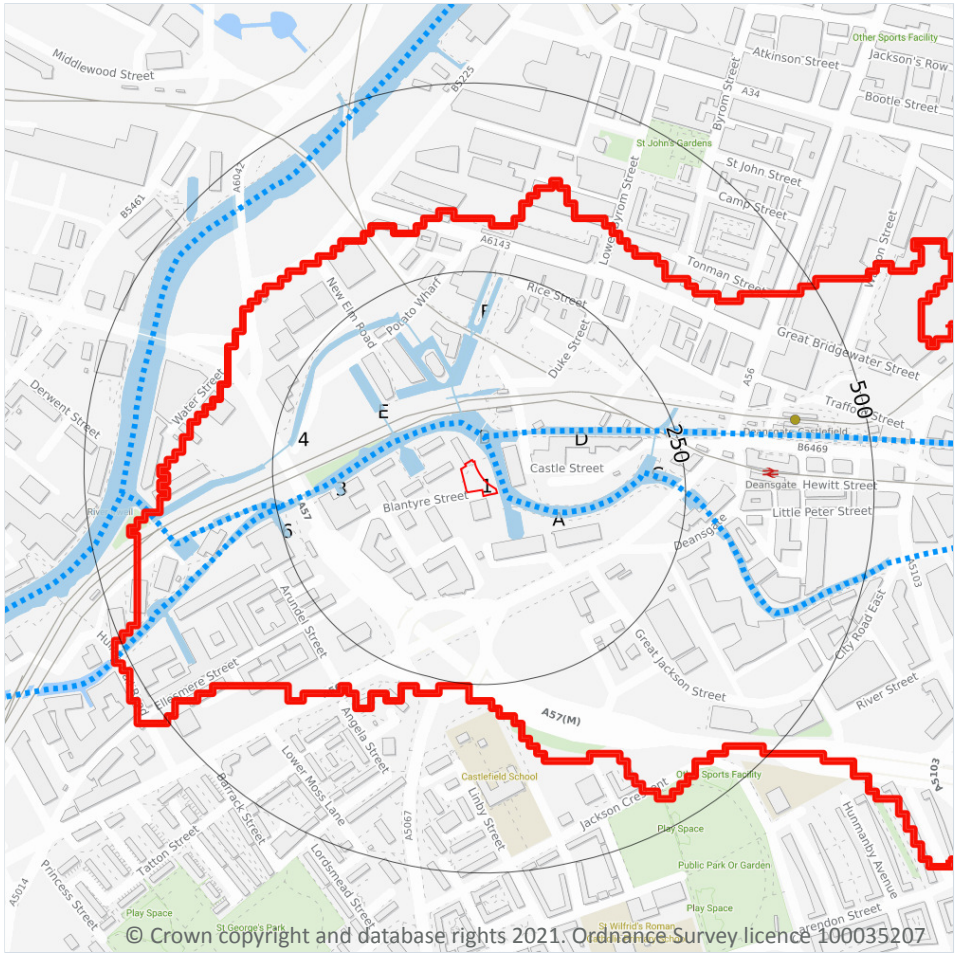
5.10 Source Protection Zones (confined aquifer)

Records within 500m	0

Source Protection Zones in the confined aquifer define the sensitivity around a deep groundwater abstraction to contamination. A confined aquifer would normally be protected from contamination by overlying geology and is only considered a sensitive resource if deep excavation/drilling is taking place.

This data is sourced from the Environment Agency and Natural Resources Wales.

6 Hydrology



Site Outline

Search buffers in metres (m)

Water Network (OS MasterMap)

Surface water features (wider than 5m)

Surface water features (narrower than 5m)

WFD River, canal and surface water transfer water bodies

WFD Lake water bodies

WFD Transitional and coastal water bodies

WFD Surface water body catchments boundaries

WFD Groundwater body boundaries

6.1 Water Network (OS MasterMap)

Records within 250m	27

Detailed water network of Great Britain showing the flow and precise central course of every river, stream, lake and canal.

Features are displayed on the Hydrology map on **page 92**

ID	Location	Type of water feature	Ground level	Permanence	Name
A	11m E	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Bridgewater Canal

ID	Location	Type of water feature	Ground level	Permanence	Name
B	38m NE	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Bridgewater Canal
D	38m NE	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Rochdale Canal
B	50m N	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Bridgewater Canal
B	50m N	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Medlock
B	58m W	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
3	92m NW	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Bridgewater Canal
E	92m NW	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
B	102m N	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Medlock
B	102m N	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Medlock
B	111m N	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Medlock
B	111m N	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
B	160m NW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Medlock
B	162m NW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Medlock

ID	Location	Type of water feature	Ground level	Permanence	Name
B	162m NW	Inland river not influenced by normal tidal action.	Underground	Watercourse contains water year round (in normal circumstances)	River Medlock
F	165m N	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
F	165m N	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
C	200m E	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Bridgewater Canal
C	200m E	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Medlock
4	209m NW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Medlock
C	209m E	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Bridgewater Canal
C	222m E	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Bridgewater Canal
C	225m E	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Rochdale Canal
C	237m E	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
C	237m E	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Rochdale Canal
C	237m E	Inland river not influenced by normal tidal action.	Underground	Watercourse contains water year round (in normal circumstances)	River Medlock
6	242m W	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	-

This data is sourced from the Ordnance Survey.

6.2 Surface water features

Records within 250m	12

Covering rivers, streams and lakes (some overlap with OS MasterMap Water Network data in previous section) but additionally covers smaller features such as ponds. Rivers and streams narrower than 5m are represented as a single line. Lakes, ponds and rivers or streams wider than 5m are represented as polygons.

Features are displayed on the Hydrology map on **page 92**

This data is sourced from the Ordnance Survey.

6.3 WFD Surface water body catchments

Records on site	1

The Water Framework Directive is an EU-led framework for the protection of inland surface waters, estuaries, coastal waters and groundwater through river basin-level management planning. In terms of surface water, these basins are broken down into smaller units known as management, operational and water body catchments.

Features are displayed on the Hydrology map on **page 92**

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
A	**On site**	**River WB catchment**	**Medlock (Lumb Brook to Irwell)**	**GB112069061152**	**Roch Irk Medlock**	**Irwell**

This data is sourced from the Environment Agency and Natural Resources Wales.

6.4 WFD Surface water bodies

Records identified	3

Surface water bodies under the Directive may be rivers, lakes, estuary or coastal. To achieve the purpose of the Directive, environmental objectives have been set and are reported on for each water body. The progress towards delivery of the objectives is then reported on by the relevant competent authorities at the end of each six-year cycle. The river water body directly associated with the catchment listed in the previous section is detailed below, along with any lake, canal, coastal or artificial water body within 250m of the site. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each water body listed.

Features are displayed on the Hydrology map on **page 92**

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
2	11m E	River	Medlock (Lumb Brook to Irwell)	GB112069061152	Moderate	Good	Moderate	2016

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
C	35m NE	Canal	Rochdale Canal, western section	GB71210517	Moderate	Good	Moderate	2016
H	244m W	Canal	Bridgewater Canal	GB71210001	Moderate	Good	Moderate	2016

This data is sourced from the Environment Agency and Natural Resources Wales.

6.5 WFD Groundwater bodies

Records on site	**1**

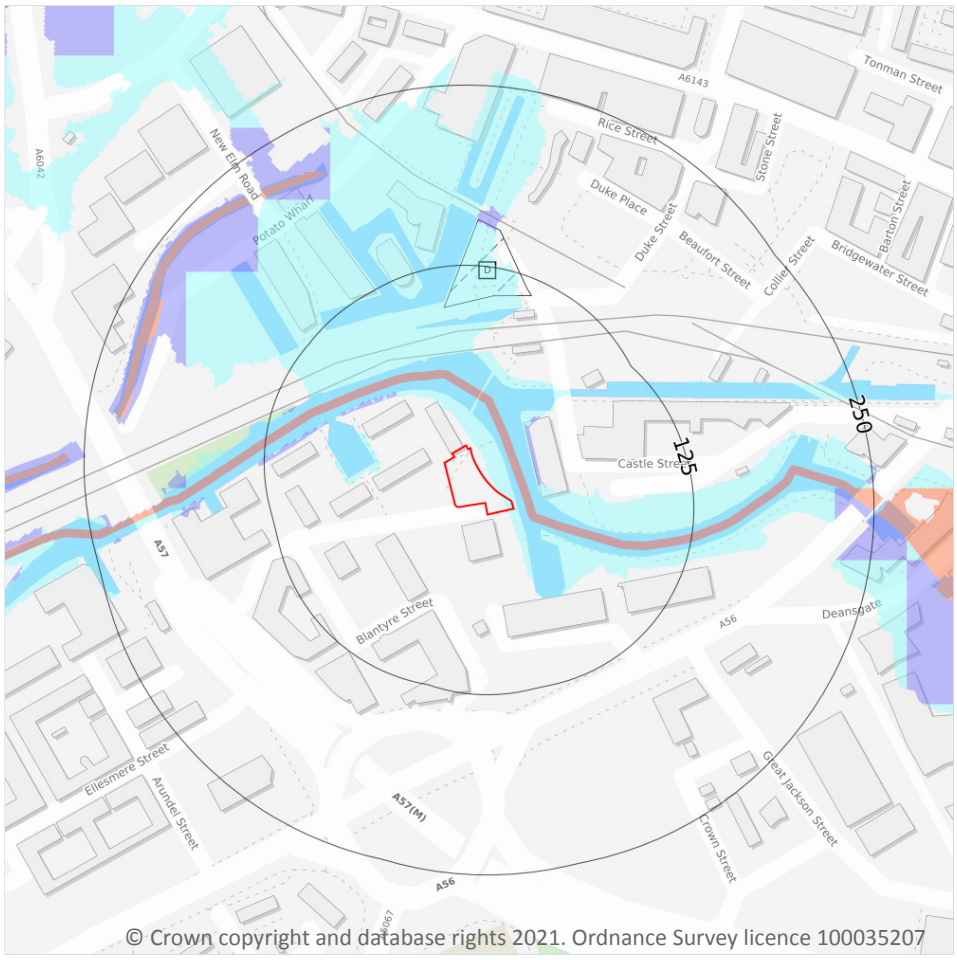
Groundwater bodies are also covered by the Directive and the same regime of objectives and reporting detailed in the previous section is in place. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each groundwater body listed.

Features are displayed on the Hydrology map on **page 92**

ID	Location	Name	Water body ID	Overall rating	Chemical rating	Quantitative	Year
1	**On site**	**Manchester and East Cheshire Permo-Triassic Sandstone Aquifers**	**GB41201G101100**	**Poor**	**Poor**	**Poor**	**2015**

This data is sourced from the Environment Agency and Natural Resources Wales.

7 River and coastal flooding



7.1 Risk of Flooding from Rivers and Sea (RoFRaS)

Records within 50m	5

The chance of flooding from rivers and/or the sea in any given year, based on cells of 50m. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance).

Features are displayed on the River and coastal flooding map on **page 97**

Distance	RoFRaS flood risk
On site	**Low**
0 - 50m	High

This data is sourced from the Environment Agency and Natural Resources Wales.

7.2 Historical Flood Events

Records within 250m	1

Records of historic flooding from rivers, the sea, groundwater and surface water. Records began in 1946 when predecessor bodies started collecting detailed information about flooding incidents, although limited details may be included on flooding incidents prior to this date. Takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding, and includes flood extents that may have been affected by overtopping, breaches or blockages.

Features are displayed on the River and coastal flooding map on **page 97**

ID	Location	Event name	Date of flood	Flood source	Flood cause	Type of flood
D	97m N	Ea01326_21dec1991_Bridgewatercanal_Castlefield	1991-12-21 1991-12-22	Other	Other	No data

This data is sourced from the Environment Agency and Natural Resources Wales.

7.3 Flood Defences

Records within 250m	0

Records of flood defences owned, managed or inspected by the Environment Agency and Natural Resources Wales. Flood defences can be structures, buildings or parts of buildings. Typically these are earth banks, stone and concrete walls, or sheet-piling that is used to prevent or control the extent of flooding.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.4 Areas Benefiting from Flood Defences

Records within 250m	0

Areas that would benefit from the presence of flood defences in a 1 in 100 (1%) chance of flooding each year from rivers or 1 in 200 (0.5%) chance of flooding each year from the sea.

This data is sourced from the Environment Agency and Natural Resources Wales.

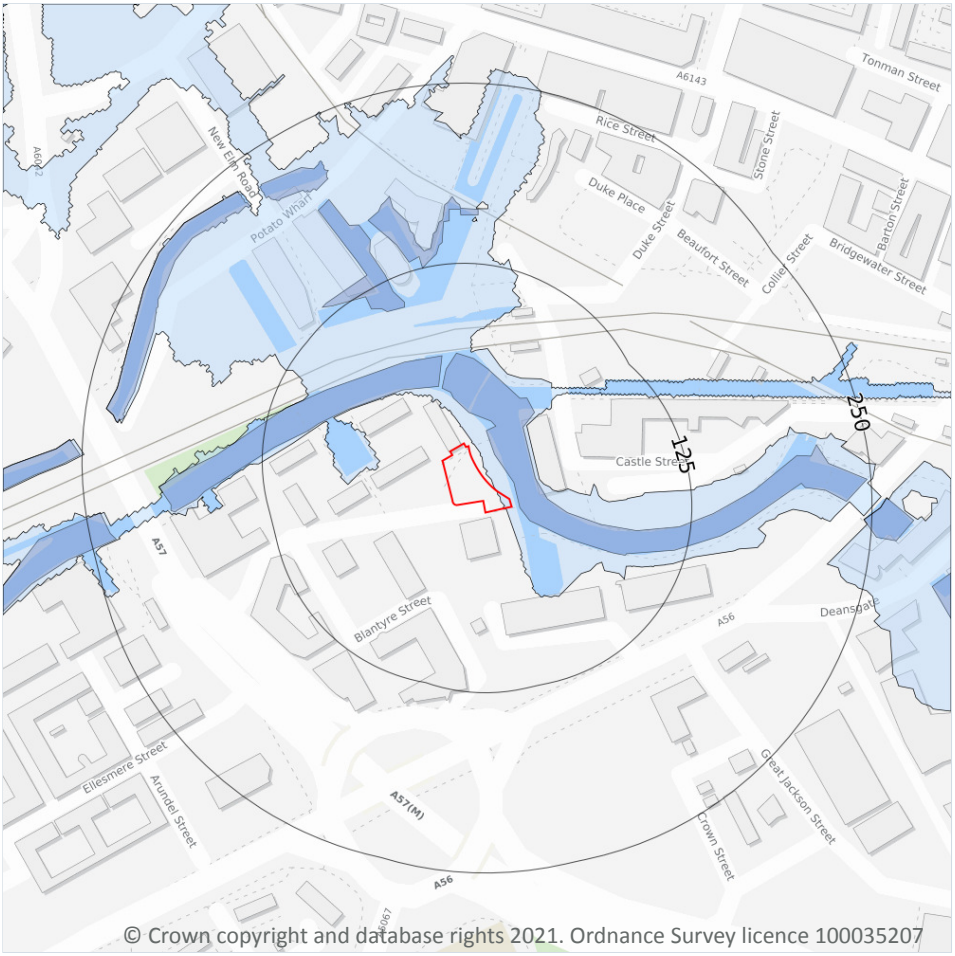
7.5 Flood Storage Areas

Records within 250m	0

Areas that act as a balancing reservoir, storage basin or balancing pond to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel or to delay the timing of a flood peak so that its volume is discharged over a longer period.

This data is sourced from the Environment Agency and Natural Resources Wales.

River and coastal flooding - Flood Zones



7.6 Flood Zone 2

Records within 50m	1

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land between Flood Zone 3 (see next section) and the extent of the flooding from rivers or the sea with a 1 in 1000 (0.1%) chance of flooding each year.

Features are displayed on the River and coastal flooding map on **page 97**

Location	Type
On site	**Zone 2 - (Fluvial /Tidal Models)**

This data is sourced from the Environment Agency and Natural Resources Wales.

7.7 Flood Zone 3

Records within 50m	1

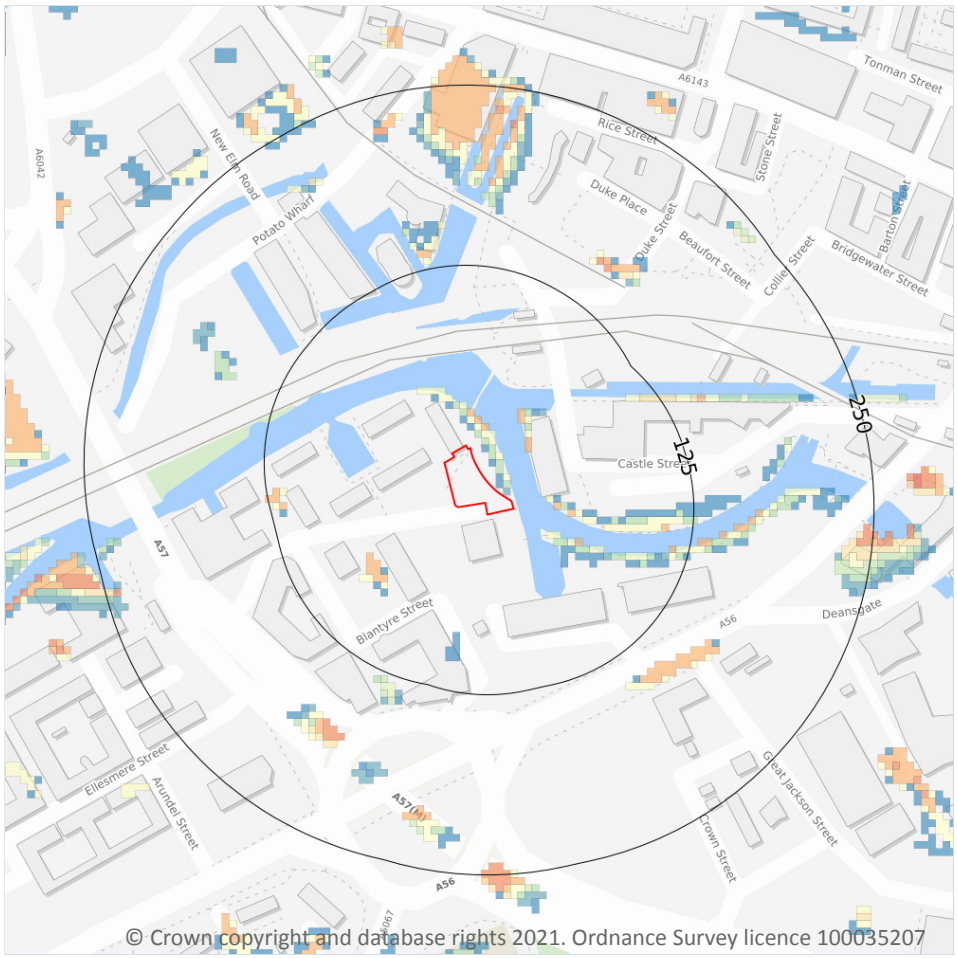
Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land with a 1 in 100 (1%) or greater chance of flooding each year from rivers or a 1 in 200 (0.5%) or greater chance of flooding each year from the sea.

Features are displayed on the River and coastal flooding map on **page 97**

Location	Type
5m E	Zone 3 - (Fluvial Models)

This data is sourced from the Environment Agency and Natural Resources Wales.

8 Surface water flooding



8.1 Surface water flooding

Highest risk on site	**Negligible**
Highest risk within 50m	**1 in 30 year, 0.1m - 0.3m**

Ambiental Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.

Features are displayed on the Surface water flooding map on **page 102**

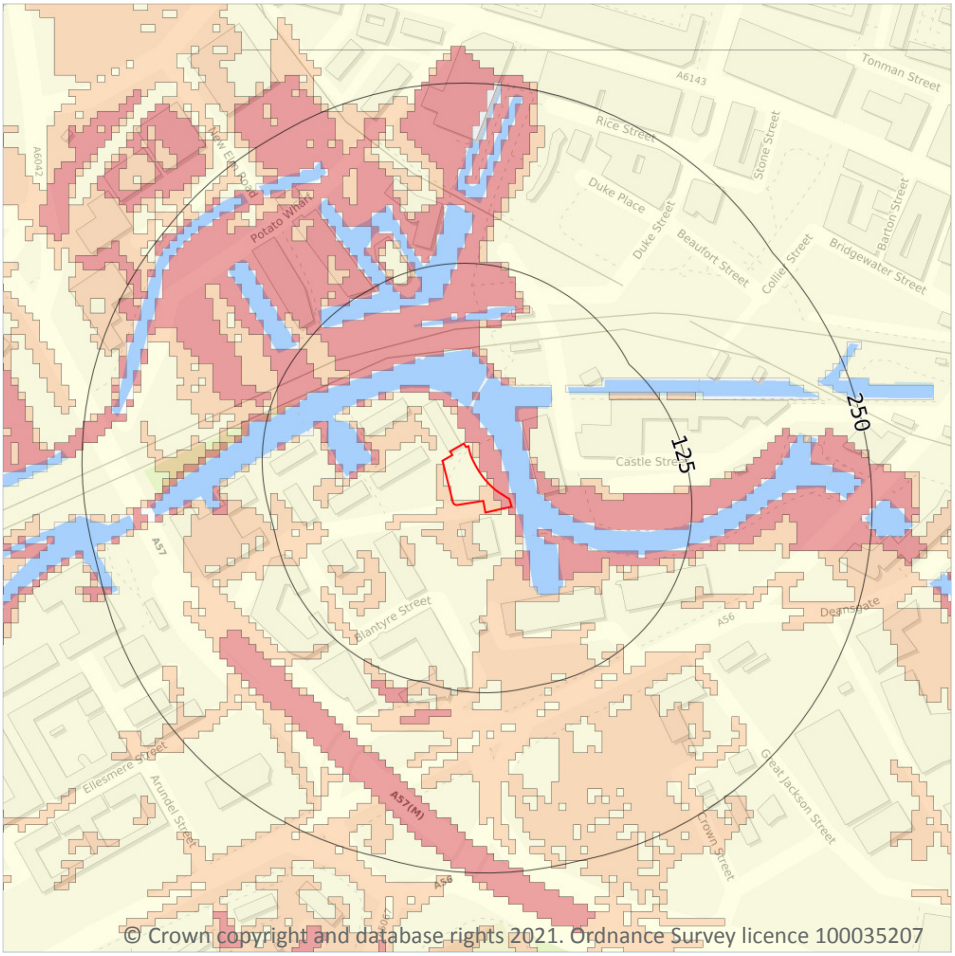
The data shown on the map and in the table above shows the highest likelihood of flood events happening at the site. Lower likelihood events may have greater flood depths and hence a greater potential impact on a site.

The table below shows the maximum flood depths for a range of return periods for the site.

Return period	Maximum modelled depth
1 in 1000 year	Between 0.3m and 1.0m
1 in 250 year	Between 0.1m and 0.3m
1 in 100 year	Between 0.1m and 0.3m
1 in 30 year	Negligible

This data is sourced from Ambiental Risk Analytics.

9 Groundwater flooding



9.1 Groundwater flooding

Highest risk on site	**High**
Highest risk within 50m	**High**

Groundwater flooding is caused by unusually high groundwater levels. It occurs when the water table rises above the ground surface or within underground structures such as basements or cellars. Groundwater flooding tends to exhibit a longer duration than surface water flooding, possibly lasting for weeks or months, and as a result it can cause significant damage to property. This risk assessment is based on a 1 in 100 year return period and a 5m Digital Terrain Model (DTM).

Features are displayed on the Groundwater flooding map on **page 104**

This data is sourced from Ambiental Risk Analytics.

10 Environmental designations

10.1 Sites of Special Scientific Interest (SSSI)

Records within 2000m	0

Sites providing statutory protection for the best examples of UK flora, fauna, or geological or physiographical features. Originally notified under the National Parks and Access to the Countryside Act 1949, SSSIs were re-notified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs were introduced by the Countryside and Rights of Way Act 2000 (in England and Wales) and (in Scotland) by the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2010.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.2 Conserved wetland sites (Ramsar sites)

Records within 2000m	0

Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. They cover all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities. These sites cover a broad definition of wetland; marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, and even some marine areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.3 Special Areas of Conservation (SAC)

Records within 2000m	0

Areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.4 Special Protection Areas (SPA)

Records within 2000m	0

Sites classified by the UK Government under the EC Birds Directive, SPAs are areas of the most important habitat for rare (listed on Annex I to the Directive) and migratory birds within the European Union.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.5 National Nature Reserves (NNR)

Records within 2000m	0

Sites containing examples of some of the most important natural and semi-natural terrestrial and coastal ecosystems in Great Britain. They are managed to conserve their habitats, provide special opportunities for scientific study or to provide public recreation compatible with natural heritage interests.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.6 Local Nature Reserves (LNR)

Records within 2000m	0

Sites managed for nature conservation, and to provide opportunities for research and education, or simply enjoying and having contact with nature. They are declared by local authorities under the National Parks and Access to the Countryside Act 1949 after consultation with the relevant statutory nature conservation agency.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.7 Designated Ancient Woodland

Records within 2000m	0

Ancient woodlands are classified as areas which have been wooded continuously since at least 1600 AD. This includes semi-natural woodland and plantations on ancient woodland sites. 'Wooded continuously' does not mean there is or has previously been continuous tree cover across the whole site, and not all trees within the woodland have to be old.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.8 Biosphere Reserves

Records within 2000m	0

Biosphere Reserves are internationally recognised by UNESCO as sites of excellence to balance conservation and socioeconomic development between nature and people. They are recognised under the Man and the Biosphere (MAB) Programme with the aim of promoting sustainable development founded on the work of the local community.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.9 Forest Parks

Records within 2000m	0

These are areas managed by the Forestry Commission designated on the basis of recreational, conservation or scenic interest.

This data is sourced from the Forestry Commission.

10.10 Marine Conservation Zones

Records within 2000m	0

A type of marine nature reserve in UK waters established under the Marine and Coastal Access Act (2009). They are designated with the aim to protect nationally important, rare or threatened habitats and species.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.11 Green Belt

Records within 2000m	0

Areas designated to prevent urban sprawl by keeping land permanently open.

This data is sourced from the Ministry of Housing, Communities and Local Government.

10.12 Proposed Ramsar sites

Records within 2000m	0

Ramsar sites are areas listed as a Wetland of International Importance under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention) 1971. The sites here supplied have a status of 'Proposed' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.13 Possible Special Areas of Conservation (pSAC)

Records within 2000m	0

Special Areas of Conservation are areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive. Those sites supplied here are those with a status of 'Possible' having been identified for potential adoption under the framework.

This data is sourced from Natural England and Natural Resources Wales.

10.14 Potential Special Protection Areas (pSPA)

Records within 2000m	0

Special Protection Areas (SPAs) are areas designated (or 'classified') under the European Union Wild Birds Directive for the protection of nationally and internationally important populations of wild birds. Those sites supplied here are those with a status of 'Potential' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.15 Nitrate Sensitive Areas

Records within 2000m	0

Areas where nitrate concentrations in drinking water sources exceeded or was at risk of exceeding the limit of 50 mg/l set by the 1980 EC Drinking Water Directive. Voluntary agricultural measures as a means of reducing the levels of nitrate were introduced by DEFRA as MAFF, with payments being made to farmers who complied. The scheme was started as a pilot in 1990 in ten areas, later implemented within 32 areas. The scheme was closed to further new entrants in 1998, although existing agreements continued for their full term. All Nitrate Sensitive Areas fell within the areas designated as Nitrate Vulnerable Zones (NVZs) in 1996 under the EC Nitrate Directive (91/676/EEC).

This data is sourced from Natural England.

10.16 Nitrate Vulnerable Zones

Records within 2000m	3

Areas at risk from agricultural nitrate pollution designated under the EC Nitrate Directive (91/676/EEC). These are areas of land that drain into waters polluted by nitrates. Farmers operating within these areas have to follow mandatory rules to tackle nitrate loss from agriculture.

Location	Name	Type	NVZ ID	Status
889m NW	Irwell / Man. Ship Canal (Kearsley to Irlam Locks) NVZ	Surface Water	S643	Existing
1467m NE	River Irk (Moston Brook to River Irwell) NVZ	Surface Water	S638	Existing
1468m N	River Irk (Moston Brook to River Irwell) NVZ	Surface Water	S638	Existing

This data is sourced from Natural England and Natural Resources Wales.

SSSI Impact Zones and Units



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10.17 SSSI Impact Risk Zones

Records on site	1

Developed to allow rapid initial assessment of the potential risks to SSSIs posed by development proposals. They define zones around each SSSI which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts.

Features are displayed on the SSSI Impact Zones and Units map on **page 109**

ID	Location	Type of developments requiring consultation
1	**On site**	**Air pollution - Livestock & poultry units with floorspace > 500m², slurry lagoons > 4000m². Combustion - General combustion processes >50MW energy input. Incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion**

This data is sourced from Natural England.

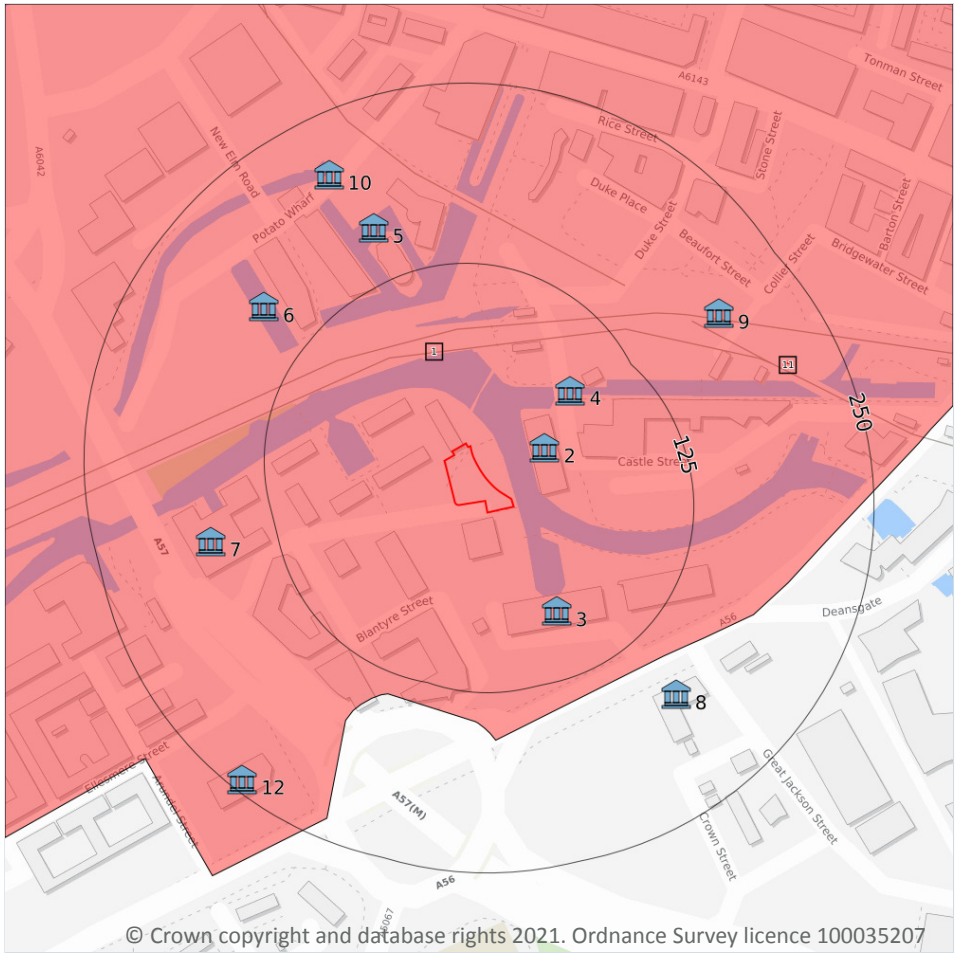
10.18 SSSI Units

Records within 2000m	0

Divisions of SSSIs used to record management and condition details. Units are the smallest areas for which Natural England gives a condition assessment, however, the size of units varies greatly depending on the types of management and the conservation interest.

This data is sourced from Natural England and Natural Resources Wales.

11 Visual and cultural designations



11.1 World Heritage Sites

Records within 250m	0

Sites designated for their globally important cultural or natural interest requiring appropriate management and protection measures. World Heritage Sites are designated to meet the UK's commitments under the World Heritage Convention.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.2 Area of Outstanding Natural Beauty

Records within 250m	0

Areas of Outstanding Natural Beauty (AONB) are conservation areas, chosen because they represent 18% of the finest countryside. Each AONB has been designated for special attention because of the quality of their flora, fauna, historical and cultural associations, and/or scenic views. The National Parks and Access to the Countryside Act of 1949 created AONBs and the Countryside and Rights of Way Act, 2000 added further regulation and protection. There are likely to be restrictions to some developments within these areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

11.3 National Parks

Records within 250m	0

In England and Wales, the purpose of National Parks is to conserve and enhance landscapes within the countryside whilst promoting public enjoyment of them and having regard for the social and economic well-being of those living within them. In Scotland National Parks have the additional purpose of promoting the sustainable use of the natural resources of the area and the sustainable social and economic development of its communities. The National Parks and Access to the Countryside Act 1949 established the National Park designation in England and Wales, and The National Parks (Scotland) Act 2000 in Scotland.

This data is sourced from Natural England, Natural Resources Wales and the Scottish Government.

11.4 Listed Buildings

Records within 250m	10

Buildings listed for their special architectural or historical interest. Building control in the form of 'listed building consent' is required in order to make any changes to that building which might affect its special interest. Listed buildings are graded to indicate their relative importance, however building controls apply to all buildings equally, irrespective of their grade, and apply to the interior and exterior of the building in its entirety, together with any curtilage structures.

Features are displayed on the Visual and cultural designations map on **page 111**

ID	Location	Name	Grade	Reference Number	Listed date
2	42m NE	Merchants Warehouse, Deansgate, Manchester, M3	II	1197778	20/06/1988
3	78m S	Middle Warehouse, At Former Castle Field Goods Yard, Deansgate, Manchester, M15	II	1208653	05/06/1990
4	79m NE	Rochdale Canal Lock Number 92 And Castle Street Bridge, Deansgate, Manchester, M3	II	1270858	20/06/1988
5	163m NW	The Giants Basin, Deansgate, Manchester, M3	II	1247068	06/06/1994

ID	Location	Name	Grade	Reference Number	Listed date
6	165m NW	Bridgewater Canal Basin At Potato Wharf, Deansgate, Manchester, M3	II	1246959	06/06/1994
7	171m W	Former Canal Flour Mills, Deansgate, Manchester, M15	II	1200858	09/11/1992
8	172m SE	Bridgewater Canal Offices, Deansgate, Manchester, M15	II	1283068	03/10/1974
9	193m NE	Castlefield Railway Viaduct From G-Mex To Dawson Street, Deansgate, Manchester, M3	II	1292315	14/02/1988
10	210m NW	Pair Of Culvert Arches Over River Medlock And Associated Overflow Channel, Deansgate, Manchester, M3	II	1283003	06/06/1994
12	242m SW	Church Of St George, Hulme, Manchester, M15	II*	1208640	03/10/1974

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.5 Conservation Areas

Records within 250m	**1**

Local planning authorities are obliged to designate as conservation areas any parts of their own area that are of special architectural or historic interest, the character and appearance of which it is desirable to preserve or enhance. Designation of a conservation area gives broader protection than the listing of individual buildings. All the features within the area, listed or otherwise, are recognised as part of its character. Conservation area designation is the means of recognising the importance of all factors and of ensuring that planning decisions address the quality of the landscape in its broadest sense.

Features are displayed on the Visual and cultural designations map on **page 111**

ID	Location	Name	District	Date of designation
1	**On site**	**Castlefield**	**Manchester**	**13/10/1979**

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.6 Scheduled Ancient Monuments

Records within 250m	**1**

A scheduled monument is an historic building or site that is included in the Schedule of Monuments kept by the Secretary of State for Digital, Culture, Media and Sport. The regime is set out in the Ancient Monuments and Archaeological Areas Act 1979. The Schedule of Monuments has c.20,000 entries and includes sites such as Roman remains, burial mounds, castles, bridges, earthworks, the remains of deserted villages and industrial sites. Monuments are not graded, but all are, by definition, considered to be of national importance.

Features are displayed on the Visual and cultural designations map on **page 111**

ID	Location	Ancient monument name	Reference number
11	211m NE	Remains of eastern wall of the Roman fort	1001953

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

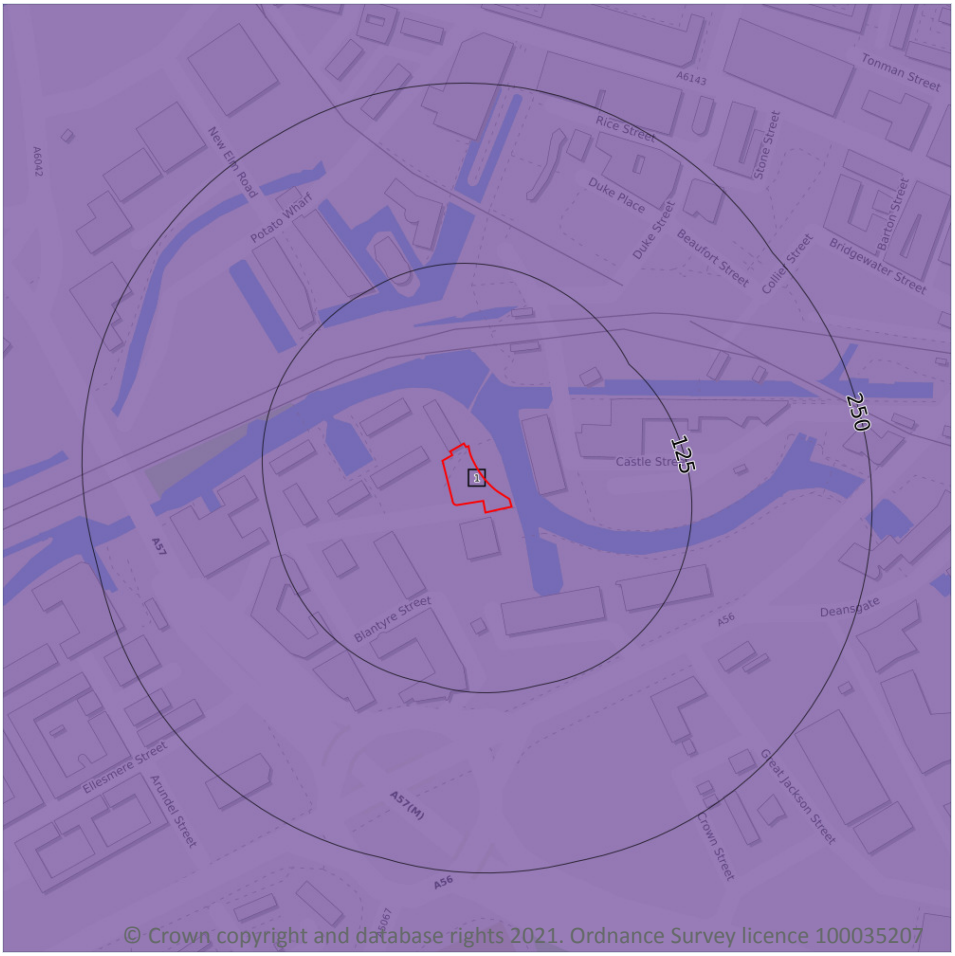
11.7 Registered Parks and Gardens

Records within 250m	**0**

Parks and gardens assessed to be of particular interest and of special historic interest. The emphasis being on 'designed' landscapes, rather than on planting or botanical importance. Registration is a 'material consideration' in the planning process, meaning that planning authorities must consider the impact of any proposed development on the special character of the landscape.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

12 Agricultural designations



Site Outline

Search buffers in metres (m)

- Grade 1 - excellent quality
- Grade 2 - very good quality
- Grade 3 - good to moderate quality
- Grade 3a - good quality
- Grade 3b - moderate quality
- Grade 4 - poor quality
- Grade 5 - very poor quality
- Non-agricultural land
- Urban land
- Exclusion land
- Tree felling licences
- Open Access land

12.1 Agricultural Land Classification

Records within 250m	1

Classification of the quality of agricultural land taking into consideration multiple factors including climate, physical geography and soil properties. It should be noted that the categories for the grading of agricultural land are not consistent across England, Wales and Scotland.

Features are displayed on the Agricultural designations map on **page 115**

ID	Location	Classification	Description
1	**On site**	**Urban**	-

This data is sourced from Natural England.

12.2 Open Access Land

Records within 250m	0

The Countryside and Rights of Way Act 2000 (CROW Act) gives a public right of access to land without having to use paths. Access land includes mountains, moors, heaths and downs that are privately owned. It also includes common land registered with the local council and some land around the England Coast Path. Generally permitted activities on access land are walking, running, watching wildlife and climbing.

This data is sourced from Natural England and Natural Resources Wales.

12.3 Tree Felling Licences

Records within 250m	0

Felling Licence Application (FLA) areas approved by Forestry Commission England. Anyone wishing to fell trees must ensure that a licence or permission under a grant scheme has been issued by the Forestry Commission before any felling is carried out or that one of the exceptions apply.

This data is sourced from the Forestry Commission.

12.4 Environmental Stewardship Schemes

Records within 250m	0

Environmental Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. The schemes identified may be historical schemes that have now expired, or may still be active.

This data is sourced from Natural England.

12.5 Countryside Stewardship Schemes

Records within 250m	0

Countryside Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. Main objectives are to improve the farmed environment for wildlife and to reduce diffuse water pollution.

This data is sourced from Natural England.

13 Habitat designations

13.1 Priority Habitat Inventory

Records within 250m	0

Habitats of principal importance as named under Natural Environment and Rural Communities Act (2006) Section 41.

This data is sourced from Natural England.

13.2 Habitat Networks

Records within 250m	0

Habitat networks for 18 priority habitat networks (based primarily, but not exclusively, on the priority habitat inventory) and areas suitable for the expansion of networks through restoration and habitat creation.

This data is sourced from Natural England.

13.3 Open Mosaic Habitat

Records within 250m	0

Sites verified as Open Mosaic Habitat. Mosaic habitats are brownfield sites that are identified under the UK Biodiversity Action Plan as a priority habitat due to the habitat variation within a single site, supporting an array of invertebrates.

This data is sourced from Natural England.

13.4 Limestone Pavement Orders

Records within 250m	0

Limestone pavements are outcrops of limestone where the surface has been worn away by natural means over millennia. These rocks have the appearance of paving blocks, hence their name. Not only do they have geological interest, they also provide valuable habitats for wildlife. These habitats are threatened due to their removal for use in gardens and water features. Many limestone pavements have been designated as SSSIs which affords them some protection. In addition, Section 34 of the Wildlife and Countryside Act 1981 gave them additional protection via the creation of Limestone Pavement Orders, which made it a criminal offence to remove any part of the outcrop. The associated Limestone Pavement Priority Habitat is part of the UK Biodiversity Action Plan priority habitat in England.

This data is sourced from Natural England.

14 Geology 1:10,000 scale - Availability



14.1 10k Availability

Records within 500m	1

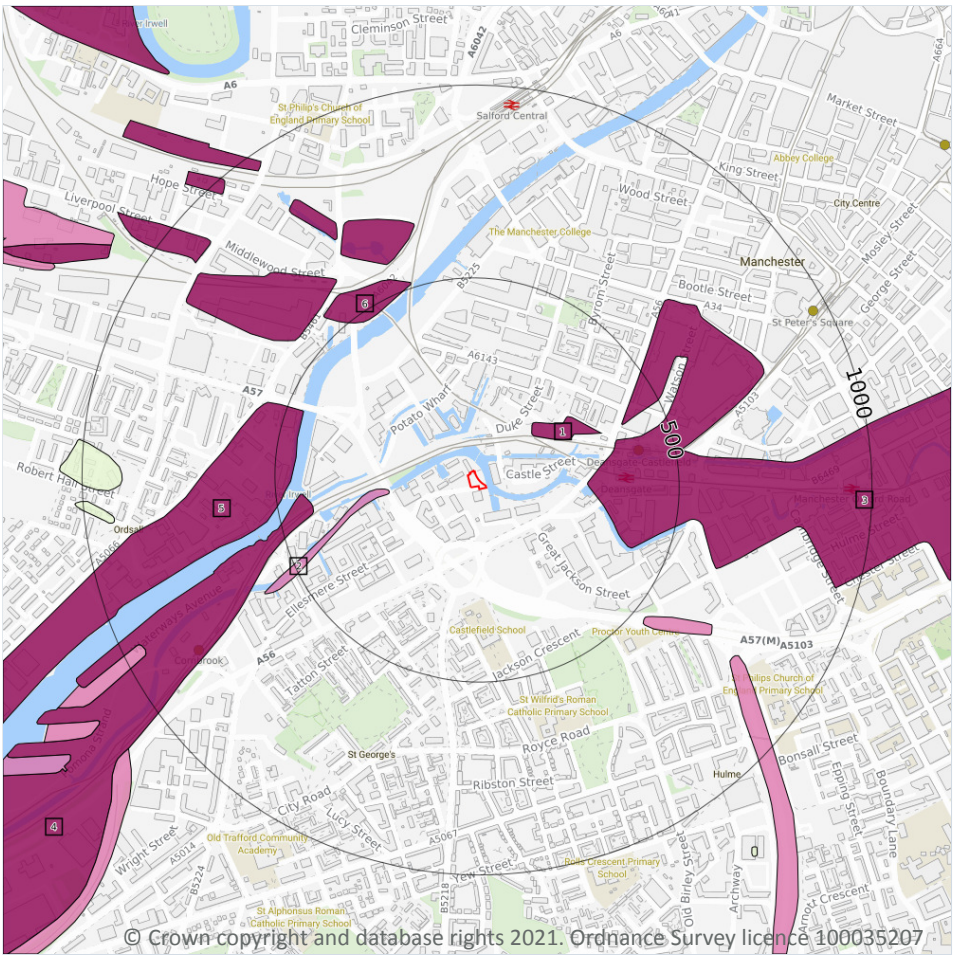
An indication on the coverage of 1:10,000 scale geology data for the site, the most detailed dataset provided by the British Geological Survey. Either 'Full', 'Partial' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:10,000 scale - Availability map on **page 118**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**Full**	**Full**	**Full**	**No coverage**	**SJ89NW**

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Artificial and made ground



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14.2 Artificial and made ground (10k)

Records within 500m	6

Details of made, worked, infilled, disturbed and landscaped ground at 1:10,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

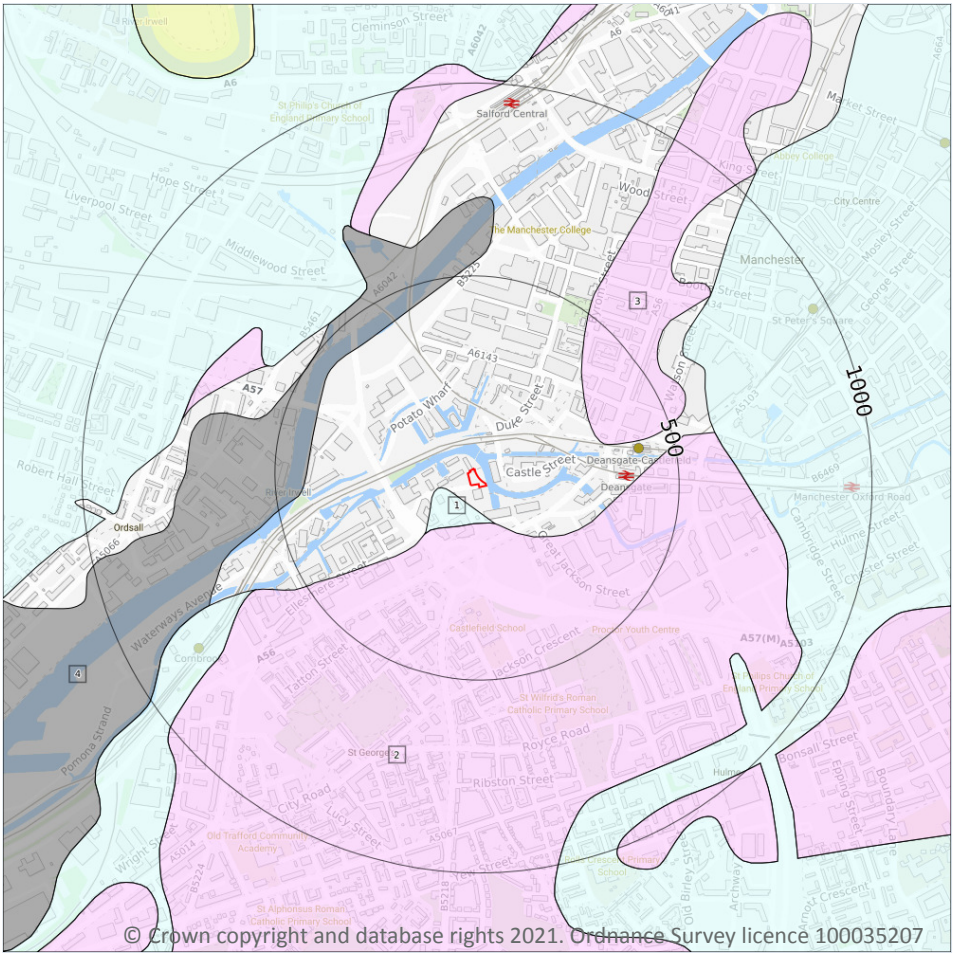
Features are displayed on the Geology 1:10,000 scale - Artificial and made ground map on **page 119**

ID	Location	LEX Code	Description	Rock description
1	177m NE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
2	208m W	WGR-VOID	Worked Ground (Undivided)	Void
3	262m E	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
4	409m W	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit

ID	Location	LEX Code	Description	Rock description
5	447m W	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
6	475m NW	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Superficial



14.3 Superficial geology (10k)

Records within 500m	4

Superficial geological deposits at 1:10,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:10,000 scale - Superficial map on **page 121**

ID	Location	LEX Code	Description	Rock description
1	45m SW	TILLD-DMTN	Till, Devensian - Diamicton	Diamicton
2	94m S	GFSDD-XSV	Glaciofluvial Sheet Deposits, Devensian - Sand And Gravel	Sand And Gravel
3	310m NE	GFSDD-XSV	Glaciofluvial Sheet Deposits, Devensian - Sand And Gravel	Sand And Gravel

ID	Location	LEX Code	Description	Rock description
4	412m W	ALV-XSWCV	Alluvium - Sand With Clay And Gravel	Sand With Clay And Gravel [unlithified Deposits Coding Scheme - Extended]

This data is sourced from the British Geological Survey.

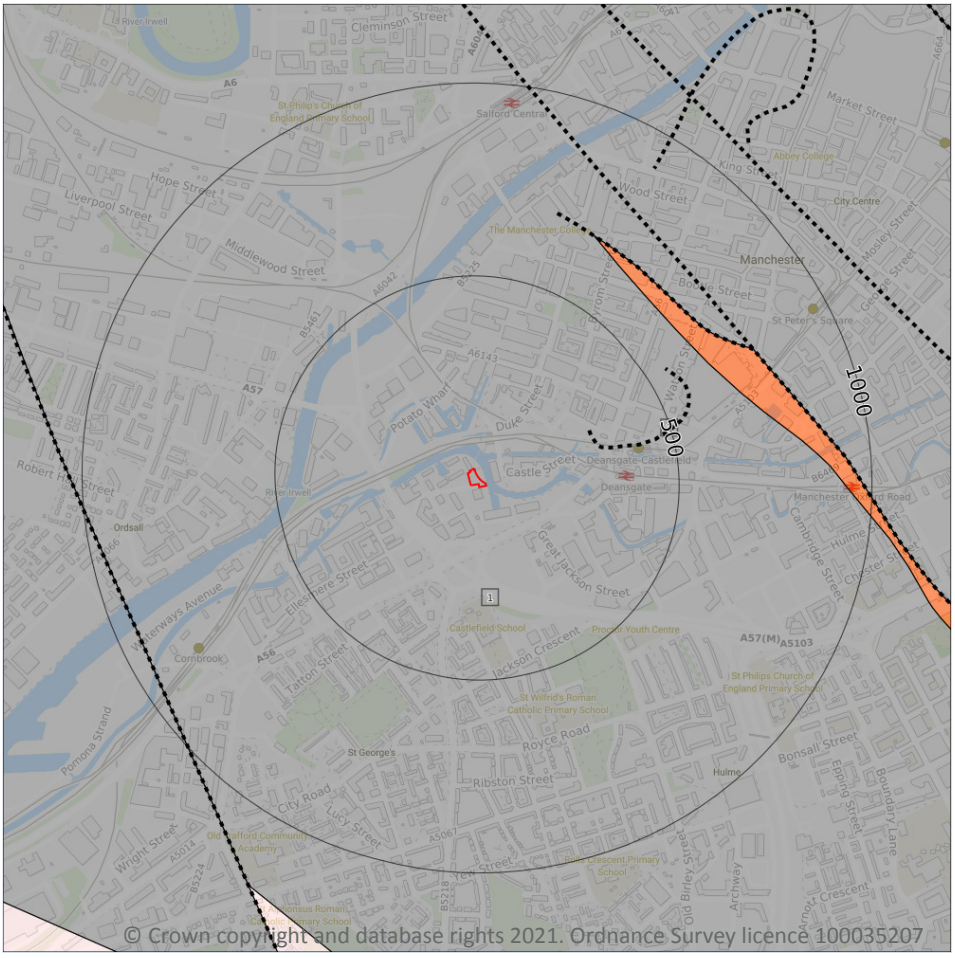
14.4 Landslip (10k)

Records within 500m	**0**

Mass movement deposits on BGS geological maps at 1:10,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Bedrock



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Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (10k)

Bedrock geology (10k)
Please see table for more details.

14.5 Bedrock geology (10k)

Records within 500m	1

Bedrock geology at 1:10,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 123**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**CPB-SDST**	**Chester Pebble Beds Formation - Sandstone**	**Early Triassic Epoch**

This data is sourced from the British Geological Survey.

14.6 Bedrock faults and other linear features (10k)

Records within 500m	**1**

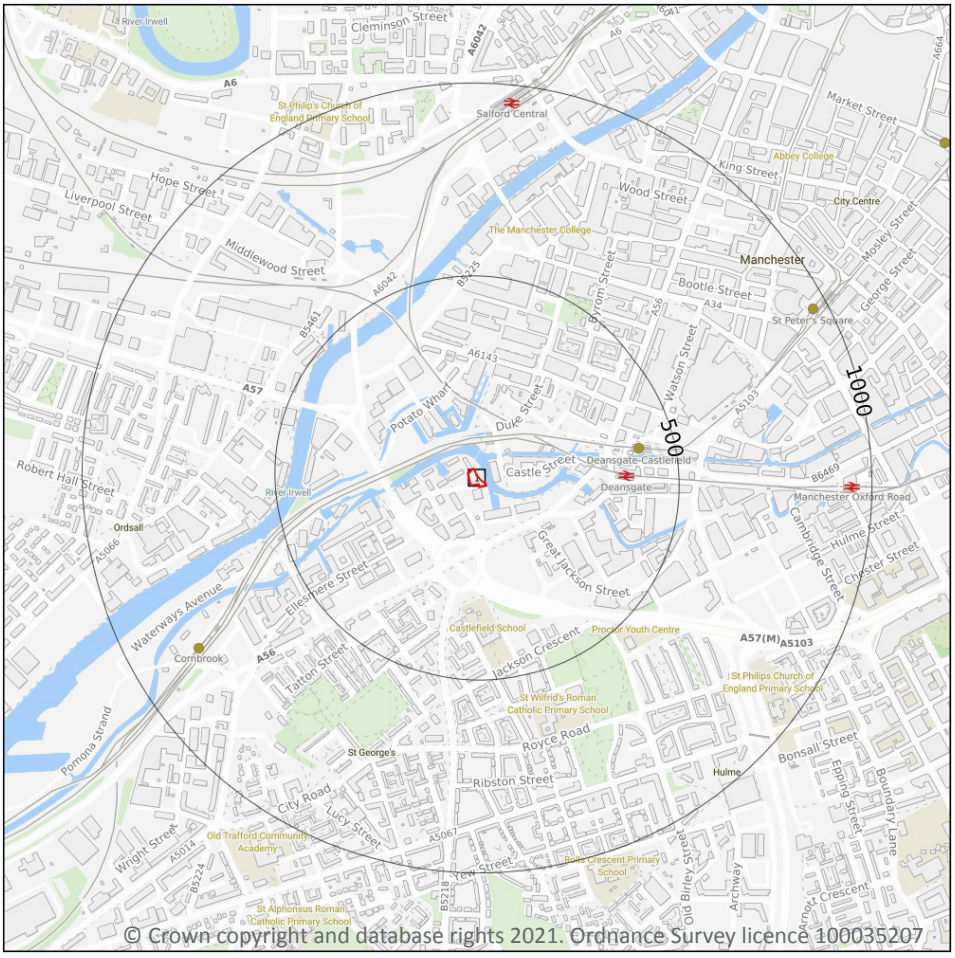
Linear features at the ground or bedrock surface at 1:10,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 123**

ID	Location	Category	Description
2	300m NE	LANDFORM	Buried channel or valley margin

This data is sourced from the British Geological Survey.

15 Geology 1:50,000 scale - Availability



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15.1 50k Availability

Records within 500m	1

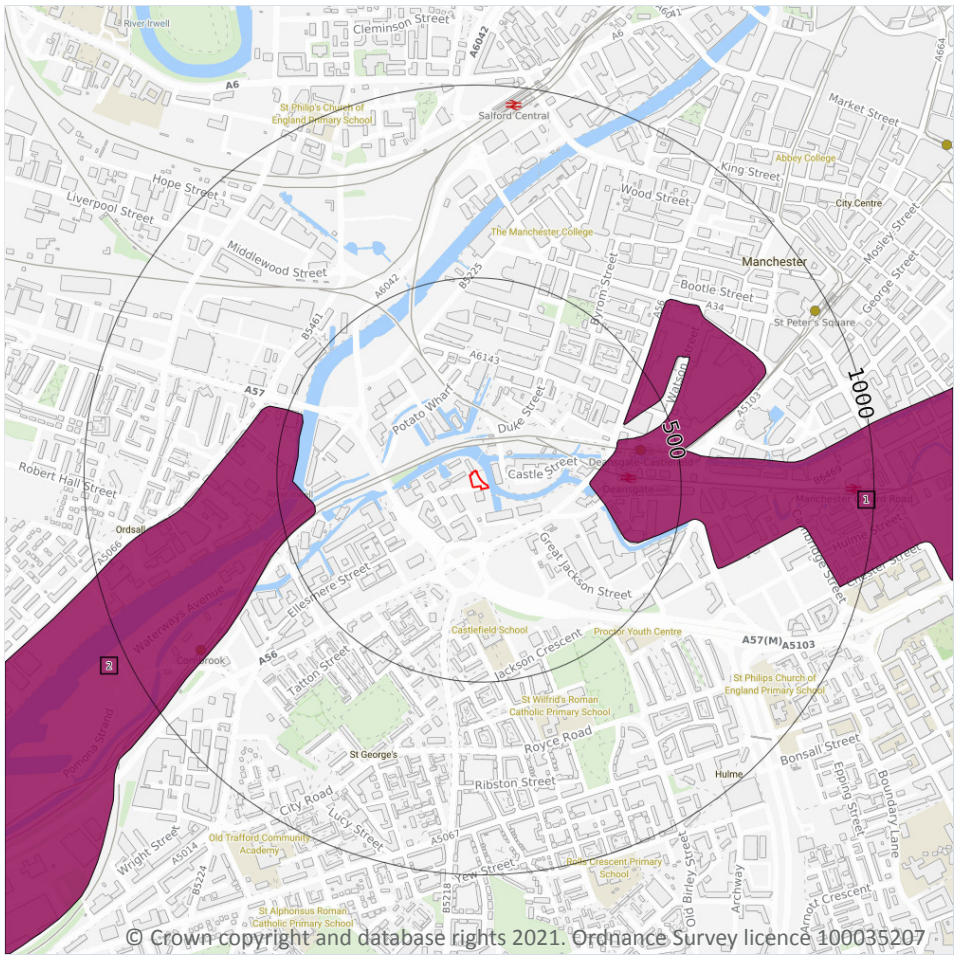
An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:50,000 scale - Availability map on **page 125**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**No coverage**	**Full**	**Full**	**No coverage**	**EW085_manchester_v4**

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Artificial and made ground



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15.2 Artificial and made ground (50k)

Records within 500m	2

Details of made, worked, infilled, disturbed and landscaped ground at 1:50,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

Features are displayed on the Geology 1:50,000 scale - Artificial and made ground map on **page 126**

ID	Location	LEX Code	Description	Rock description
1	263m E	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
2	409m W	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

This data is sourced from the British Geological Survey.

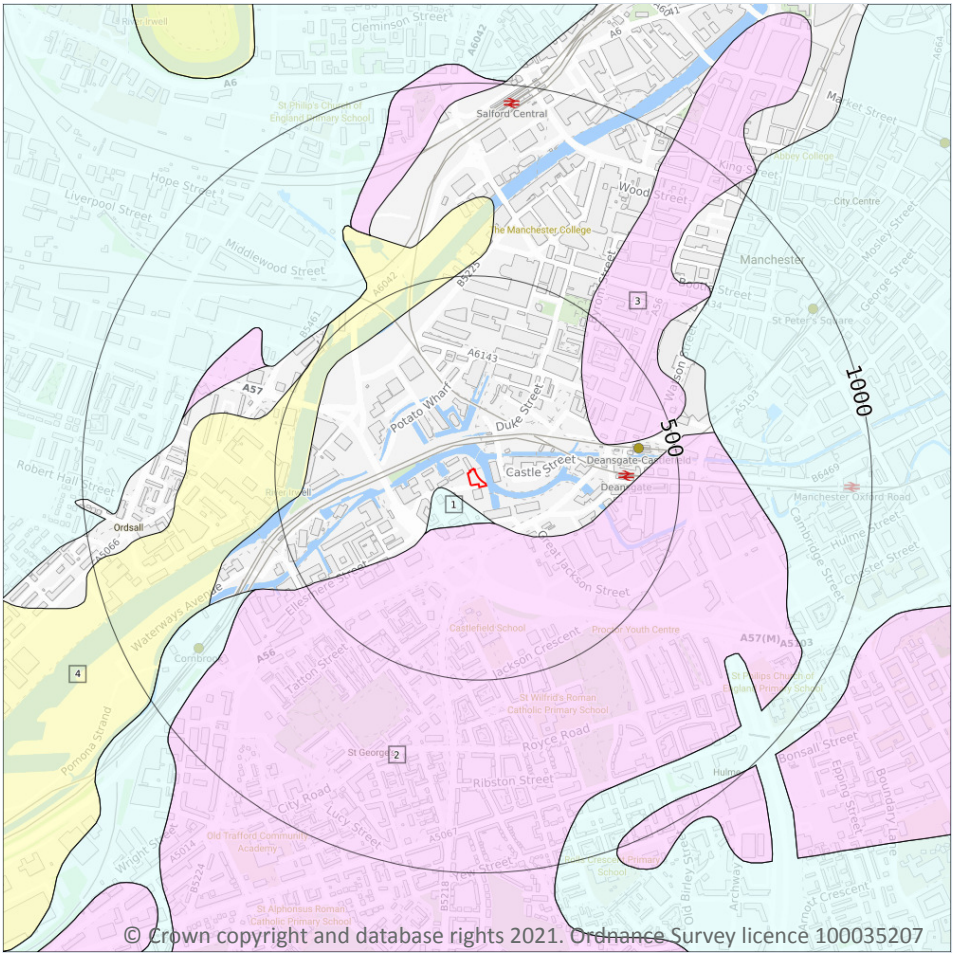
15.3 Artificial ground permeability (50k)

Records within 50m	0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any artificial deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Superficial



Site Outline

Search buffers in metres (m)

Landslip (50k)

Superficial geology (50k)
Please see table for more details.

15.4 Superficial geology (50k)

Records within 500m **4**

Superficial geological deposits at 1:50,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:50,000 scale - Superficial map on **page 128**

ID	Location	LEX Code	Description	Rock description
1	44m SW	TILLD-DMTN	TILL, DEVENSIAN	DIAMICTON
2	94m S	GFSDD-XSV	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN	SAND AND GRAVEL
3	310m NE	GFSDD-XSV	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN	SAND AND GRAVEL
4	412m W	ALV-XCZSV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL

This data is sourced from the British Geological Survey.

15.5 Superficial permeability (50k)

Records within 50m	1

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
44m SW	Mixed	High	Low

This data is sourced from the British Geological Survey.

15.6 Landslip (50k)

Records within 500m	0

Mass movement deposits on BGS geological maps at 1:50,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

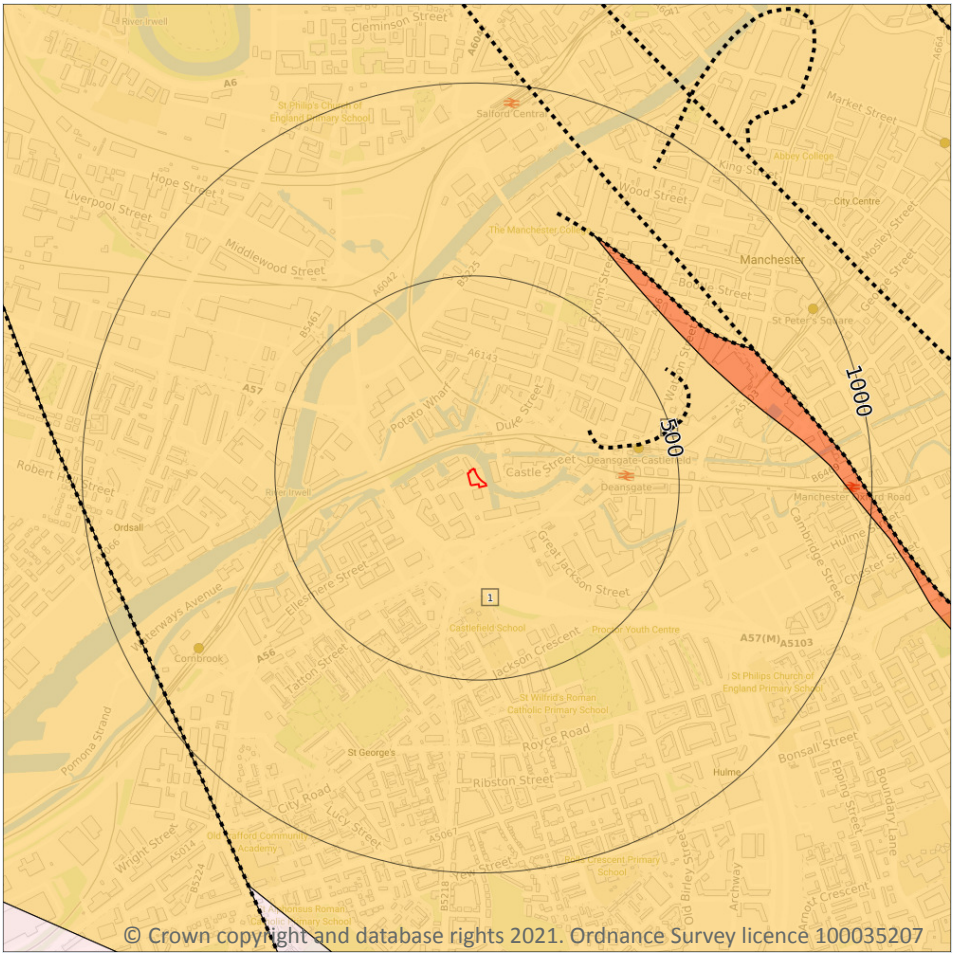
15.7 Landslip permeability (50k)

Records within 50m	0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any landslip deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Bedrock



Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (50k)

Bedrock geology (50k)
Please see table for more details.

15.8 Bedrock geology (50k)

Records within 500m	1

Bedrock geology at 1:50,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 130**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**CHES-SDST**	**CHESTER FORMATION - SANDSTONE**	**OLENEKIAN**

This data is sourced from the British Geological Survey.

15.9 Bedrock permeability (50k)

Records within 50m	1

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of bedrock (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Mixed**	**High**	**Moderate**

This data is sourced from the British Geological Survey.

15.10 Bedrock faults and other linear features (50k)

Records within 500m	1

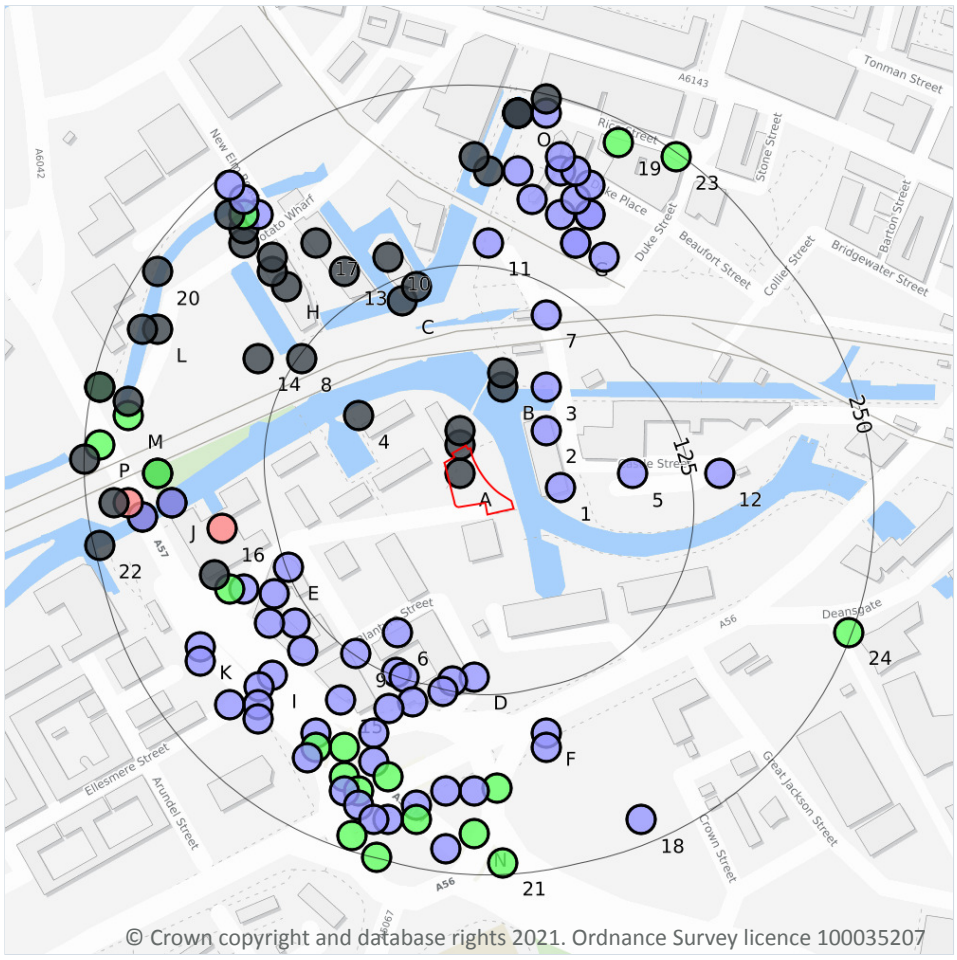
Linear features at the ground or bedrock surface at 1:50,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 130**

ID	Location	Category	Description
2	300m NE	LANDFORM	Approximate margin of buried (superficial deposit-filled) channel or valley

This data is sourced from the British Geological Survey.

16 Boreholes



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16.1 BGS Boreholes

Records within 250m	127

The Single Onshore Boreholes Index (SOBI); an index of over one million records of boreholes, shafts and wells from all forms of drilling and site investigation work held by the British Geological Survey. Covering onshore and nearshore boreholes dating back to at least 1790 and ranging from one to several thousand metres deep.

Features are displayed on the Boreholes map on **page 132**

ID	Location	Grid reference	Name	Length	Confidential	Web link
A	**On site**	**383040 397510**	**MERCHANTS BRIDGE CASTLEFIELD 5**	**-**	**Y**	**N/A**
A	3m NW	383040 397530	MERCHANTS BRIDGE CASTLEFIELD 4	-	Y	N/A
A	11m N	383040 397540	MERCHANTS BRIDGE CASTLEFIELD 3	-	Y	N/A

ID	Location	Grid reference	Name	Length	Confidential	Web link
1	36m E	383110 397500	CASTLEFIELD ROAD AND SEWERS C	5.0	N	1045609
B	48m NE	383070 397570	MERCHANTS BRIDGE CASTLEFIELD 2	-	Y	N/A
2	54m E	383100 397540	CASTLEFIELD ROAD AND SEWERS D	3.45	N	1045610
B	57m NE	383070 397580	MERCHANTS BRIDGE CASTLEFIELD 1	-	Y	N/A
3	68m NE	383100 397570	CASTLEFIELD ROAD AND SEWERS E	2.5	N	1045611
4	68m NW	382970 397550	POTATO WHARF CASTLEFIELD 1	-	Y	N/A
5	86m E	383160 397510	CASTLEFIELD ROAD AND SEWERS B	4.0	N	1045608
6	96m SW	382997 397400	BLANTYRE STREET MANCHESTER 7	4.7	N	15624894
7	106m NE	383100 397620	CASTLEFIELD ROAD AND SEWERS F	3.0	N	1045612
C	110m NW	383000 397630	VISIONS CENTRE, CASTLEFIELD 3	-	Y	N/A
D	113m S	383050 397369	BLANTYRE STREET MANCHESTER 12	5.0	N	15624905
C	116m N	383010 397640	VISIONS CENTRE, CASTLEFIELD 2	-	Y	N/A
D	118m S	383035 397366	BLANTYRE STREET MANCHESTER 13	8.0	N	15624906
D	123m S	382996 397372	BLANTYRE STREET MANCHESTER 9	5.0	N	15624899
8	123m NW	382930 397590	POTATO WHARF CASTLEFIELD	-	Y	N/A
E	124m W	382921 397445	BLANTYRE STREET MANCHESTER 1	4.5	N	15624877
9	124m SW	382968 397385	BLANTYRE STREET MANCHESTER 6	5.0	N	15624893
D	124m S	383001 397369	BLANTYRE STREET MANCHESTER 14	8.1	N	15624908
D	127m S	383028 397359	BLANTYRE STREET MANCHESTER 11	5.0	N	15624903
E	138m SW	382926 397406	BLANTYRE STREET MANCHESTER 4	4.5	N	15624889
D	139m S	383007 397352	BLANTYRE STREET MANCHESTER 15	9.0	N	15624909
E	140m SW	382911 397427	BLANTYRE STREET MANCHESTER 2	4.5	N	15624884
10	141m NW	382990 397660	VISIONS CENTRE, CASTLEFIELD 1	-	Y	N/A
11	141m N	383060 397670	CASTLEFIELD ROAD AND SEWERS G	3.6	N	1045613
12	145m E	383220 397510	CASTLEFIELD ROAD AND SEWERS A	5.5	N	1045607
E	146m SW	382931 397387	BLANTYRE STREET MANCHESTER 5	5.0	N	15624891
13	146m NW	382960 397650	POTATO WHARF MANCHESTER TP 3	-	Y	N/A
D	148m S	382991 397347	BLANTYRE STREET MANCHESTER 10	5.0	N	15624902

ID	Location	Grid reference	Name	Length	Confidential	Web link
14	148m NW	382900 397590	POTATO WHARF MANCHESTER TP 5	-	Y	N/A
E	153m SW	382908 397406	BLANTYRE STREET MANCHESTER 3	4.0	N	15624886
15	157m SW	382957 397353	BLANTYRE STREET MANCHESTER 8	5.0	N	15624897
F	157m S	383100 397330	MANCHESTER AND SALFORD INNER RELIEF ROAD TP34	1.5	N	1045765
E	158m W	382890 397430	MANCUNIAN WAY - REGENT ROAD U2	5.5	N	1043498
G	160m NE	383120 397670	DUKE PLACE ARCHAEOLOGICAL EXCAVATION E	6.1	N	1045662
G	160m NE	383120 397670	DUKE PLACE ARCHAEOLOGICAL EXCAVATION D	6.15	N	1045661
16	161m W	382875 397472	SUTCLIFFE & SONS, FLOUR MILLS, EGERTON STREET	90.22	N	1042379
G	162m NE	383140 397660	DUKE PLACE ARCHAEOLOGICAL EXCAVATION F	3.2	N	1045663
H	163m NW	382920 397640	POTATO WHARF MANCHESTER TP 2	-	Y	N/A
F	167m S	383100 397320	MANCHESTER AND SALFORD INNER RELIEF ROAD TP20	1.5	N	1045759
E	167m W	382880 397430	LOWER MEDLOCK C/1 SITE 0181 301/301A	14.52	N	1043409
D	167m S	382980 397330	MANCHESTER AND SALFORD INNER RELIEF ROAD TP30	1.5	N	1045762
I	173m SW	382910 397370	MANCUNIAN WAY - REGENTS ROAD U4	4.6	N	1043805
G	173m N	383110 397690	CASTLEFIELD ROAD AND SEWERS K	6.0	N	1045616
E	174m W	382870 397440	CHESTER ROAD PHASE 2 8	-	Y	N/A
17	174m NW	382940 397670	POTATO WHARF MANCHESTER TP 1	-	Y	N/A
G	177m N	383090 397700	DUKE PLACE 5	2.05	N	1045657
H	177m NW	382910 397650	POTATO WHARF MANCHESTER R1	-	Y	N/A
G	182m NE	383130 397690	DUKE PLACE ARCHAEOLOGICAL EXCAVATION A	6.05	N	1045658
G	182m NE	383130 397690	DUKE PLACE ARCHAEOLOGICAL EXCAVATION B	6.2	N	1045659
D	184m SW	382960 397320	MANCUNIAN WAY - REGENTS ROAD U8	16.2	N	1043809
H	184m NW	382910 397660	POTATO WHARF MANCHESTER R2	-	Y	N/A
D	185m SW	382940 397330	MANCHESTER AND SALFORD INNER RELIEF ROAD TP29	1.5	N	1045761
I	185m SW	382901 397362	MANCHESTER CORP. C.SEWER	8.53	N	1042279
D	186m S	382980 397310	MANCUNIAN WAY - REGENTS ROAD U6	8.8	N	1043807

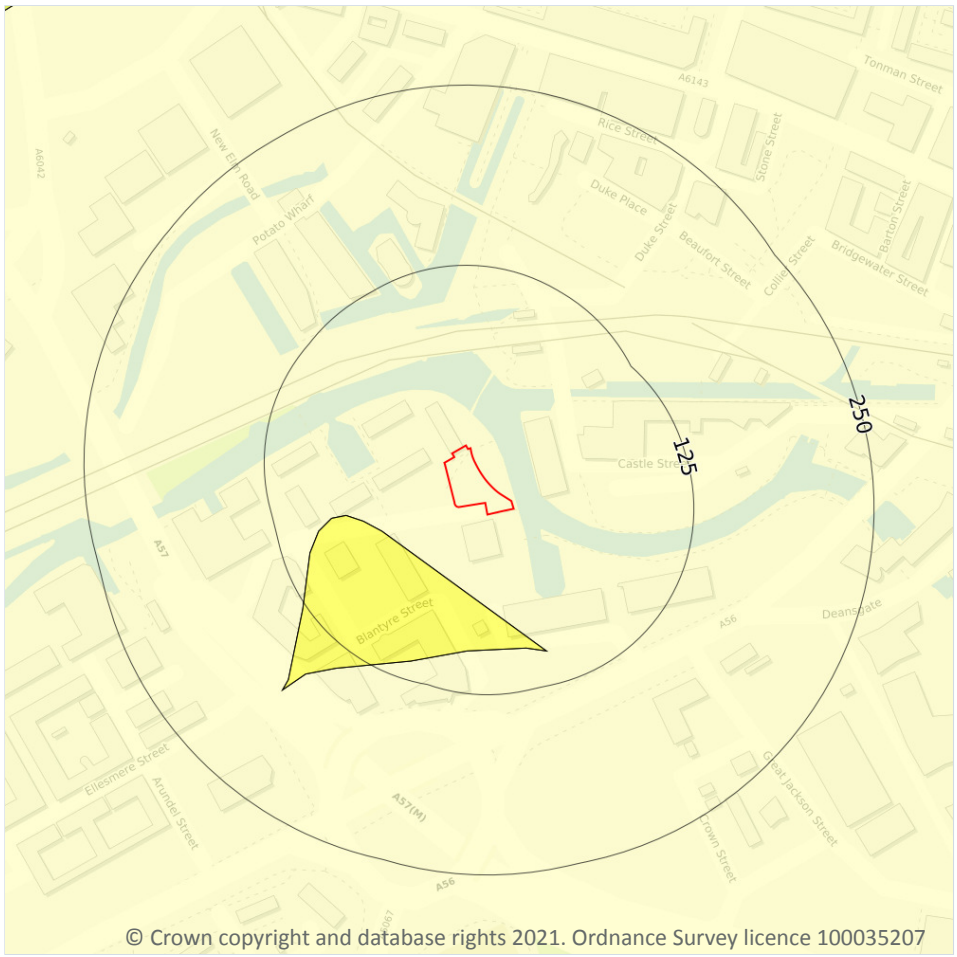
ID	Location	Grid reference	Name	Length	Confidential	Web link
G	187m NE	383120 397700	DUKE PLACE ARCHAEOLOGICAL EXCAVATION C	6.25	N	1045660
D	190m S	383066 397292	MANCUNIAN WAY 2	11.89	N	1042489
G	191m N	383060 397720	SWING BRIDGES, STAFFS WHARFE 1	-	Y	N/A
J	191m W	382840 397490	CHESTER ROAD PHASE 2 TP2	-	Y	N/A
J	191m W	382840 397490	MANCUNIAN WAY - REGENT ROAD ES6	4.0	N	1043497
D	192m S	383050 397290	MANCHESTER AND SALFORD INNER RELIEF ROAD TP19	1.5	N	1045758
D	193m S	382990 397300	MANCUNIAN WAY - REGENTS ROAD U10	12.5	N	1043811
D	194m SW	382940 397320	MANCUNIAN WAY - REGENTS ROAD U5	15.05	N	1043806
D	194m S	383030 397290	MANCHESTER AND SALFORD INNER RELIEF ROAD TP18	1.5	N	1045757
G	194m N	383080 397720	CASTLEFIELD ROAD AND SEWERS H	2.5	N	1045614
I	194m SW	382900 397350	MANCUNIAN WAY - REGENTS ROAD U3	5.6	N	1043804
J	199m W	382830 397510	CHESTER ROAD PHASE 2 9	-	Y	N/A
J	199m W	382830 397510	MANCUNIAN WAY - REGENT ROAD ES3	19.0	N	1043495
G	200m NE	383130 397710	DUKE PLACE 3	7.65	N	1045655
G	201m N	383050 397730	SWING BRIDGES, STAFFS WHARFE 2	-	Y	N/A
G	202m N	383110 397720	DUKE PLACE 1	6.9	N	1045653
I	202m SW	382900 397340	MANCHESTER AND SALFORD INNER RELIEF ROAD TP14	1.5	N	1045753
K	202m SW	382860 397390	MANCUNIAN WAY - REGENTS ROAD U1	3.5	N	1043803
D	203m SW	382960 397300	MANCHESTER 7 SALFORD INNER RELIEF ROAD REGENT ROAD TO CHESTER ROAD U23	10.2	N	1044173
D	203m SW	382934 397313	MANCHESTER CORP. C.SEWER	9.45	N	1042278
G	205m N	383120 397720	DUKE PLACE 2	6.4	N	1045654
H	206m NW	382890 397670	POTATO WHARF NEW ELM STREET 1	-	Y	N/A
K	207m SW	382860 397380	MANCHESTER AND SALFORD INNER RELIEF ROAD TP28	0.43	N	1045760
D	208m S	383010 397280	MANCHESTER AND SALFORD INNER RELIEF ROAD TPB	1.5	N	1045751
D	209m S	382970 397290	MANCUNIAN WAY - REGENTS ROAD U9	19.6	N	1043810

ID	Location	Grid reference	Name	Length	Confidential	Web link
I	209m SW	382880 397350	MANCHESTER AND SALFORD INNER RELIEF ROAD TP13	1.5	N	1045752
G	211m N	383110 397730	DUKE PLACE 4	3.85	N	1045656
D	212m S	382960 397290	MANCUNIAN WAY - REGENTS ROAD U7	9.8	N	1043808
J	213m W	382820 397480	CHESTER ROAD PHASE 2 TP1	-	Y	N/A
J	213m W	382820 397480	MANCUNIAN WAY - REGENT ROAD ES5	4.2	N	1043496
H	213m NW	382890 397680	POTATO WHARF NEW ELM STREET 3	-	Y	N/A
H	214m NW	382900 397690	MANCHESTER AND SALFORD INNER RELIEF ROAD TP42	4.0	N	1045789
D	217m S	383010 397270	MANCUNIAN WAY - REGENTS ROAD U12	18.25	N	1043813
D	218m S	382970 397280	MANCHESTER AND SALFORD INNER RELIEF ROAD TP17	1.5	N	1045756
L	220m NW	382830 397610	POTATO WHARF PWR1	-	Y	N/A
H	220m NW	382890 397690	MANCHESTER AND SALFORD INNER RELIEF ROAD NER2	21.1	N	1045787
J	221m W	382810 397490	MANCUNIAN WAY - REGENT ROAD ES2	30.6	N	1043494
M	222m W	382810 397550	MANCUNIAN WAY - REGENT ROAD DS6	20.35	N	1043492
N	222m S	383050 397260	MANCUNIAN WAY - REGENTS ROAD U14	10.3	N	1043815
D	222m S	382990 397270	MANCUNIAN WAY - REGENTS ROAD U11	10.0	N	1043812
M	223m W	382810 397560	CHESTER ROAD PHASE 2 10	-	Y	N/A
D	225m S	382980 397270	MANCHESTER AND SALFORD INNER RELIEF ROAD TPA	1.5	N	1045750
H	227m NW	382880 397690	POTATO WHARF NEW ELM STREET 2	-	Y	N/A
H	228m NW	382890 397700	MANCHESTER AND SALFORD INNER RELIEF ROAD NER1	8.0	N	1045786
L	229m NW	382820 397610	CHESTER ROAD PHASE 2 11A	-	Y	N/A
J	231m W	382800 397490	CHESTER ROAD PHASE 2 7	-	Y	N/A
18	233m S	383166 397270	MANCUNIAN WAY 6	7.77	N	15635230
O	233m N	383080 397760	PRO DEV STAFF'DSHIRE WHARF TP4	-	Y	N/A
O	233m N	383080 397760	PRO DEV STAFF'DSHIRE WHARF BH2	-	Y	N/A
O	233m N	383080 397760	PRO DEV STAFF'DSHIRE WHARF BH1	-	Y	N/A

ID	Location	Grid reference	Name	Length	Confidential	Web link
O	233m N	383080 397760	PRO DEV STAFF'DSHIRE WHARF TP1	-	Y	N/A
O	233m N	383080 397760	PRO DEV STAFF'DSHIRE WHARF BH3	-	Y	N/A
O	233m N	383080 397760	PRO DEV STAFF'DSHIRE WHARF TP3	-	Y	N/A
O	233m N	383080 397760	PRO DEV STAFF'DSHIRE WHARF TP2	-	Y	N/A
N	233m S	383030 397250	MANCHESTER AND SALFORD INNER RELIEF ROAD TP31	1.2	N	1045763
19	236m NE	383150 397740	BRIDGEWATER STREET / RICE STREET MAIN DRAINAGE 5	12.0	N	1045621
O	237m N	383100 397760	CASTLEFIELD ROAD AND SEWERS J	5.05	N	1045615
20	239m NW	382830 397650	POTATO WHARF PWR2	-	Y	N/A
D	240m S	382965 397259	MANCHESTER CORP. C.SEWER	10.21	N	1042277
P	240m W	382790 397530	MANCHESTER 7 SALFORD INNER RELIEF ROAD REGENT ROAD TO CHESTER ROAD DS5	12.2	N	1044174
H	242m NW	382880 397710	MANCHESTER AND SALFORD INNER RELIEF ROAD TP41	2.0	N	1045788
21	242m S	383070 397240	MANCUNIAN WAY - REGENTS ROAD U16	18.35	N	1043817
M	245m W	382790 397570	MANCUNIAN WAY - REGENT ROAD DS3	10.5	N	1043490
M	245m W	382790 397570	CHESTER ROAD PHASE 2 13	-	Y	N/A
22	246m W	382790 397460	MANCHESTER 7 SALFORD INNER RELIEF ROAD REGENT ROAD TO CHESTER ROAD ES4	-	Y	N/A
O	247m N	383100 397770	CASTLEFIELD CENTRE MANCHESTER TP 3	-	Y	N/A
23	248m NE	383190 397730	BRIDGEWATER STREET / RICE STREET MAIN DRAINAGE 4	12.0	N	1045620
24	248m E	383310 397400	LOWER MEDLOCK UCSO'S CONTRACT 1 MAN 0276 303	10.59	N	1043414
P	249m W	382780 397520	CHESTER ROAD PHASE 2 6	-	Y	N/A
D	249m S	382982 397244	MANCUNIAN WAY 1	10.06	N	1042488

This data is sourced from the British Geological Survey.

17 Natural ground subsidence - Shrink swell clays



17.1 Shrink swell clays

Records within 50m	2

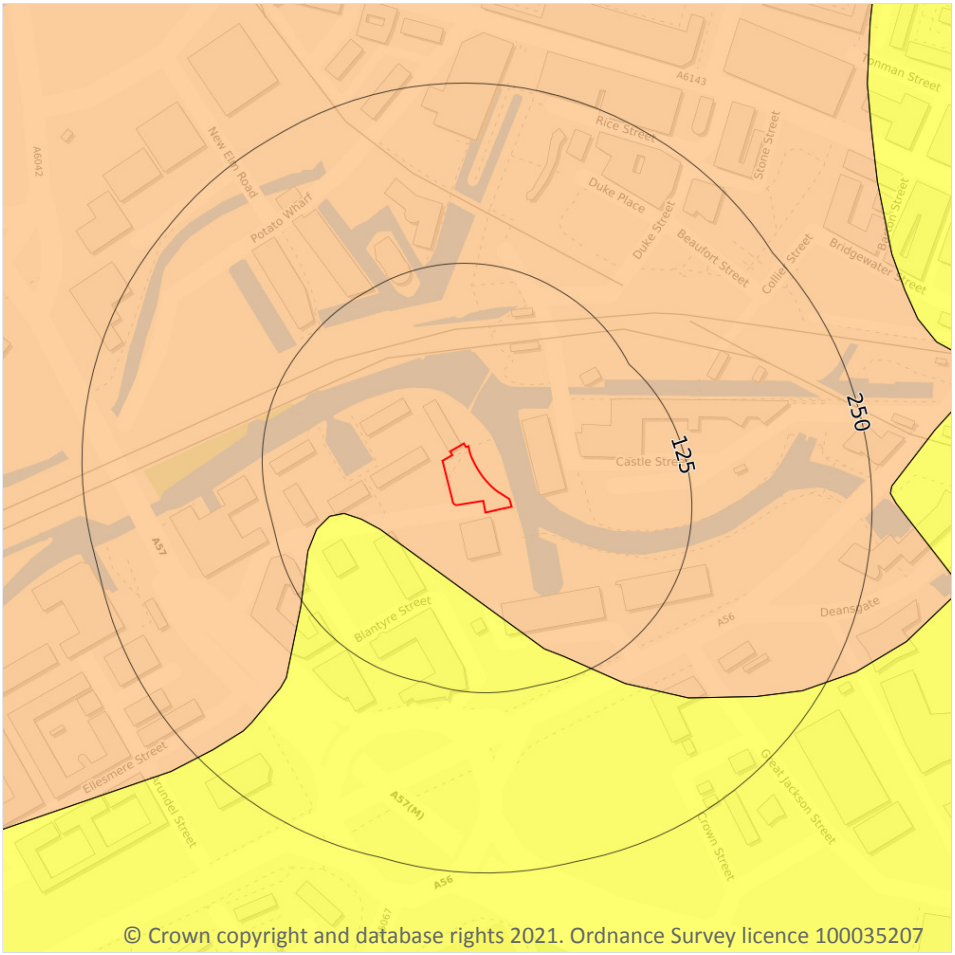
The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and local drainage).

Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 138**

Location	Hazard rating	Details
On site	**Negligible**	**Ground conditions predominantly non-plastic.**
44m SW	Very low	Ground conditions predominantly low plasticity.

This data is sourced from the British Geological Survey.

Natural ground subsidence - Running sands



17.2 Running sands

Records within 50m	2

The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

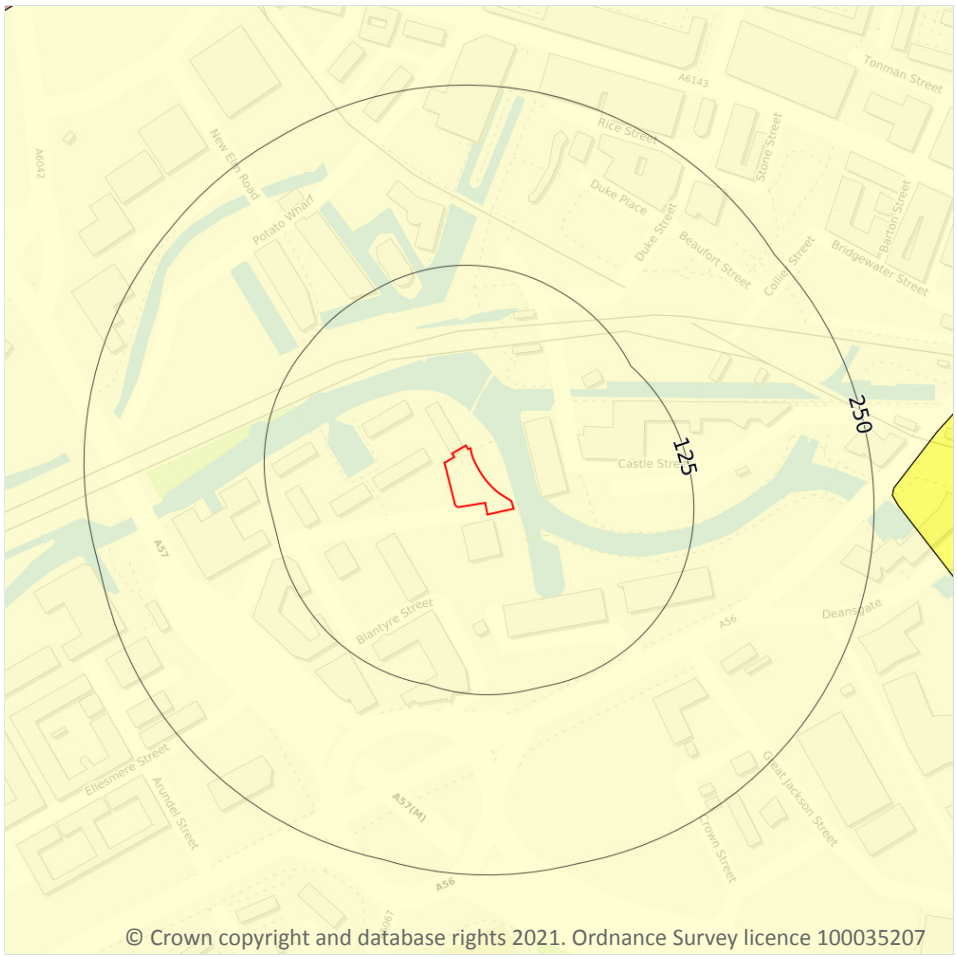
Features are displayed on the Natural ground subsidence - Running sands map on **page 139**

Location	Hazard rating	Details
On site	**Low**	**Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.**

Location	Hazard rating	Details
44m SW	Very low	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.

This data is sourced from the British Geological Survey.

Natural ground subsidence - Compressible deposits



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Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.3 Compressible deposits

Records within 50m	1

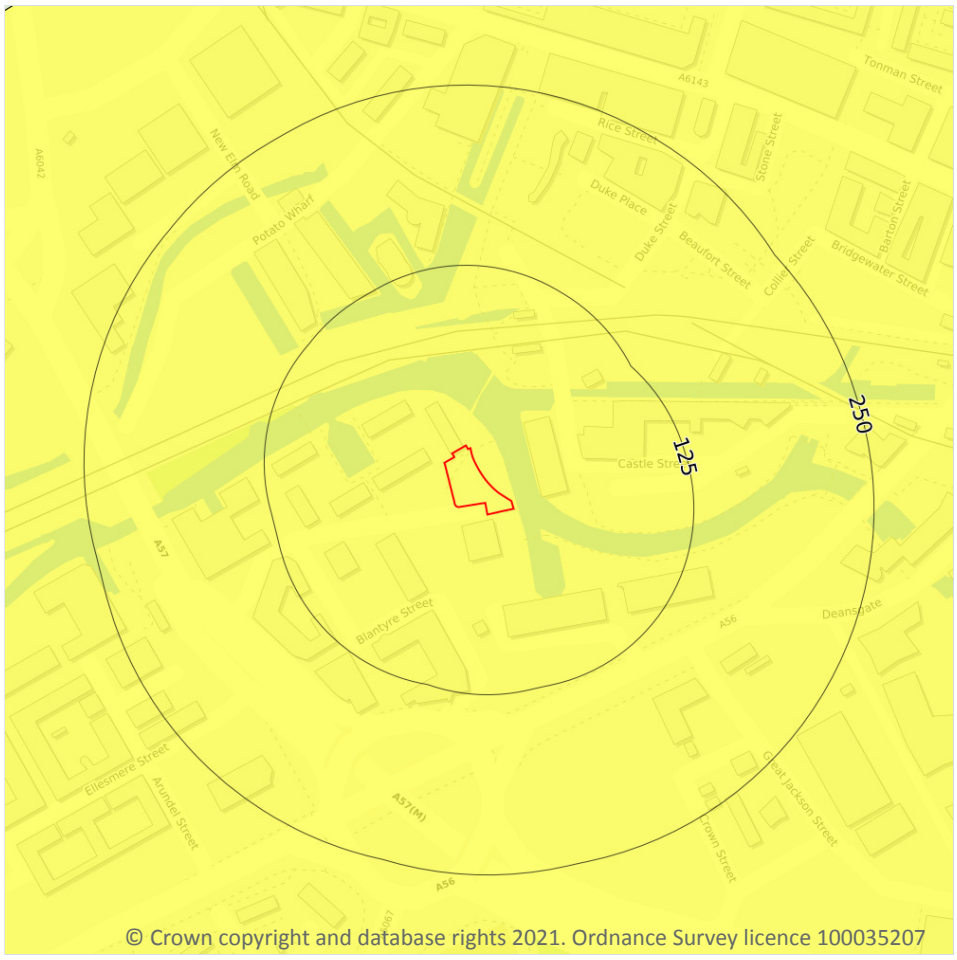
The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 141**

Location	Hazard rating	Details
On site	**Negligible**	**Compressible strata are not thought to occur.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Collapsible deposits



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.4 Collapsible deposits

Records within 50m	1

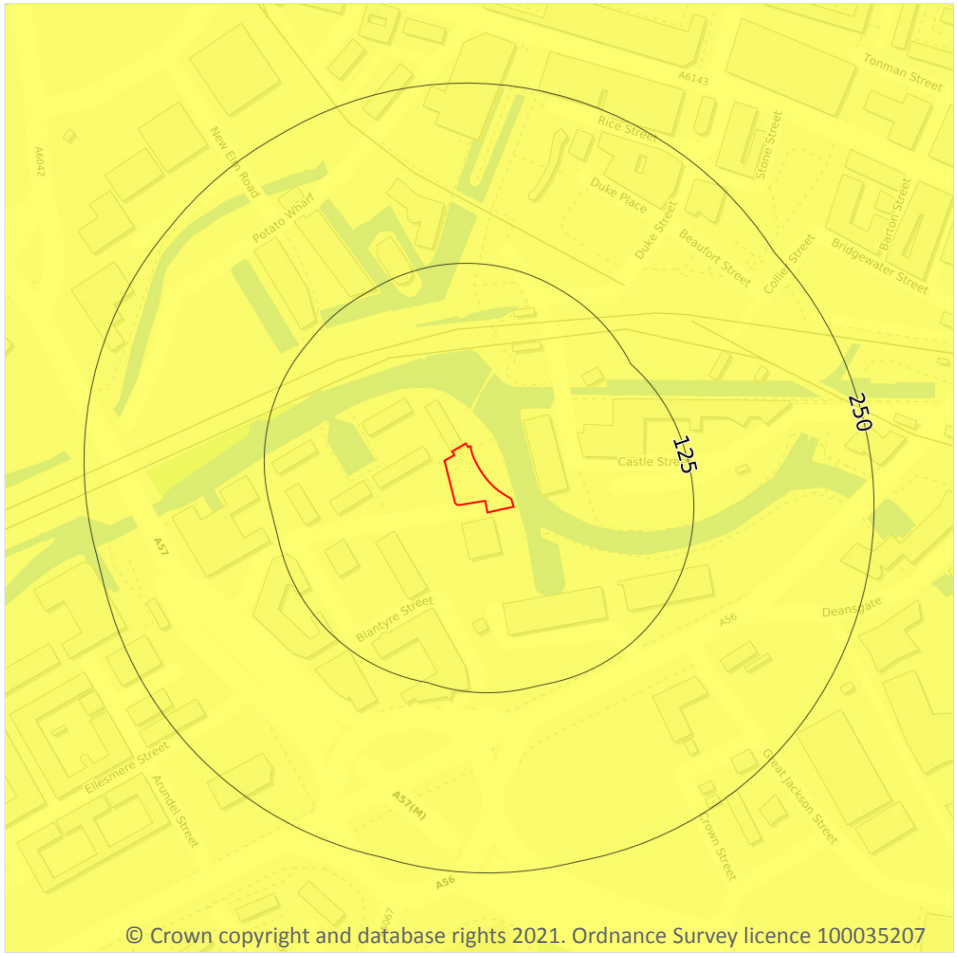
The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 142**

Location	Hazard rating	Details
On site	**Very low**	**Deposits with potential to collapse when loaded and saturated are unlikely to be present.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Landslides



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.5 Landslides

Records within 50m	1

The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on **page 143**

Location	Hazard rating	Details
On site	**Very low**	**Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Ground dissolution of soluble rocks



17.6 Ground dissolution of soluble rocks

Records within 50m	1

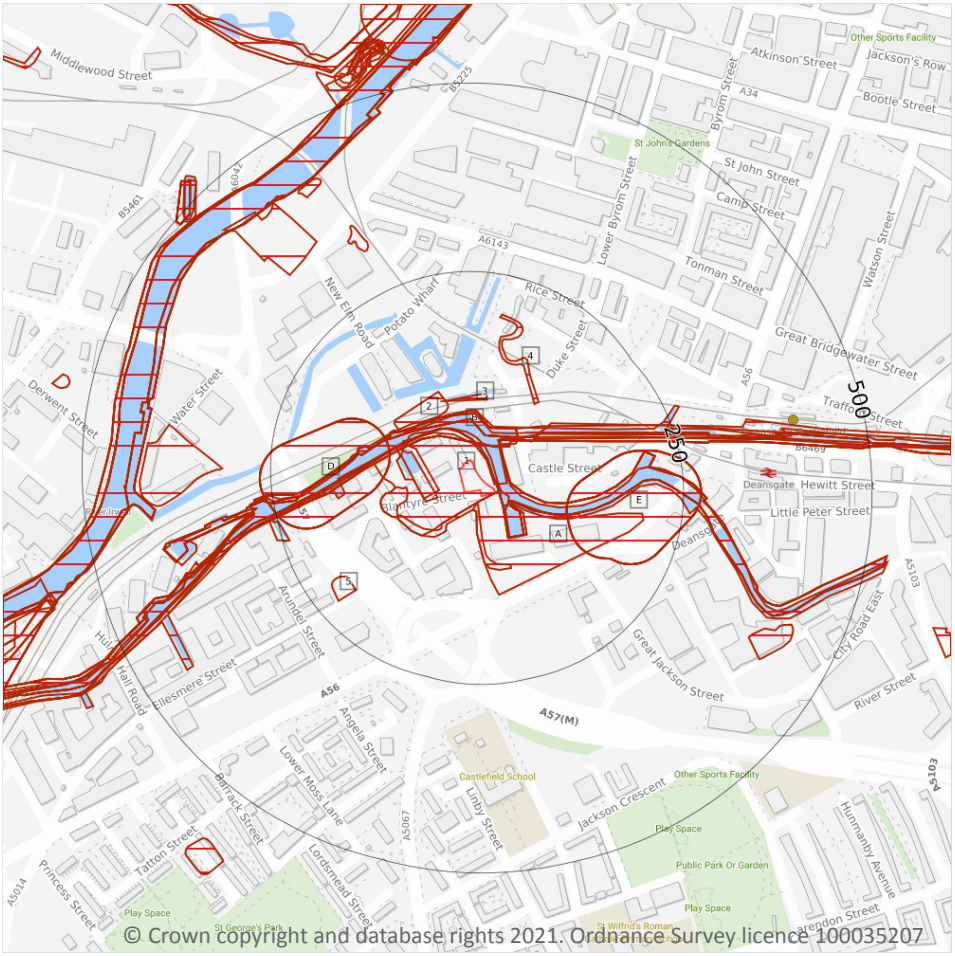
The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 144**

Location	Hazard rating	Details
On site	**Negligible**	**Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.**

This data is sourced from the British Geological Survey.

18 Mining, ground workings and natural cavities



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Site Outline

Search buffers in metres (m)

- Natural cavities (Area)
- Natural cavities (Point)
- BritPits
- Surface ground workings
- Underground workings
- Historical Mineral Planning Areas
- Mining Cavities

Non Coal Mining

- Sporadic underground mining of restricted extent possible
- Localised small scale underground mining possible
- Small scale mining possible
- Underground mining known or likely within or in close proximity
- Underground mining known within or in very close proximity

18.1 Natural cavities

Records within 500m	0

Industry recognised national database of natural cavities. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering. Ground instability can result from movement of loose material contained within these cavities, often triggered by water.

This data is sourced from Stantec UK Ltd.

18.2 BritPits

Records within 500m	0

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

This data is sourced from the British Geological Survey.

18.3 Surface ground workings

Records within 250m	30

Historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

Features are displayed on the Mining, ground workings and natural cavities map on **page 146**

ID	Location	Land Use	Year of mapping	Mapping scale
1	**On site**	**Quay**	**1851**	**1:10560**
A	**On site**	**Quay**	**1851**	**1:10560**
A	5m E	Canal	1956	1:10560
A	5m E	Canal	1988	1:10000
B	5m E	Canal	1971	1:10000
B	5m E	Canal	1978	1:10000
B	5m E	Canal	1985	1:10000
B	5m E	Canal	1994	1:10000
C	6m NE	Canal	1896	1:10560
B	9m SW	Unspecified Ground Workings	1851	1:10560
A	22m SE	Pond	1851	1:10560
C	24m N	Canal	1938	1:10560
C	24m N	Canal	1932	1:10560
C	24m N	Canal	1916	1:10560
C	24m N	Canal	1905	1:10560
C	24m N	Canal	1923	1:10560
2	71m NW	Timber Wharf	1851	1:10560

ID	Location	Land Use	Year of mapping	Mapping scale
C	74m W	Gravel Pit	1851	1:10560
3	79m N	Water Body	1896	1:10560
D	93m W	Unspecified Wharves	1938	1:10560
D	93m W	Unspecified Wharves	1932	1:10560
D	93m W	Unspecified Wharves	1916	1:10560
D	93m W	Unspecified Wharves	1905	1:10560
E	97m E	Quay	1938	1:10560
E	97m E	Quay	1932	1:10560
E	97m E	Quay	1916	1:10560
E	97m E	Quay	1905	1:10560
E	97m E	Quay	1923	1:10560
4	112m NE	Unspecified Ground Workings	1851	1:10560
5	193m SW	Sand Pit	1851	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.4 Underground workings

Records within 1000m	0

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

This is data is sourced from Ordnance Survey/Groundsure.

18.5 Historical Mineral Planning Areas

Records within 500m	0

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

This data is sourced from the British Geological Survey.

18.6 Non-coal mining

Records within 1000m	0

The potential for historical non-coal mining to have affected an area. The assessment is drawn from expert knowledge and literature in addition to the digital geological map of Britain. Mineral commodities may be divided into seven general categories - vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities (including ball clay, jet, black marble, graphite and chert).

This data is sourced from the British Geological Survey.

18.7 Mining cavities

Records within 1000m	1

Industry recognised national database of mining cavities. Degraded mines may result in hazardous subsidence (crown holes). Climatic conditions and water escape can also trigger subsidence over mine entrances and workings.

Features are displayed on the Mining, ground workings and natural cavities map on **page 146**

ID	Location	Mine Address	Mineral	Data source	Publisher
-	838m W	Wodens Cave, Manchester, Greater Manchester	Firestone, Freestone, Hearthstone, Honestone, Ragstone, Sandstone, Scythestone, Silver Sand, Whetstone	'Underground Manchester - Secrets of the city revealed'	Willow Publishing

This data is sourced from Stantec UK Ltd.

18.8 JPB mining areas

Records on site	1

Areas which could be affected by former coal and other mining. This data includes some mine plans unavailable to the Coal Authority.

Location	Details
On site	**In addition to being located inside an area where The Coal Authority have information on coal mining activities, Johnson Poole & Bloomer (JPB) have information such as mining plans and maps held within their archive of mining activities that have occurred within 1km of this property which may supplement this information. Please note, the plans held by JPB may also relate to non-mining records. Further details and a quote for services (if appropriate) can be obtained by emailing this report to enquiries.gs@jpb.co.uk.**

This data is sourced from Johnson Poole and Bloomer.

18.9 Coal mining

Records on site	**1**

Areas which could be affected by past, current or future coal mining.

Location	Details
On site	**The site is located within a coal mining area as defined by the Coal Authority. A Consultants Coal Mining Report is recommended to further assess coal mining issues at the site. This can be ordered directly through Groundsure or your preferred search provider.**

This data is sourced from the Coal Authority.

18.10 Brine areas

Records on site	**0**

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

This data is sourced from the Cheshire Brine Subsidence Compensation Board.

18.11 Gypsum areas

Records on site	**0**

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

18.12 Tin mining

Records on site	0

Generalised areas that may be affected by historical tin mining.

This data is sourced from Mining Searches UK.

18.13 Clay mining

Records on site	0

Generalised areas that may be affected by kaolin and ball clay extraction.

This data is sourced from the Kaolin and Ball Clay Association (UK).

19 Radon



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19.1 Radon

Records on site	1

Estimated percentage of dwellings exceeding the Radon Action Level. This data is the highest resolution radon dataset available for the UK and is produced to a 75m level of accuracy to allow for geological data accuracy and a 'residential property' buffer. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain. The data was derived from both geological assessments and long term measurements of radon in more than 479,000 households.

Features are displayed on the Radon map on **page 152**

Location	Estimated properties affected	Radon Protection Measures required
On site	**Less than 1%**	**None****

This data is sourced from the British Geological Survey and Public Health England.

20 Soil chemistry

20.1 BGS Estimated Background Soil Chemistry

Records within 50m	4

The estimated values provide the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km^2. In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km^2; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	**25 - 35 mg/kg**	**No data**	**100 - 200 mg/kg**	**60 - 120 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**15 mg/kg**
On site	**25 - 35 mg/kg**	**No data**	**100 - 200 mg/kg**	**60 - 120 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**15 mg/kg**
29m NW	25 - 35 mg/kg	No data	100 - 200 mg/kg	60 - 120 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 mg/kg
33m W	25 - 35 mg/kg	No data	100 - 200 mg/kg	60 - 120 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 mg/kg

This data is sourced from the British Geological Survey.

20.2 BGS Estimated Urban Soil Chemistry

Records within 50m	6

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km^2).

Location	Arsenic (mg/kg)	Bioaccessible Arsenic (mg/kg)	Lead (mg/kg)	Bioaccessible Lead (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Tin (mg/kg)
On site	**18**	**3.2**	**81**	**56**	**0.4**	**57**	**30**	**23**	**8**
On site	**18**	**3.2**	**79**	**54**	**0.3**	**59**	**30**	**24**	**7**

Location	Arsenic (mg/kg)	Bioaccessible Arsenic (mg/kg)	Lead (mg/kg)	Bioaccessible Lead (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Tin (mg/kg)
23m SE	17	3	60	41	0.3	58	49	24	6
26m NE	18	3.2	57	39	0.3	55	43	23	6
29m NW	18	3.2	46	32	0.3	60	23	24	5
33m SW	18	3.2	50	34	0.3	60	29	24	6

This data is sourced from the British Geological Survey.

20.3 BGS Measured Urban Soil Chemistry

Records within 50m	0

The locations and measured total concentrations (mg/kg) of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc in urban topsoil samples from 23 urban centres across Great Britain. These are collected at a sample density of 4 per km^2.

This data is sourced from the British Geological Survey.

21 Railway infrastructure and projects



Site Outline

Search buffers in metres (m)

- Crossrail 1 Stations
- Crossrail 1 Route
- Crossrail 1 Worksites
- Crossrail 2 Stations
- Crossrail 2 Route
- Crossrail 2 Worksites
- Crossrail 2 Safeguarding
- Crossrail 2 Headhouses
- Railway stations
- Active railways
- Active tunnels
- Abandoned railways
- Historic railways
- Historic tunnels
- Underground stations
- Underground Lines
- Royal Mail tunnels
- HS2 optimised route
- HS2 Stations
- HS2 Depots
- HS2 Surface Safeguarding
- HS2 Subsurface Safeguarding

21.1 Underground railways (London)

Records within 250m	0

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

This data is sourced from publicly available information by Groundsure.

21.2 Underground railways (Non-London)

Records within 250m	0

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.

This data is sourced from publicly available information by Groundsure.

21.3 Railway tunnels

Records within 250m	1

Railway tunnels taken from contemporary Ordnance Survey mapping.

Features are displayed on the Railway infrastructure and projects map on **page 155**

Location	Type
156m NE	Railway Tunnel

This data is sourced from the Ordnance Survey.

21.4 Historical railway and tunnel features

Records within 250m	28

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

Features are displayed on the Railway infrastructure and projects map on **page 155**

Location	Land Use	Year of mapping	Mapping scale
3m NE	Railway Sidings	1948	1250
3m NE	Railway Sidings	1963	1250
3m NE	Railway Sidings	1979	1250
59m N	Railway Sidings	1893	2500
59m N	Railway Sidings	1908	2500
59m N	Railway Sidings	1922	2500
59m N	Railway Sidings	1932	2500
61m N	Railway	1922	-
63m N	Railway Sidings	1948	2500
63m N	Railway Sidings	1979	2500
65m N	Railways	1893	-
65m N	Railway	1932	-
107m NW	Railway	1889	-

Location	Land Use	Year of mapping	Mapping scale
133m W	Railway	1908	-
158m NE	Railway Sidings	1923	10560
163m NE	Railway Sidings	1938	10560
163m NE	Railway Sidings	1932	10560
163m NE	Railway Sidings	1916	10560
163m NE	Railway Sidings	1905	10560
180m NE	Railway Sidings	1963	2500
188m NE	Railway Sidings	1956	10560
192m NE	Railway Sidings	1948	1250
193m NE	Railway Sidings	1963	2500
194m NE	Railway Sidings	1979	1250
195m NE	Railway Sidings	1963	1250
195m NE	Railway Sidings	1955	-
212m W	Railways	1893	-
212m W	Railways	1948	-

This data is sourced from Ordnance Survey/Groundsure.

21.5 Royal Mail tunnels

Records within 250m	0

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.

This data is sourced from Groundsure/the Postal Museum.

21.6 Historical railways

Records within 250m	3

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

Features are displayed on the Railway infrastructure and projects map on **page 155**

Location	Description
91m N	Abandoned
95m N	Abandoned
99m N	Abandoned

This data is sourced from OpenStreetMap.

21.7 Railways

Records within 250m	**24**

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

Features are displayed on the Railway infrastructure and projects map on **page 155**

Location	Name	Type
65m N	Not given	Multi Track
66m N		rail
69m N		rail
76m N		light_rail
78m N	Not given	Multi Track
79m N		light_rail
101m NW	Not given	Multi Track
124m W		rail
146m NE		rail
149m NE	Not given	Multi Track
149m NE		rail
158m NE	Not given	Multi Track
168m NE	Not given	Multi Track
176m NE	Not given	Multi Track
176m NE	Not given	Multi Track
186m W	Not given	Multi Track
186m NE	Not given	Multi Track
188m NE		rail

Location	Name	Type
188m NE		rail
192m NE	Not given	Multi Track
197m NE	Not given	Multi Track
203m NE	Not given	Multi Track
205m NE		rail
208m NE		rail

This data is sourced from Ordnance Survey and OpenStreetMap.

21.8 Crossrail 1

Records within 500m	0

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

This data is sourced from publicly available information by Groundsure.

21.9 Crossrail 2

Records within 500m	0

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

This data is sourced from publicly available information by Groundsure.

21.10 HS2

Records within 500m	0

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

This data is sourced from HS2 ltd.

Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information. To find out who they are and their areas of expertise see https://www.groundsure.com/sources-reference.

Terms and conditions

Groundsure's Terms and Conditions can be accessed at this link: https://www.groundsure.com/terms-and-conditions-jan-2020/.

APPENDIX 5

BGS BOREHOLE LOGS, BGS MINERAL RESOURCES MAP FOR GREATER MANCHESTER AND THE GREATER MANCHESTER JOINTS MINERAL PLANS

SJ89NW 8288 9743 . 1215

STRATA SURVEYS LIMITED

Location **Lower Medlock UCSO's C/1 Site 0181**

Client: **BeWT** Project Ref.: **9-00-00-910**

Borehole No. **BH301**

Job No.: **9069/63**

Equipment and methods **Light cable percussion**

Start Date:	End Date:	Final Depth:	Casing Diameter	Casing Depth
11/02/1998	11/02/1998	3.10m	150mm	2.00m

FIELD RECORDS	Samples / Tests: Casing (Water) Depth (m)	Depth (m) from	to	SAMPLE Type & No	SPT (N) {Cu}	Description	Strata: Depth & Thickness m	Reduced Level (m)	Legend
						MADE GROUND (dark grey and brown clay with brick and cinder)	(0.60)		
		0.50		D 1			0.60	29.68	
		1.00		D 2		MADE GROUND (firm to stiff brown sandy clay with some fine to medium gravel cinder and rootlets, and occasional bands of red/brown clayey fine to coarse sand)			
[u14]		1.30	1.70	U 1	{18}	*U1 - sample disturbed*	(1.50)		
38, 50 /50mm	2.00	2.10	2.20	B 1	((211))		2.10	28.18	
		2.10		S 1		Red/brown moderately weathered SANDSTONE			
T1									
M1							(1.00)		
2.50									
2.50									
41, 50 /25mm	2.00	3.00	3.10	S 2	((273))				
-{11/02/1998}-						**Borehole Completed**	3.10	27.18	

Remarks 1) Service pit dug 1.0m x 1.0m x 1.2m
2) Water met at 2.50m with no rise after 20 mins
3) 1 hour shelling from 2.10m
4)Borehole continued by rotary drilling

Logged by **LW** Drilled by **CB**

Ground level **30.28mAD**

Co-ordinates:

SSL--cable per -0896 Rev 4

British Geological Survey

SJ89NW 8289 9742 1304

STRATA SURVEYS LTD.,
Telephone: 0606 84 4637 Fax: 0606 84 5657

Borehole Number : U2
Sheet 1 of 1.

Job Number : 5977/12 Location : Mancunian Way-Regents Road.
Client : Manchester City.

Dia. & Drilling Methods
150mm Diameter
light cable percussion

Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sample Depths	Sample Types	N Value	Cu	ø	Water Level	Pie -zo	Daily Prog.
	30.80			0.00								
MADE GROUND (brick and brown medium sand and clay)			(2.40)		1.20 - 1.65	S 1	N 13					
					1.70	D 1						
					2.20 - 2.65	S 2	N 26					
	28.40			2.40								
Brown medium grained highly weathered SANDSTONE.					2.90 - 3.08	S 3	N 50 /175					
			(3.10)									
					4.40 - 4.44	S 4	N 50 /35					
	25.30			5.50								27/11
Borehole Completed												

General Remarks :
Trial pit excavated with use of a breaker to 1.00m X 1.00m X 1.20m deep (1.5hours)
No water encountered during drilling.
Chiselling sandstone (2hours)

Dates : 27 November 91
Driller : RC
Engineer: GH

British Geological Survey

MANCHESTER CITY COUNCIL

CITY ENGINEER AND SURVEYORS DEPARTMENT

SJ89NW/3416
8310 9754

SITE INVESTIGATION FOR	DSG	DATE COMMENCED	13.2.86
LOCATION	Castlefield REF:	BORING METHOD	Shell and Auger
BOREHOLE No.	D	BORING DIAMETER	150mm
GRID REFERENCE		SCALE:	1:50 approx.

DATE	CASING DEPTH (m)	WATER LEVEL MORNING & EVENING	DEPTH OF STRATA BELOW GL	Reduced Level	DESCRIPTION	No. and Type of Sample	SAMPLE DEPTH PENETRATION From	SAMPLE DEPTH PENETRATION To	No. of Blows	Legend
			0.2		Cobbles					
			0.5		Ashes					
					Sand, clay, ashes, sandstone pieces etc. - made ground	D1 P2 P3 B4	0.6 1.35 2.15 2.0	 1.65 2.45 3.0	 1 1	
			3.0							
13.2.86	3.00	Dry	3.45		Dense slightly clayey fine/ medium grained SANDSTONE	P5	3.15	3.45	31	

WATER OBSERVATIONS DURING BORING			
DEPTH OF WATER ENTRY (m)	ESTIMATED SEE PAGE	STANDING LEVEL (m)	DEPTH OF CASING WHEN SEALED (m)
None			
Observed			

WATER LEVEL IN CASED/UNCASED BOREHOLE ON COMPLETION		
DATE	WATER LEVEL	DEPTH OF CASING

REMARKS:-

SAMPLE TEST KEY

D – DISTURBED SAMPLE B – BULK SAMPLE U – UNDISTURBED SAMPLE
P – SPT SAMPLE W – WATER SAMPLE

NOTE: WHERE FULL 0.3 PENETRATION HAS NOT BEEN ACHIEVED, THE NUMBER OF BLOWS FOR THE QUOTED PENETRATION IS GIVEN (NOT N – VALUE)

ALL DEPTHS AND REDUCED LEVELS IN (m) UNLESS OTHERWISE STATED

REMARKS

M/c 5971

British Geological Survey

MANCHESTER CITY COUNCIL

CITY ENGINEER AND SURVEYORS DEPARTMENT

SJ89NW 3417
8310 9757

SITE INVESTIGATION FOR	DSG	DATE COMMENCED	14.2.86
LOCATION	Castlefield REF:	BORING METHOD	Shell and Auger
BOREHOLE No.	E	BORING DIAMETER	150mm
GRID REFERENCE		SCALE:	1:50 approx.

DATE	CASING DEPTH (m)	WATER LEVEL MORNING & EVENING	DEPTH OF STRATA BELOW GL	Reduced Level	DESCRIPTION	No. and Type of Sample	SAMPLE DEPTH PENETRATION From	To	No. of Blows	Legend
14.2.86			0.50	0.50	Cobbles, sand stone pieces, topsoil.					
					Very dense red/brown fine/medium grained SANDSTONE	D1	0.6			
						P2	0.7	0.775	50	
						P3	1.6	1.675	50	
						P4	2.5	2.55	50	
14.2.86	1.20	Dry	2.50							

British Geological Survey

WATER OBSERVATIONS DURING BORING

DEPTH OF WATER ENTRY (m)	ESTIMATED SEE PAGE	STANDING LEVEL (m)	DEPTH OF CASING WHEN SEALED (m)
None			
Observed			

WATER LEVEL IN CASED/UNCASED BOREHOLE ON COMPLETION

*DATE	WATER LEVEL	DEPTH OF CASING

REMARKS:–

SAMPLE TEST KEY

D – DISTURBED SAMPLE
B – BULK SAMPLE
U – UNDISTURBED SAMPLE
P – SPT SAMPLE
W – WATER SAMPLE

NOTE: WHERE FULL 0.3 PENETRATION HAS NOT BEEN ACHIEVED, THE NUMBER OF BLOWS FOR THE QUOTED PENETRATION IS GIVEN (NOT N – VALUE)

ALL DEPTHS AND REDUCED LEVELS IN (m) UNLESS OTHERWISE STATED

REMARKS

SPT samples P2 and P3 recorded 50 blows for 75mm penetration within the initial 150mm penetration

SPT samples P4 recorded 50 blows for 50mm penetration within the initial 150mm penetration

M/c 5021

SJ89NW

GROUND ENGINEERING LIMITED

Peterborough Tel: 01733-568153

Site: BLANTYRE STREET, CASTLEFIELD, MANCHESTER

BOREHOLE BH1

Date: 10/03/00

Hole Size: 150mm dia to 4.50m

382921
397445

Ground Level:

Samples and in-situ Tests			(Date) Casing	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Blows					
				MADE GROUND - ASPHALT		0.20	
				MADE GROUND - Light brown SANDSTONE FILL (Drillers Description)		0.40	
0.40	D1			MADE GROUND - Loose dark brown/red brown mottled clayey gravelly SAND with some fragments of brick, ash, charcoal and ash			
0.80	D2						
1.20-1.70	B1						
1.20	D3						
1.35-1.65	C	N4	1.20				
2.20-2.70	B2						
2.35-2.65	C	N4	2.20			2.80	
3.00-3.50	B3			Dense red brown silty fine medium SAND with occasional fine gravel size fragments of weakly cemented sandstone (WEATHERED SHERWOOD SANDSTONE)			
3.15-3.45	C	N73	3.00			3.50	
4.00	D4			Weak red brown SANDSTONE			
4.15-4.23	C	50*	4.00	(SHERWOOD SANDSTONE)			
4.50	D5					4.50	
				Borehole completed at 4.5m depth			

REMARKS

1. Excavating starter pit to 1.2m (1hr)
2. Chiselling from 4.3m to 4.5m (0.5hr)
3. Borehole cased to 4.5m depth
4. Water added to assist progress from 2.8m to 4.5m
5. Borehole sides collapsed to 2.4m on removal of casing

Project No 7888

Scale 1:25

Page 1/1

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
S/C - SPT Spoon/Cone
▽ Water Strike
▼ Water Rise
N - SPT Blows for 0.3m
* - Blows for quoted penetration
V - Vane Shear Test Cohesion ( ) kPa
▽c Level on completion
c▽w Level casing withdrawn
▼s Standpipe Level

Groundwater Strikes

Depth m					
No	Struck	Rose to	Rate	Cased	Sealed

Groundwater Observations

	Depth m		
Date	Hole	Casing	Water
10/03/00	4.50	4.50	dry
10/03/00		2.60	2.80

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Office of the Deputy Prime Minister
Creating sustainable communities

GREATER MANCHESTER

(comprising the Cities of Manchester and Salford and the Metropolitan Boroughs of Bolton, Bury, Oldham, Rochdale, Stockport, Tameside, Trafford and Wigan)

Mineral Resource Information in Support of National, Regional and Local Planning

Mineral Resources

Scale 1:100 000

Compiled by D.J. Minchin, D.G. Cameron, D.J. Evans, G.K. Lott, S.F. Hobbs and D.E. Highley.
Project Leader: D.E. Highley.
Digital cartography by N.A. Spencer, British Geological Survey.

Published 2006.

This map comprises part of a summary of the 'Mineral Resources of the North-West England Region'.
For more information see www.mineralsUK.com

BIBLIOGRAPHIC REFERENCE

Minchin D J, and 5 others. 2006. Mineral Resource Information for National, Regional and Local Planning: Greater Manchester (comprising the Cities of Manchester and Salford and Metropolitan Boroughs of Bolton, Bury, Oldham, Rochdale, Stockport, Tameside, Trafford and Wigan). *British Geological Survey Commissioned Report CR/05/182N.*

Production of this map was commissioned and funded by the Office of the Deputy Prime Minister (Contract MP0677).

SAND & GRAVEL

Superficial deposits

- Sub-alluvial: Inferred resources
- River Terrace deposits
- Glaciofluvial deposits

PEAT

SANDSTONE

Carboniferous: Millstone Grit and Pennine Coal Measures

BRICK CLAY

- Brick clay and Fireclay coincident with coal bearing strata - Shallow Coal/ Unproductive Coal Measures

Carboniferous: Pennine Coal Measures

COAL

- Area of shallow coal
- Opencast coal: worked area

MINERAL PLANNING PERMISSION (as at 01.01.06)

Source: Mineral Planning Authorities

- Surface planning permission (valid and expired)
- Underground planning permission other than coal (valid and expired)

MINERAL WORKINGS

- Harwood — Active site
- *Cowbury Dale* — Inactive (including yet to be worked), worked-out and/or restored site

Mineral commodity

Cl	Clay & Shale	San	Sand
Co	Coal	Sec	Secondary aggregate
CR	Crushed Rock	SiS	Silica Sand
Fr	Fireclay	Sst	Sandstone
Gas	Natural Gas	Sg	Sand and Gravel
Min	Mineral, unspecified		

- Active rail aggregate depot

ENVIRONMENTAL DESIGNATIONS (as at 06/07/05)

- National nature conservation designations (SSSIs and NNRs)
- International nature conservation designations (SACs, SPAs and Ramsar sites)
- National Park: Peak District (part)
- \+ Scheduled Monument

ADMINISTRATIVE AREAS

- Mineral Planning Authority (National Parks are also MPAs)

Aims and Limitations

The purpose of the maps in this series is to show the broad distribution of those mineral resources which may be of current or potential economic interest and to relate these to selected nationally-recognised planning designations. The maps are intended to assist in the consideration and preparation of development plan policies in respect of mineral extraction and the protection of important mineral resources against sterilisation. They bring together a wide range of information, much of which is scattered and not always available in a convenient form.

The maps have been produced by the collation and interpretation of mineral resource data principally held by the British Geological Survey. Information on the extent of mineral planning permissions has been obtained from the relevant Mineral Planning Authority (MPA). Some of these permissions may have lapsed or expired. The status of individual areas can be ascertained from the appropriate MPA. Location information on national planning designations has been obtained from the appropriate statutory body (Countryside Agency, English Nature and English Heritage). For further information the relevant body should be contacted.

The mineral resource data presented are based on the best available information, but are not comprehensive and their quality is variable. The inferred boundaries shown are, therefore, approximate. Mineral resources defined on the map delineate areas within which potentially workable minerals may occur. These areas are not of uniform potential and should be taken no account of planning constraints that may limit their working. The economic potential of specific sites can only be proved by a detailed evaluation programme. Such an investigation is an essential precursor to submitting a planning application for mineral working. Extensive areas are shown as having no mineral resource potential, but some isolated mineral workings may occur in these areas. The presence of these operations generally reflect very local or specific situations.

The maps are intended for general consideration of mineral issues and not as a source of detailed information on specific sites. The maps should not be used to determine individual planning applications or in taking other decisions on the acquisition or use of a particular piece of land, although they may give useful background information which sets a specific proposal within context.

BRICK CLAY (including FIRECLAY)

Brick clay is the term used to describe 'clay and shale' used in the manufacture of structural clay products, such as facing and engineering bricks, pavers, clay tiles and vitrified clay pipes. These clays may also be used in cement manufacture, as a source of constructional fill and for lining and sealing landfill sites. Brick manufacture is the largest tonnage use in England. Clay bricks are versatile construction materials and one of the most visible components of the built environment. They make an important contribution to local architectural styles.

Brick clays are essentially mudstones of different geological ages and compositions. Their mineralogy, chemistry and physical properties are critical to determining their suitability for the manufacture of structural clay products. These properties affect the forming behaviour of the clay (the process of shaping the ware) and also its behaviour during drying and firing. They will also determine the technical properties of the fired product, such as strength, water absorption (porosity) and frost-resistance, and thus its durability and performance in service and, importantly, its architectural appearance, such as colour and texture. Most facing bricks, engineering bricks and pavers for clay-based building products are manufactured in large automated factories. These represent a high capital investment and are therefore increasingly dependent on raw material with predictable and consistent firing characteristics in order to achieve high yields at saleable products. Blending different clays to achieve improved durability and to provide a range of fired colours and textures is an increasingly common feature of the brick industry. Continuity of supply of raw materials is of paramount importance.

In Manchester, brick clay has been produced for local consumption from small brick pits for over two hundred years. Historically, a variety of clays were extracted for 'common' brick making, including boulder clay, Triassic Mercia Mudstone and mudstones from the Pennine Lower and Middle Coal Measures. Fireclay, the fine-grained seatearth that commonly underlie coal seams, was mined alongside coal in opencast and deep mines for use in pipe making. With the demise of the 'common' brick and consolidation of the brick industry, most of these clay quarries closed. Today, one active clay quarry remains at Harwood, northeast of Bolton, working the Pennine Lower Coal Measures. This quarry produces high quality brick clay for use in facing, engineering and paving bricks but has no associated brickworks. The clay is delivered to a brickworks at Denton, in Tameside, which has no associated quarry and sources clay from a variety of locations, mainly from a site in Glossop, approximately 13 km away in Derbyshire.

Pennine Coal Measures mudstones, which occur interbedded with siltstone, sandstone, coal seams and seatearths, are the principal brick clay resource in North West England. Resources occur across the north and east of the county but are currently only worked in Bolton. The clay mineralogy of Coal Measures mudstones is dominated by kaolinite and illite which tend to provide optimum firing characteristics. Carbon and sulphur contents are also critical to firing performance. Excessive amounts of either may lead to firing problems and sulphur may also give unacceptable emission levels, although blending of clays may reduce these problems. In general, carbon and sulphur contents should be less than 1.5 per cent and 0.2 per cent respectively. Both fireclays and mudstones occur in association with opencast coal, with which they may be worked. However, this is only rarely the case because of the variable quality of the clay, particularly of the fireclays, and due to operational and planning difficulties. Fireclays have relatively low iron content compared to other brick clays and they are primarily valued for the manufacture of buff-coloured bricks and pavers. There is no current fireclay extraction in the area.

PEAT

Peat is an unconsolidated deposit of compressed plant remains in a water-saturated environment such as a bog or fen. Bogs occur in areas where inputs of water (almost exclusively from precipitation) have a low nutrient content and where the rainfall is sufficient to maintain the ground surface in a waterlogged condition. The vegetation is characterised by acid-tolerant plant communities in which the moss genus *Sphagnum* is dominant. The two main types of bog are (i) raised bogs, characteristic of flat underlying topography and found on plains and broad valley floors and (ii) blanket bogs, which occur mainly in upland areas where conditions are suitably cool and wet. Many lowland raised bogs have been designated as sites of international and national conservation areas. Peat is dug in England mainly from raised lowland bogs, almost entirely (98 per cent) for horticultural use, either as growing media or as a soil improver. Areas of upland blanket peat are not worked and therefore not shown.

Peat is being extracted from three sites on Chat Moss to the west and north west of Irlam on the Wigan/Salford boundary. The peat deposits cover an area of 2587 ha of raised bogs up to 9 m thick on a flat underlying topography. Planning permission for peat extraction covers 305 ha, both in the Wigan and Salford districts. Smaller lowland peat deposits such as Carrington Moss and Ashton Moss cover approximately two square kilometres each, but are not worked.

Many of the peat deposits have been worked extensively in the past and today a large percentage of these areas have been 'reclaimed' to agricultural land. Due to the unavailability of up to date linework defining the extent of the reclamation, the entire resource as mapped is shown on the face of the map.

COAL

The area lies predominantly within the South Lancashire Coalfield. The coal-bearing strata of the Pennine Lower and Middle Coal Measures (Upper Carboniferous) generally dip to the southwest and west. The South Lancashire Coalfield crops out across an area of approximately 970 km², stretching from Rochdale in the east to St Helens in the west. A spur runs southwards from Rochdale to just south of Stockport. In the east and north, older Namurian strata are present at outcrop and to the west and south, Permo-Triassic strata unconformably overlie the Coal Measures. To the south, the coalfield deepens significantly to greater than 3000 m below Ordnance Datum beneath Permo-Triassic strata and passes into the Cheshire Basin. A substantial portion of the coalfield is covered by urban development.

Coal seams are numerous with in excess of 36 named coal seams, which vary laterally in both thickness and composition, chiefly by variation in the number of dirt partings present within the seam. Coals are mainly present within the Pennine Lower and Middle Coal Measures, with a few additional coals in the lower part of the Pennine Upper Coal Measures. The main coal-bearing interval typically varies from about 590 m in the west to 880 m in the east. The lower part of the Pennine Lower Coal Measures, below the Arley seam, typically contains coals that are thin and of variable quality. The rest of the Pennine Lower and Middle Coal Measures form the most important coal-bearing interval, with a number of coals in excess of 2 m in thickness. Coals from the Pennine Upper Coal Measures are generally thin, the exception being the Worsley Four Foot, which can be up to 1.8 m in thickness. Coal rank ranges from high to medium volatile.

There are no operating deep mines in the area, the last, Parkside, was closed in 1993. Any future commercial interest in coal extraction is likely to be confined to coal that can be recovered by surface mining. Historic opencast mining has occurred in the Wigan Coalfield, which has been mined for seven centuries, and across the north of the area. Opencast mining in the east has been limited by the steeper dip of the strata in this area. Recent, small-scale opencast production has been confined to the Wigan Coalfield, but there has been no production since 2000. Although there is potential for further opencast mining this is reduced by a number of factors. Firstly the basal part of the Pennine Lower Coal Measures does not contain many thick seams. Hence areas on the northern and eastern flank of the coalfield are probably not economically viable. Secondly there are thick drift deposits (up to 50 m in places) across the coalfield and, thirdly, much of the area is sterilised by urban development. Areas of shallow coal resources and former opencast worked areas are shown on the map.

PLANNING PERMISSIONS FOR MINERAL EXTRACTION

The extent of all known extant and former planning permissions for mineral working is shown on the map, irrespective of their current planning or operational status. The polygons were supplied as digital files by the Greater Manchester Geological Unit, and also were digitised by BGS from Plotting Sheets and other documents supplied by Wigan, Rochdale and Bury Metropolitan Councils. In addition, planning permission information was digitally acquired from Ministry of Housing and Local Government maps for the area and incorporated in the data. This data has been checked and amended by the local Authorities shown below. Any queries regarding the sites shown should be directed to these authorities at the addresses shown below. The polygons cover active, former and restored mineral workings and, occasionally, unworked deposits.

Planning Permissions represent areas where a commercial decision to work mineral has been made, a successful application has been dealt with through the provisions of the Town and Country Planning legislation and the permitted reserve will have been depleted to a greater or lesser extent. Current planning status is not qualified on the map but is available in the underlying database.

Contact addresses:

Bolton Metropolitan Borough Council, Environment Department, Town Hall, Bolton BL1 1RU. Tel: 01204 522311, Fax: 01204 387153, web address: www.bolton.gov.uk

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Greater Manchester Geological Unit, University of Manchester, Oxford Road, Manchester M13 9PL. Tel: 0161 275 7150, Fax: 0161 275 7157, web address: www.gmgu.org.uk

Oldham Metropolitan Borough Council, Development Services Department, PO Box 30, Civic Centre, West Street, Oldham OL1 1UQ. Tel: 0161 911 3000, Fax: 0161 911 3104, web address: www.oldham.gov.uk

Rochdale Metropolitan Borough Council, Planning Services and Environmental Department, PO Box 32, Telegraph House, Baillie Street, Rochdale OL16 1JH, Tel: 01706 647474, Fax: 01706 864180, web address: www.rochdale.gov.uk

Salford City Council, Development Services Directorate, Planning & Building Control Division, Civic Centre, Chorley Road, Swinton M27 5BW, Tel: 0161 794 4711, Fax: 0161 727 8269, web address: www.salford.gov.uk

Stockport Metropolitan Borough Council, Environment and Economic Development Division, Hygarth House, 103 Wellington Road South, Stockport SK1 3TT, Tel: 0161 480 4949, Fax: 0161 953 0013, web address: www.stockport.gov.uk

Tameside Metropolitan Borough Council, Environmental Services Department, Council Offices, Wellington Road, Ashton under Lyne OL6 6DL, Tel: 0161 342 8355, Fax: 0161 342 3111, web address: www.tameside.gov.uk

Trafford Metropolitan Borough Council, Trafford Town Hall, Talbot Road, Stretford, Manchester M32 0YY, Tel: 0161 912 1212, Fax: 0161 912 4490, web address: www.trafford.gov.uk

Wigan Metropolitan Borough Council, Borough Planning Department, Civic Buildings, New Market Street, Wigan WN1 1RP, Tel: 01942 244991, Fax: 01942 404022, web address: www.wiganmbc.gov.uk

PLANNING PERMISSIONS ON MAP FACE

1 *Gadbury Brickworks (Gadbury Shale Hole) (Cl)*
2 *Gadbury Fold Branch line (Lovers Lane/Leigh Road and Gadbury Fold, Atherton) (Sec)*
3 *Squires Lane Branch line (Howe Bridge, Atherton to Squires Lane, Tyldesley (Sec)*
4 *Boo Hole Sand Pit (Bury New Road) (San)*
5 *Former Broadfield Station (Sec)*

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Contact address:
English Nature, Northminster House, Northminster, Peterborough, PE1 1UA. Tel: 01733 455000, Fax: 01733 455103, Web page: www.english-nature.org.uk

Positions of Scheduled Monuments at 25th September 2003 as supplied by English Heritage.
The majority of monuments are plotted using a centred NGR symbol. Consequently the actual area and/or length of a monument protected by the legal constraints of scheduling cannot be represented here. Monuments scheduled since that date are not accounted for. ©Copyright English Heritage.
Contact address:
English Heritage, 23 Savile Row, London, W51 2ET, Tel: 020 7973 3132, Web page: www.english-heritage.org.uk

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Contact address:
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Contact address:
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CRUSHED ROCK AGGREGATES

A variety of hard rocks are, when crushed, suitable for use as aggregate. Their technical suitability for different applications depends on their physical characteristics, such as crushing strength and resistance to impact and abrasion. Higher quality aggregates are required for coating with bitumen for road surfacing, or for mixing with cement to produce concrete. For applications such as constructional fill and drainage media, with less demanding specifications, lower quality materials are acceptable.

The crushed rock aggregate resources of Greater Manchester are confined to Carboniferous sandstones, which are relatively extensive but do not provide a source of high quality aggregate.

Sandstone

The Carboniferous sandstones of the Millstone Grit and Pennine Coal Measures of Greater Manchester have traditionally been extensively used as a source of building stone and today both disused and working quarries are a common feature of the landscape.

Carboniferous sandstones consist of sand-sized particles, with minor pebbles, composed dominantly of quartz, but also with some feldspar, which are cemented by silica, to a greater or lesser extent. The sandstones are typically buff-coloured, although locally grey, and vary from fine- to coarse-grained.

Most of the sandstones are too weak and porous to make good quality aggregate for roadstone and concrete, but maybe suitable for fill and for the production of manufactured sand to produce reconstituted stone products.

There are currently 7 working sandstone quarries working Carboniferous sandstones in Greater Manchester. Most quarries produce blockstone or a range of masonry products and some produce crushed aggregate for less demanding specifications.

There are many sandstones of Carboniferous age, However the Haslingden Flags, the Fletcher Bank Grit, Kinderscout Grit (Millstone Grit), Quest Nest Grit and Old Lawrence Rock (Pennine Lower Coal Measures) are the most extensively worked. Production of sandstone in Greater Manchester was just over 1 million tonnes in 2004. Permitted reserves are of the order of 20 million tonnes.

SAND AND GRAVEL

Sand and gravel are defined on the basis of particle size rather than composition. In current commercial practice, following the introduction of new European standards from 1st January 2004, the term 'gravel' (or more correctly coarse aggregate) is used for general and concrete applications to define particles between 4 and 80 mm, and the term 'sand' for material that is finer than 4 mm, but coarser than 0.063 mm. For use in asphalt 2 mm is now the break point between coarse and fine aggregate. Most sand and gravel is composed of particles that are rich in silica (quartz, quartzite and flint), but other rock types may occur locally.

The principal uses of sand are as fine aggregate in concrete, mortar and asphalt. The main use of gravel is as coarse aggregate in concrete. Substantial quantities of sand and gravel may also be used for construction fill.

Production of sand and gravel in Greater Manchester is about 0.24 million tonnes in 2004, according to the Annual Minerals Raised Inquiry, Office for National Statistics. No separate figures are available for permitted reserves in Greater Manchester but these are believed to be small. In 2003 total permitted reserves of sand and gravel in Greater Manchester, Merseyside, Halton and Warrington were 6.7 million tonnes. (North West Regional Aggregates Working Party Annual Report, 2003).

Sand and gravel resources occur in a variety of geological environments. In Greater Manchester these resources occur mainly within superficial or 'drift' deposits, subdivided into river sand and gravel and glaciofluvial sand and gravel; the most important are the glaciofluvial deposits.

Superficial Deposits

Glaciofluvial sand and gravel

These are deposits mapped as the products of deposition by glacial melt waters and are nowadays commonly labelled on BGS maps as glaciofluvial deposits, a more accurate description of their origin. The sequence of these deposits is complex with mappable units commonly exhibiting intricate relationships. Bodies of sand and gravel may occur as sheet- or delta-like layers above till deposits or as elongate, irregular lenses within the till sequence. Areas of wholly concealed, and thus unknown, bodies of sand and gravel may occur under spreads of till and other drift deposits.

Glaciofluvial deposits cover large areas of Rochdale, Bury and Trafford but are mainly fine-grained and are largely devoid of gravel. They vary considerably in thickness but may be over 30 m thick where they fill pre-glacial hollows or buried valleys or form moraines. Sands and gravels are derived from the erosion of local bedrock by the action of ice and water and, as such, mudstones and coal fragments can be common and make the working of a deposit difficult. Glaciofluvial sand and gravel are being worked at Pilsworth South pit in Heywood, Bury. Large areas of potential resource have been sterilized by urban development.

Extensive sheets of sand and gravel, averaging 2 m to 3 m thick, were laid down in the valley of the Mersey west of Stockport, the Bollin below Styal, the Micker Brook, Irwell, Dane and Weaver, all of which drain into the Mersey Estuary. In the lower reaches of all these rivers is the same pattern of a top terrace, in places more than 12 m above present river level, and very wide compared with the later terraces, which form a group including present day alluvium confined to the immediate vicinity of the river. After the formation of the high terrace the river's place an event that suddenly lowered the base level to which the rivers were being graded. That happened to all the rivers mentioned above simultaneously, for their high terraces are at grade with one another. This high terrace phenomenon is limited in this area to the Mersey watershed.

The high terraces of the Mersey Basin were most probably formed at the end of the last Ice Age when the mouth of the river was still blocked by ice in the Irish Sea; thus water was ponded up in the lower Mersey valley and escaped over the neck of the Wirral peninsula. The spillway over the Wirral controlled the base level and it is to be noted that the high terrace is graded to. The sudden fall in the base level of the rivers took place when the last glacial ice melted and the present Mersey channel became open. The high terrace is currently being worked along with more recent river terraces of the River Goyt in Offerton Quarry near Stockport.

River Sand and Gravel (terrace and sub-alluvial deposits)

Resources occur in both raised river terrace sequences flanking the modern floodplains and in floodplain terrace deposits associated with, and underlying, present day alluvium. This sequence of deposits are best developed along the Rivers Mersey, Irwell, Croal and Roch with a succession of deposits formed representing accumulations of sand and gravel in response to falling sea level in Pleistocene times. Less developed terrace deposits occur along the River Tame, Middle Brook, Hey Brook and Moss Brook. The deposits typically consist of upwardly fining and laterally graded spreads of gravel, sand, silt and clay. Alluvium deposits in the area are usually thin and of little significance when compared to the sands and gravels of the high terrace. The composition of river sand and gravel generally reflects the rocks drained by the river and its tributaries. In this case it is mainly Carboniferous sandstones and mudstone, which are weak and friable and only suitable for low-grade uses such as construction fill.

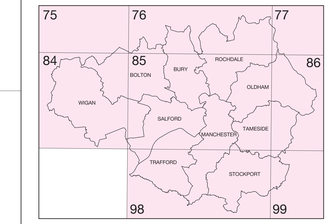
Blown sand

Overlying the glacial till is an irregular, discontinuous layer of wind blown sand referred to as the Shirdley Hill Sand. The sand, which is typically only about 1 to 1.5 m thick, although locally thicker, is younger than the glacial deposits and lies immediately beneath a cover of topsoil. The sand is characteristically uniform in both composition and grain size distribution, reflecting its wind-blown origin. Most of the sand particles fall in the range 0.5 mm to 0.1 mm, which is unsuitable for construction use. The Shirdley Hill Sand was formerly worked in St Helens and Lancashire for glass sand, and particularly for flat glass manufacture. However, these operations ceased in the mid-1970s. A number of thin spreads of blown sand resembling Shirdley Hill Sand have been noted in the area, mainly in the Bolton but are too thin to be considered economic. Wind-blown sands are generally too fine-grained and uniform size for aggregate use. They are therefore not shown on the map.

Bedrock deposits

Additional resources of sand and gravel may be won from exploiting suitable bedrock deposits. Triassic sandstones of the Sherwood Sandstone Group are being worked at Morleys Hall Quarry, southeast of Leigh, to produce sand for mortar and asphalt. The Sherwood Sandstone has been deeply weathered in places by a tropical climate during pre-glacial times. The upper part of the sandstone, immediately below the drift cover, is sometimes weathered to the extent that the cementing material between the sand grains has disintegrated leaving the original quartz grains in the form of sand that can be worked without substantial crushing. The weathered portions of the Sherwood Sandstone usually do not have an ideal particle size distribution for use in mortar, concrete or asphalt and usually the sand is too fine grained or too weak for use as concrete aggregate. Difficulties in removing overburden in the form of glacial till and extra treatment in crushing, however minor, together with marketing and slime removal can often make the resource uneconomic compared to more easily worked glacial sands. The Sherwood Sandstone is, therefore, rarely worked and is not shown on the map.

BGS maps covering Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Stockport, Tameside, Trafford and Wigan



1:63 360 or 1:50 000 map published

Current digital availability of these sheets can be found on the British Geological Survey website: www.bgs.ac.uk

BUILDING STONE

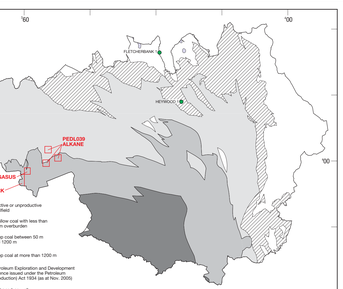
Natural stone is the traditional building material of Britain and the built environment is perhaps the most visible aspect of our cultural heritage. Production and usage of natural stone has declined since the high point of the industry in the late 19th Century, largely because of competition from cheaper alternatives, such as brick and concrete. However, more recently there has been an increased interest in natural stone and the prospects for the industry remain buoyant.

A wide range of rock types is used as building stones. In the area these comprise building sandstones, principally of Carboniferous and Permo-Triassic age. The working of local sandstones for block stone, flagstone and roofing 'slate' was very widespread in the past and almost every Carboniferous sandstone outcrop shows evidence of quarrying. However, currently only four quarries in the area are working Carboniferous sandstone for building stone.

The oldest rocks that were quarried for building stone and flagstone are from the Millstone Grit Group (Carboniferous) which crops out along the northern and eastern margins of the area. The principal sandstone quarries were located around Littleborough (Calderbrook and Long Lees) in the Huddersfield White Rock; at Stalybridge (Buckton Moor) in the Kinderscout Grit; around Horwich (Smithills Moor), Ramsbottom (Quarlton, Crowthorne, Limefield, Baddingstone, Holcombe, Rooley, Axworth), Milnrow, Gee Cross and Marple Bridge in the Rough Rock.

Quarrying of the Pennine Lower Coal Measures sandstones was extensive e.g. at Whitworth (Middle Hill, Hades Hill and Higher Slack), Burnt House Moor (Pinfold); near Bolton (Doffcocker, Moor Gate, Ridgeway in the Quiet Nest Grit); and near Ashton-under-Lyne. The Pennine Middle Coal Measures sandstones were quarried at Oldham Edge, Farnworth and Peel Hall. The small outcrop of Pennine Upper Coal Measures at Collyhurst (Worsley Delf Rock) was also an important source of building stone in the past.

The red Permian and Triassic sandstones at Collyhurst (Aspley Group) and Timperley (Sherwood Sandstone Group) were worked for building stone to a limited extent in the past.



HYDROCARBONS

Conventional Oil and Gas

Greater Manchester is perceived as having poor hydrocarbon prospectivity. Permo-Triassic strata in the south of the area form the Cheshire Basin. This is linked to the offshore East Irish Sea Basin, within which hydrocarbons (mainly gas) have been discovered in a number of fields. Oil has also been produced from the Douglas and Lennox fields. There is also the presence of the small enigmatic Formby Oilfield onshore to the west in Merseyside. The oilfield is thought to owe its existence to the breaching and migration from a deeper (older) Carboniferous trap and is capped by glacial boulder clay.

Carboniferous strata (Namurian mudstones and Westphalian Coal Measures) provide source rock potential both in Greater Manchester area and surrounding districts and the wider area has attracted interest from oil companies. Exploration has been ongoing for many years, with many kilometres of seismic reflection data acquired and hydrocarbon exploration wells drilled. Many of these wells have tested Triassic prospects within the Cheshire Basin, but have proved to be dry. Within the Greater Manchester area, the Fletchertark 1 and Heywood 1 wells (see Table below) tested Carboniferous plays. Both wells were plugged and abandoned as dry, although Heywood had minor hydrocarbon shows.

Perhaps the best prospects, therefore, represent intra-Carboniferous plays with accumulations that have been little disturbed since their formation and charging. The yields from such plays would be small and the current hydrocarbon licence situation reflects the fact that prospectivity in Greater Manchester is not presently perceived as great. Indeed, the four small licence blocks presently operated are from former larger licence block areas and relate not to oil exploration, but to coalbed methane or mine gas (methane) development (see below).

Hydrocarbon exploration wells in Greater Manchester

Exploration Well	Drilling date	Original operator	Current licence area and operator	Status
Fletcherbank 1	1958-59	Steel Brothers Company Ltd	Open acreage	Plugged and abandoned, dry
Heywood 1	1984	BP Development Company Ltd	open acreage	Plugged and abandoned, dry, minor hydrocarbon shows

Abandoned Mine Methane (AMM), Coal Mine Methane (CMM) and Coalbed Methane (CBM) potential

During the process of coal formation through the conversion of plant matter into coal, gases are produced which are either adsorbed onto the coal or dispersed into pore spaces around the coal seam. The generic term for this gas is coalbed methane (CBM). The majority of the gas is attached to the coal surface in micropores. However, during mining the coal is destressed or fractured which releases significant quantities of CBM. Further gas is released during the life of the mine and after mining has ceased. This gas is an environmental hazard but it is also a potential source of energy. This potential depends on the gas content, permeability and total thickness of the coal present.

CBM can be exploited in various ways:

- Extraction from operational mines for safety reasons prior to it entering the mine air stream (coal mine methane - CMM),
- Coal extracted from abandoned mines (abandoned mine methane - AMM),
- Extraction from virgin or unmined coal from surface boreholes (virgin coalbed methane - VCBM)

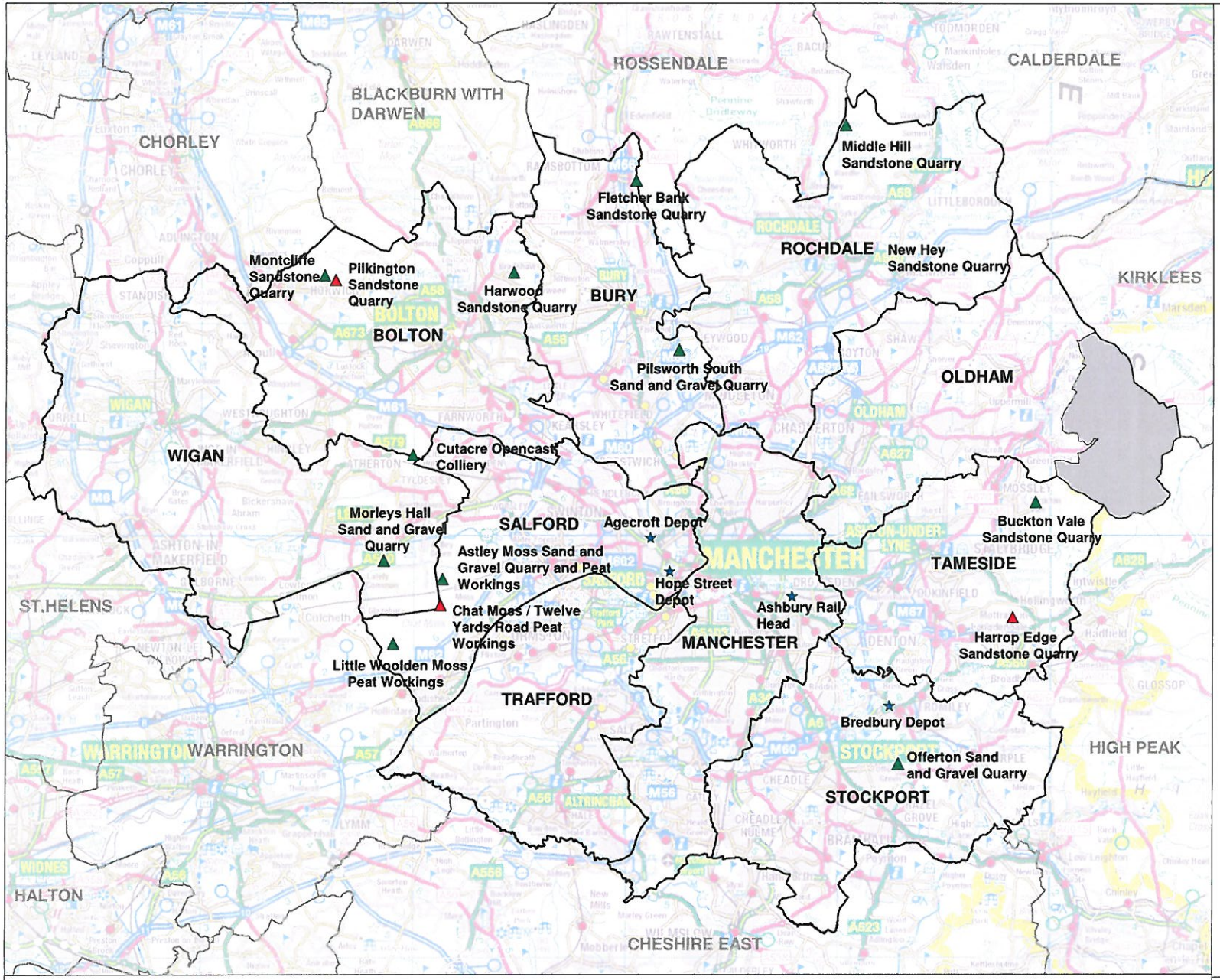
There are no operational coal mines in the area and thus there is no CMM potential.

The Pennine Lower and Middle Coal Measures of the South Lancashire coalfield comprise a succession up to 880 m thick, with 36 named coals present, attaining a maximum seam thickness of >3 m and producing 20-25 m total coal thickness. Historically, gas has been encountered in the coalfield, with some seams noted for their 'coal gas' (the fuel gas produced from a high-volatile bituminous coal). The coals are high to medium, volatile bituminous types with methane contents of up to 9.53 m³ per tonne of coal, and average methane contents of 8.2m³ per tonne of coal.

The concept of Abandoned Mine Methane capture in the UK goes back to the 1950s when Old Moor Mine in the Lancashire Coalfield was sealed and then tapped to supply gas to the adjacent Wood Colliery. This previously successful scheme has perhaps been influential in the interest generated in Abandoned Mine Methane (AMM), Coal Mine Methane (CMM) and Coalbed Methane (CBM) in the South Lancashire and North Wales coalfield areas over recent years.

Old Boston Mine lies just to the west of the area. Currently, the small licence areas EXL253 (Eastern/Pegasus) and PEDL039 (Alkane Energy) representing AMM and CBM interests in the west of the county, adjacent to the Old Boston Mine area, represent the retained areas of formerly much larger licence block areas. The relinquishment of large areas of these licence blocks perhaps suggests that prospects for AMM (and CBM) in the area are not now perceived as particularly good. This may be because any former mines are long abandoned and thus are believed to be too flooded, provide poor yields, or that the financial/taxation scheme is unhelpful at present.

In the USA, coalbed methane is produced from virgin coals containing 7 or more m³ of methane per tonne of coal. The average gas content of the coals in the South Lancashire Coalfield is 8.2 m³ of methane per tonne of coal, which is above the economic threshold in America. However, the South Lancashire Coalfield has been heavily worked and CBM development from virgin coal seams may only be a prospect in unmined areas.



Greater Manchester Districts

Neighbouring District Boundaries

Peak District National Park - although located within Oldham it is not part of the Minerals Plan area

Inactive Mineral Extraction Sites

Active Mineral Extraction Sites

Rail Depots

Inactive sites are those which have not been worked at any point within the previous year. In this case January - December 2010.

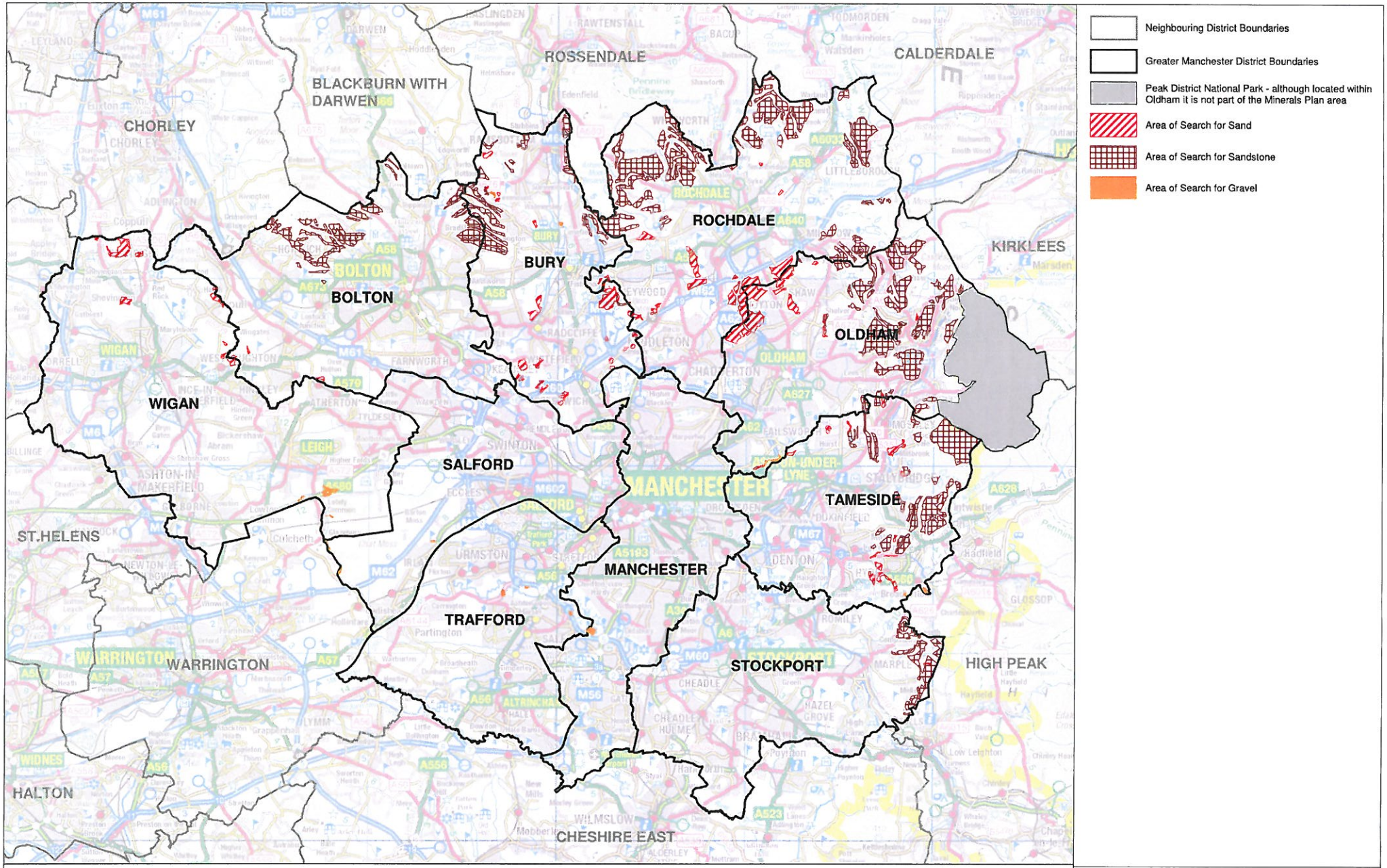
The following quarries have been identified by the English Heritage BGS Strategic Stone Study (SSS) as being important for maintaining and repairing historic buildings:

Buckton Vale
Harwood Quarry
Fletcher Bank Quarry
Middle Hill Quarry
Montcliffe Quarry

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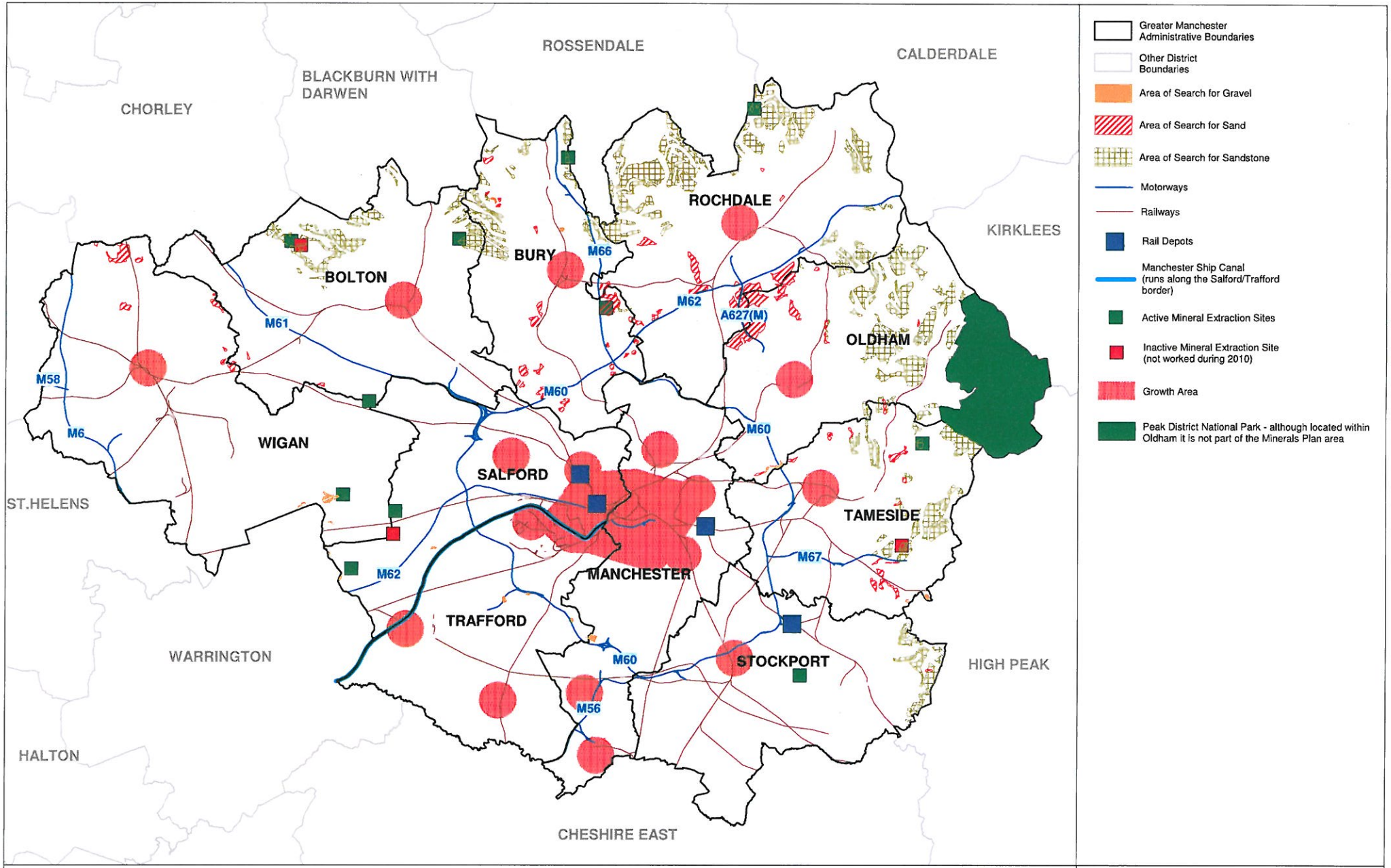
Map 1 - Existing Quarries with planning permission and Rail Depots used for minerals transportation within Greater Manchester



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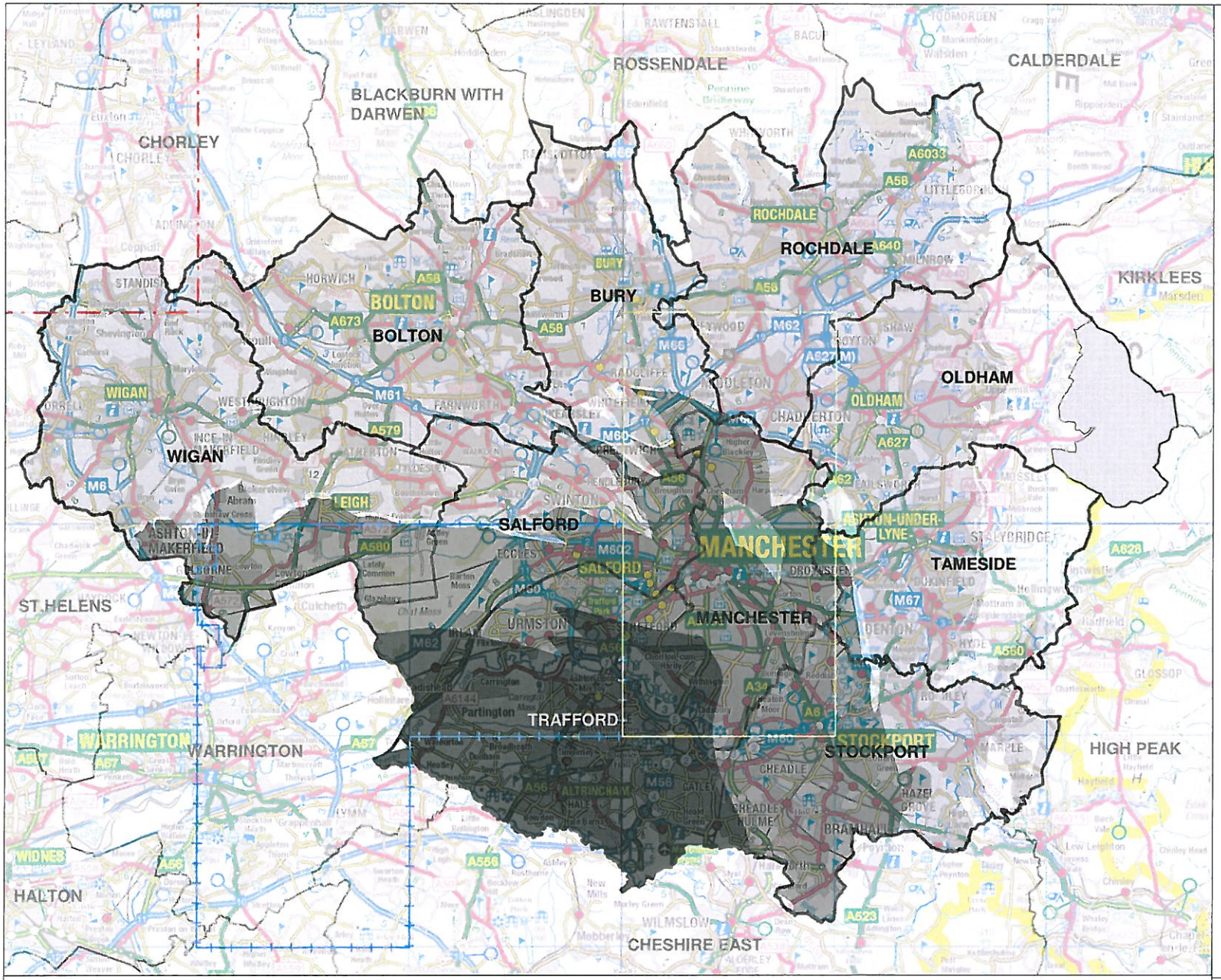
Map 2 - Areas of Search for Minerals in Greater Manchester



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Map 2a - Greater Manchester Spatial Distribution of Mineral Sites and Rail Depots with Key Locational Criteria



Greater Manchester Districts

Neighbouring District Boundaries

PEDL 165

PEDL 166

PEDL 193

Deep Coal Resource (1,200m +) - potential for Coal Bed Methane and other unconventional gas resource

Shallow Coal Resource (50 - 1,200m) - potential for Coal Bed Methane and other unconventional gas resource

Workable Surface Coal Resource

Peak District National Park - although located within Oldham it is not part of the Minerals Plan area

The extent of the coalfield with reserves at depths of 200 - 1,500m have potential for Coal Bed Mathane Extraction

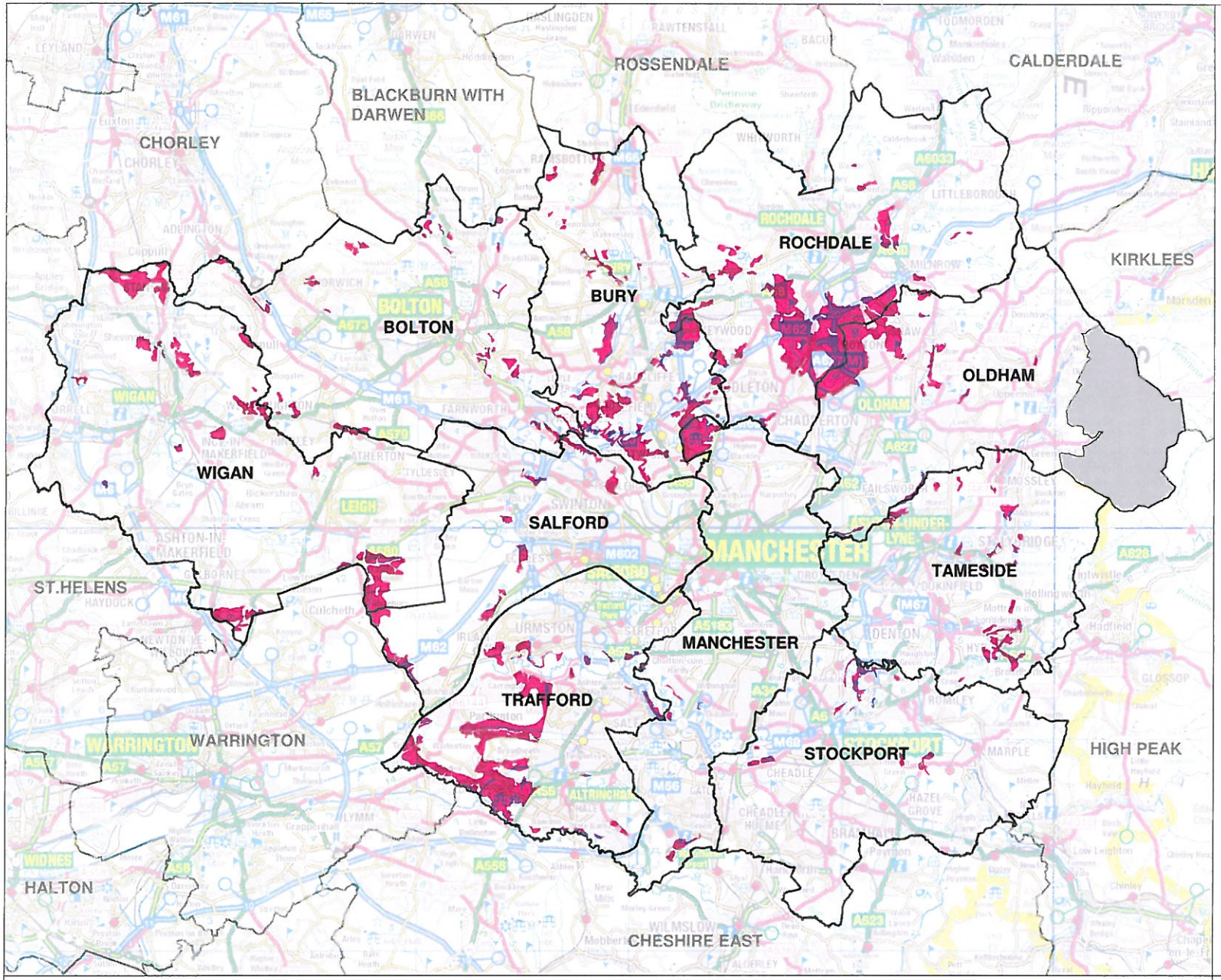
Information on PEDLs was up to date at time of Publication. For up to date PEDL information please refer to the Department of Energy and Climate Change (DECC)

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Map 3 - Coal Resource and Petroleum Exploration Development Licenses (PEDLs) in Greater Manchester



Greater Manchester Districts

Neighbouring District Boundaries

Mineral Safeguarding Area for Sand and Gravel

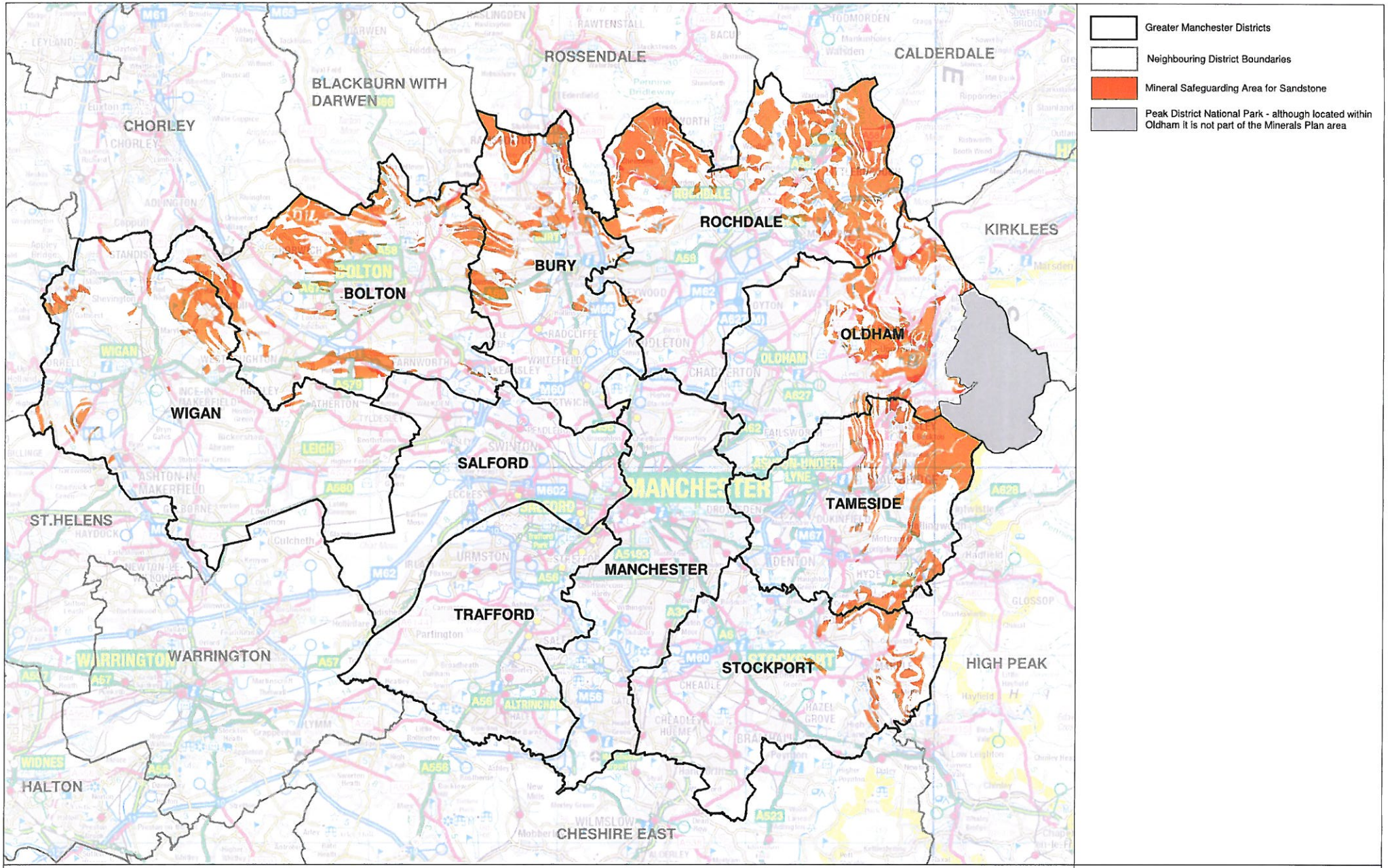
Peak District National Park - although located within Oldham it is not part of the Minerals Plan area

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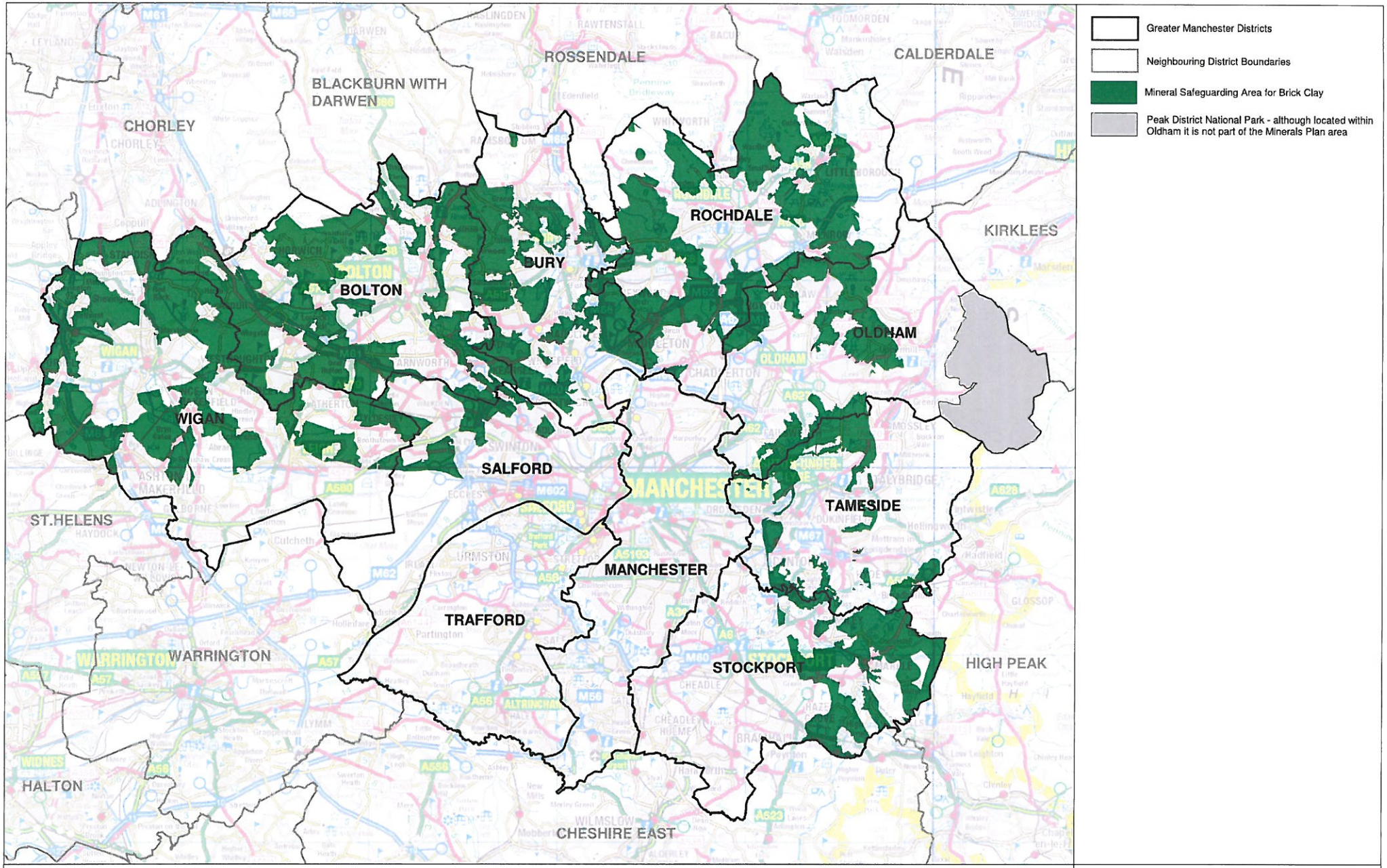
Map 4 - Mineral Safeguarding Area for Glaciofluvial Sand and Gravel



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Map 5 - Mineral Safeguarding Area for Sandstone

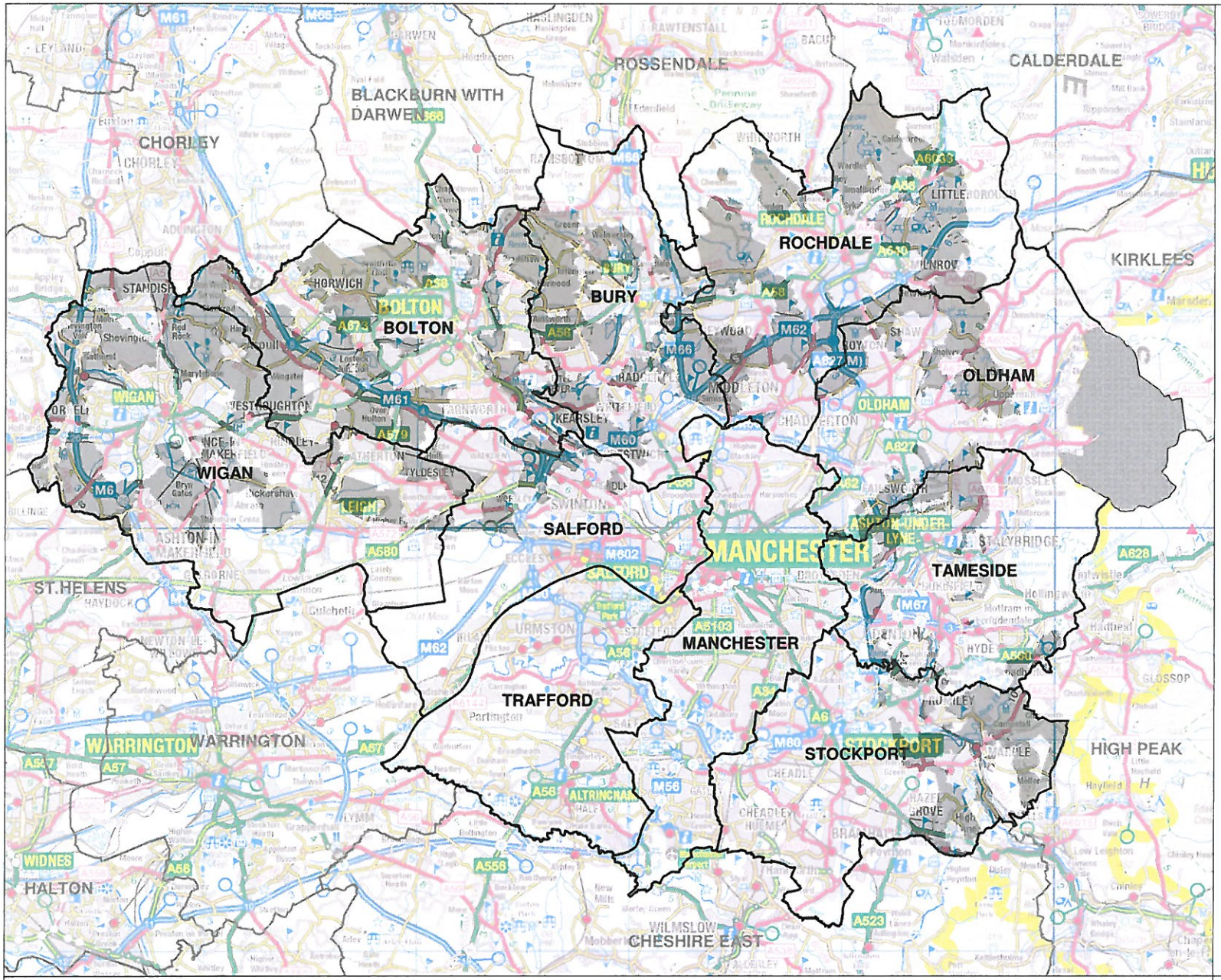


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Map 6 - Mineral Safeguarding Area for Brick Clay



Greater Manchester Districts

Neighbouring District Boundaries

Mineral Safeguarding Area for Coal

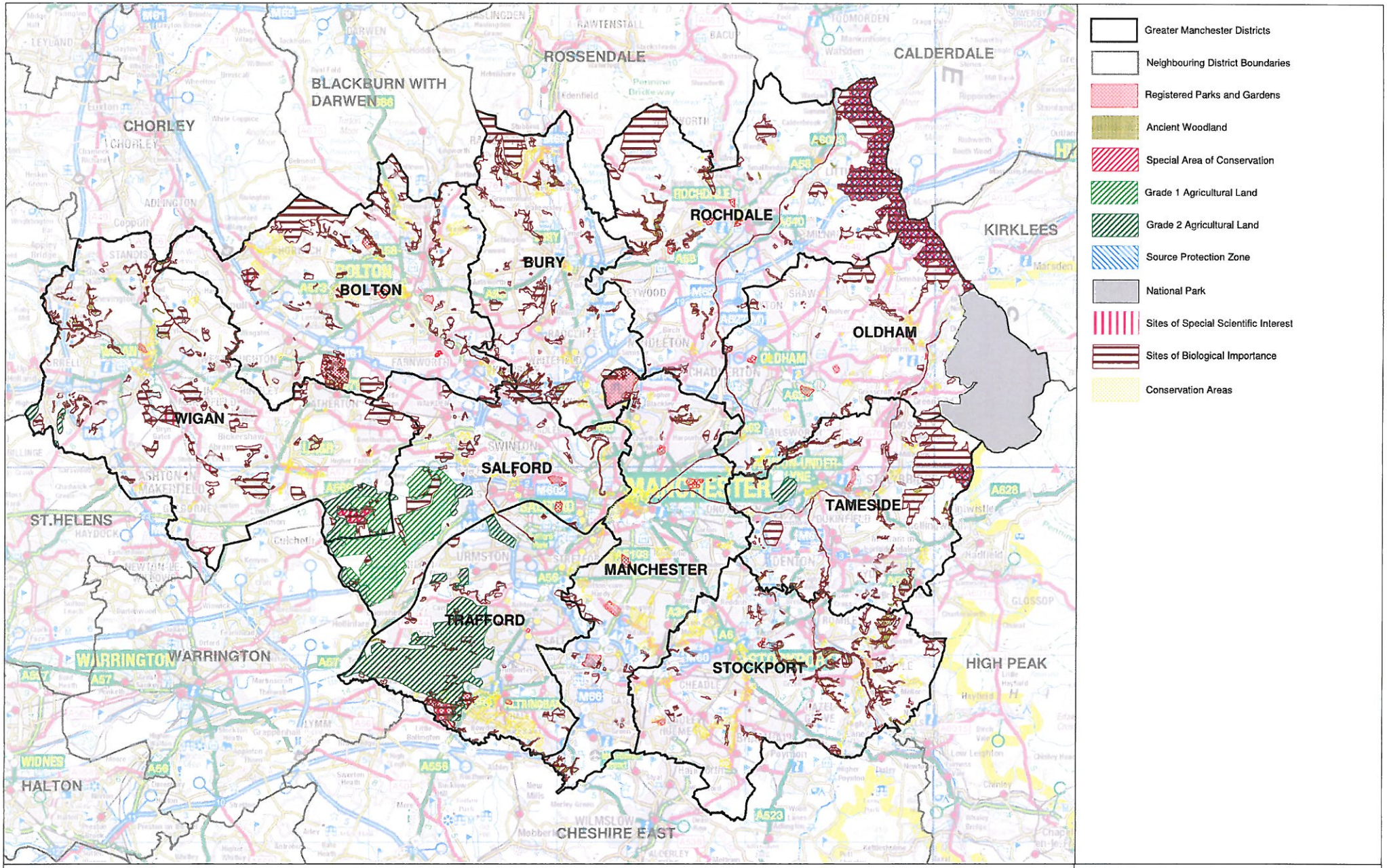
Peak District National Park - although located within Oldham it is not within the Minerals Plan area

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Map 7 - Mineral Safeguarding Area for Coal

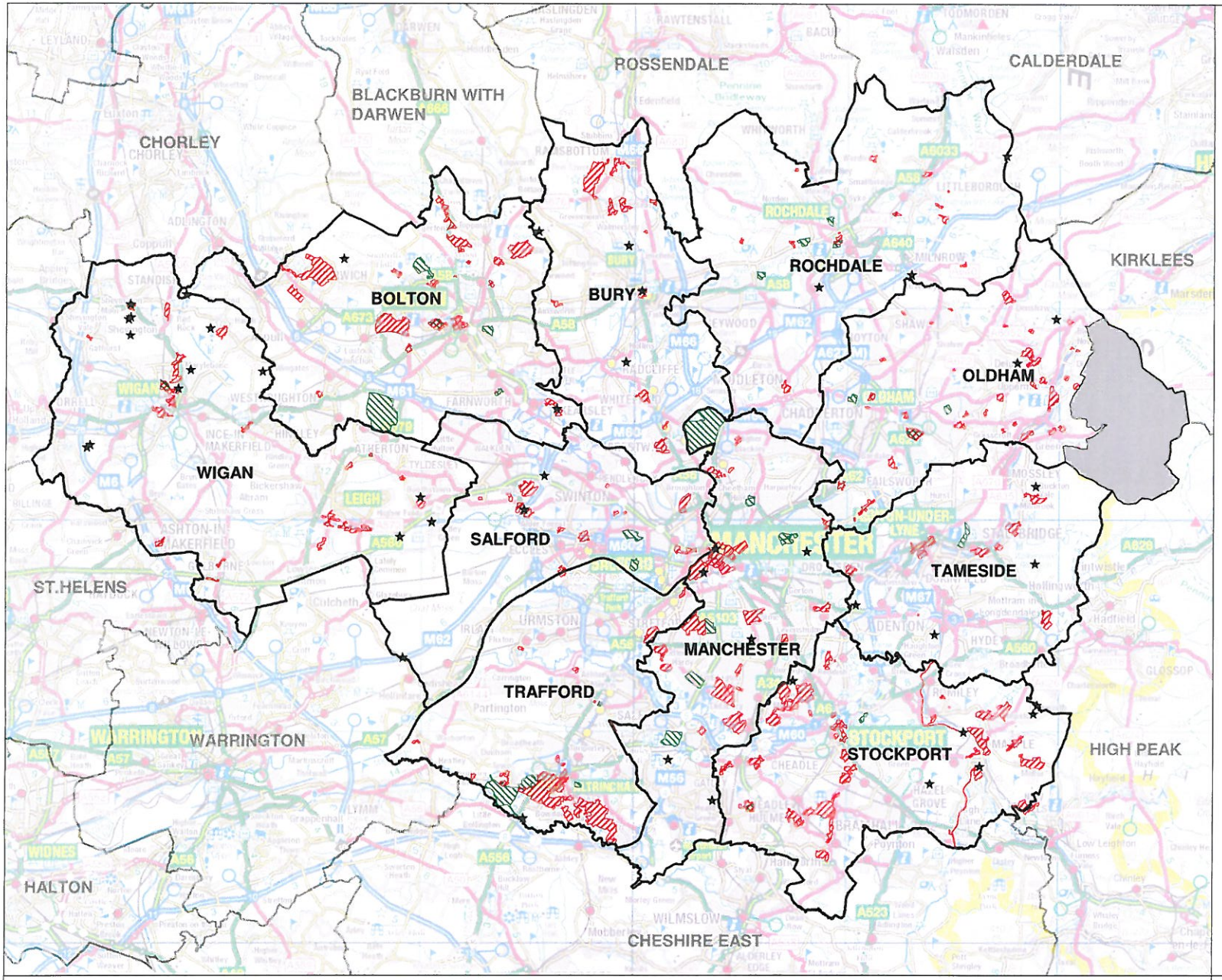


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Map 8 - Environmental Designations within Greater Manchester



Greater Manchester Districts

Neighbouring District Boundaries

Peak District National Park - although located within Oldham it is not included within the Minerals Plan area

Conservation Areas

Scheduled Ancient Monuments

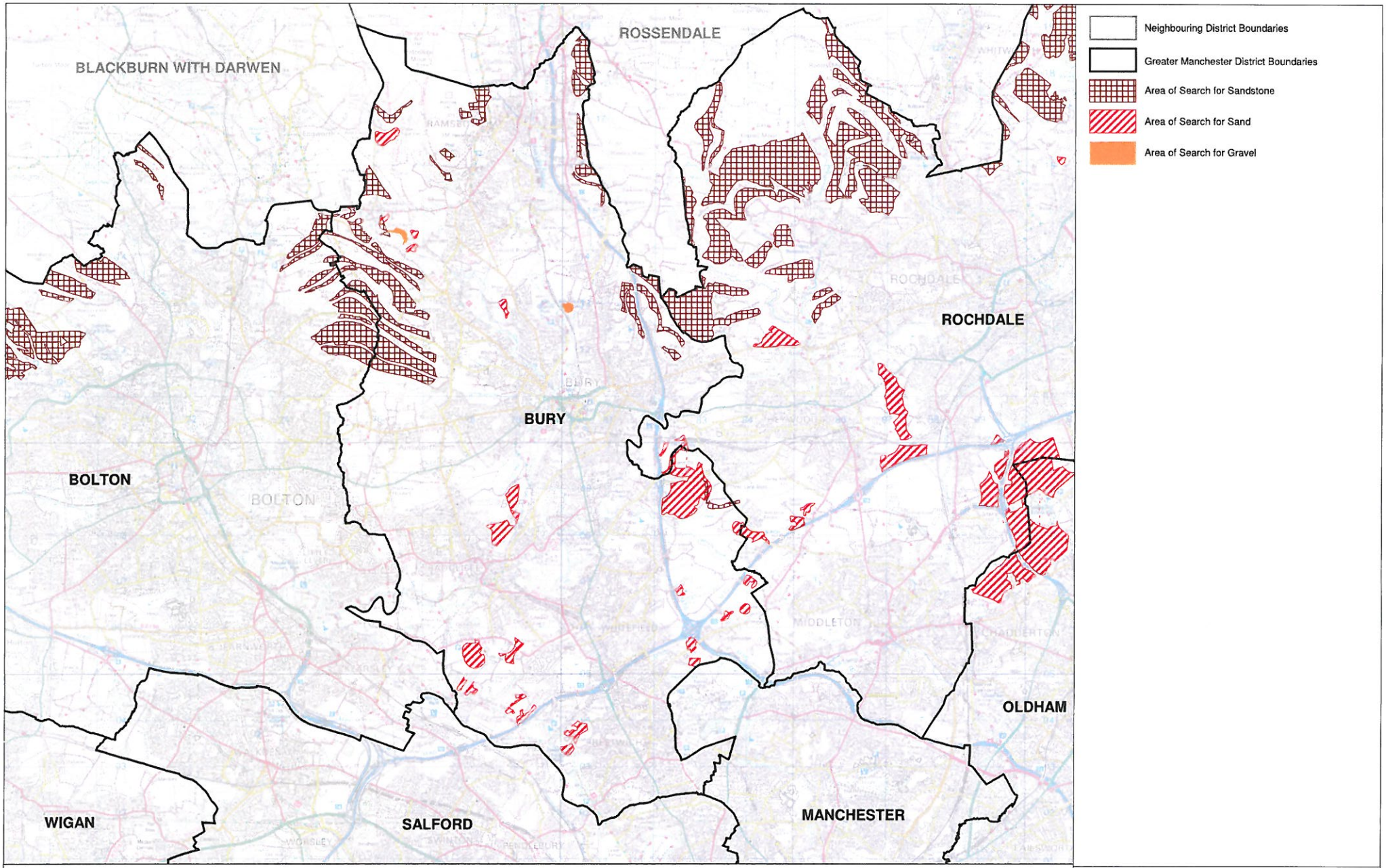
Registered Parks and Gardens

There are numerous Listed Buildings within the Greater Manchester sub-region which would be seen as a constraint to developing land. They have not been included on this map as it would make the map un-readable due to the high quantity of them.

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Map 9 - Designated Sites of Historical Importance



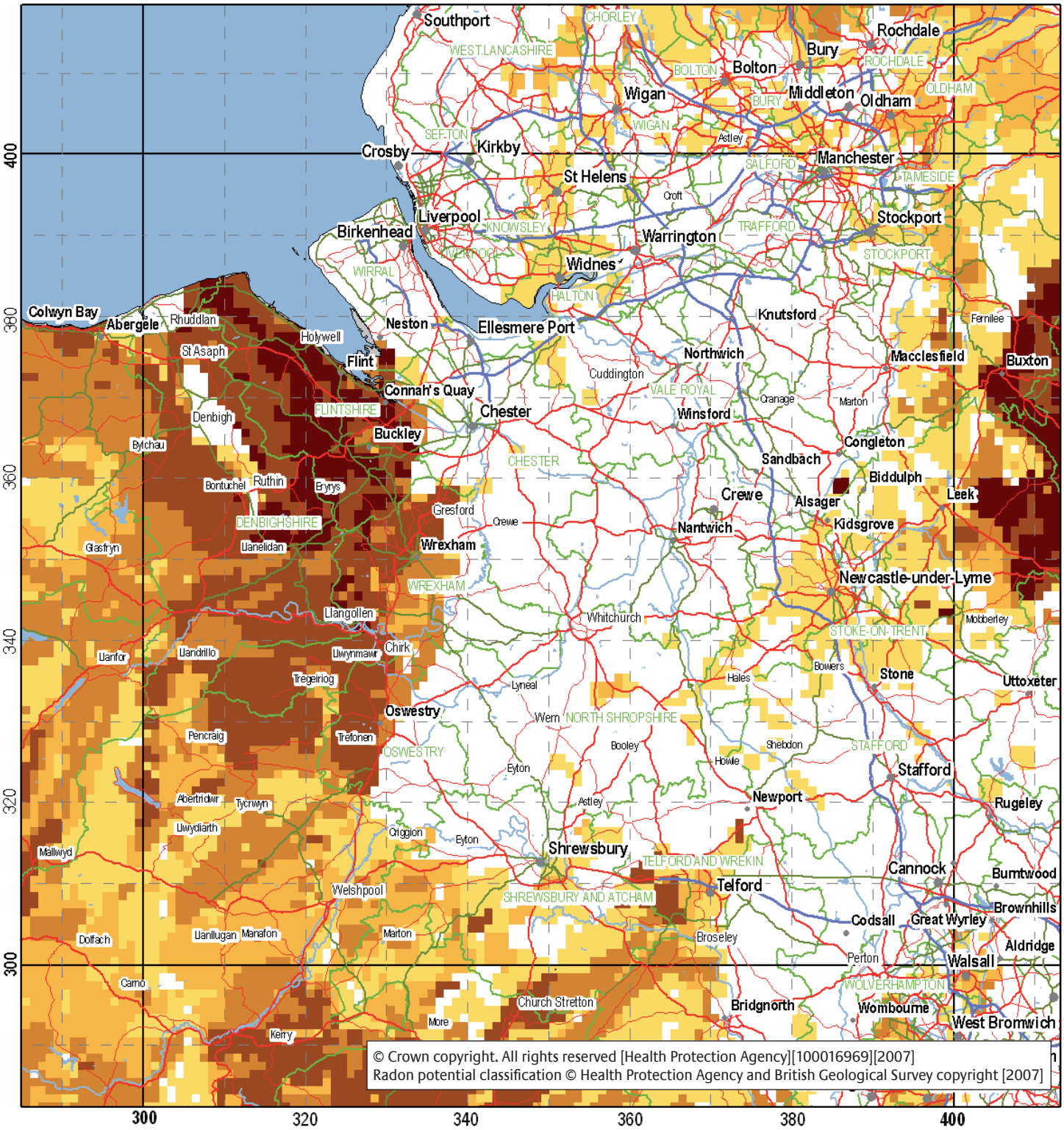
Map 11 Areas of Search for Aggregates in Bury

Scale @ A3
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APPENDIX 6

EXTRACTS OF RADON ATLAS FOR ENGLAND AND WALES



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Radon potential classification © Health Protection Agency and British Geological Survey copyright [2007]

The colours show the maximum percentage band within each 1-km grid square of the national grid (see page 4). The best estimate for an individual property in a coloured square can be obtained for a small charge from www.ukradon.org. The white squares, the 0-1% band, contain no Affected Areas as defined by the HPA.

Percentage of homes at or above the Action Level

- 0 - 1
- 1 - 3
- 3 - 5
- 5 - 10
- 10 - 30
- Greater than 30

Settlements

- Chester
- Oswestry
- Rhuddlan
- Bowers

Roads

- Motorways
- Primary Roads
- A Roads
- B Roads

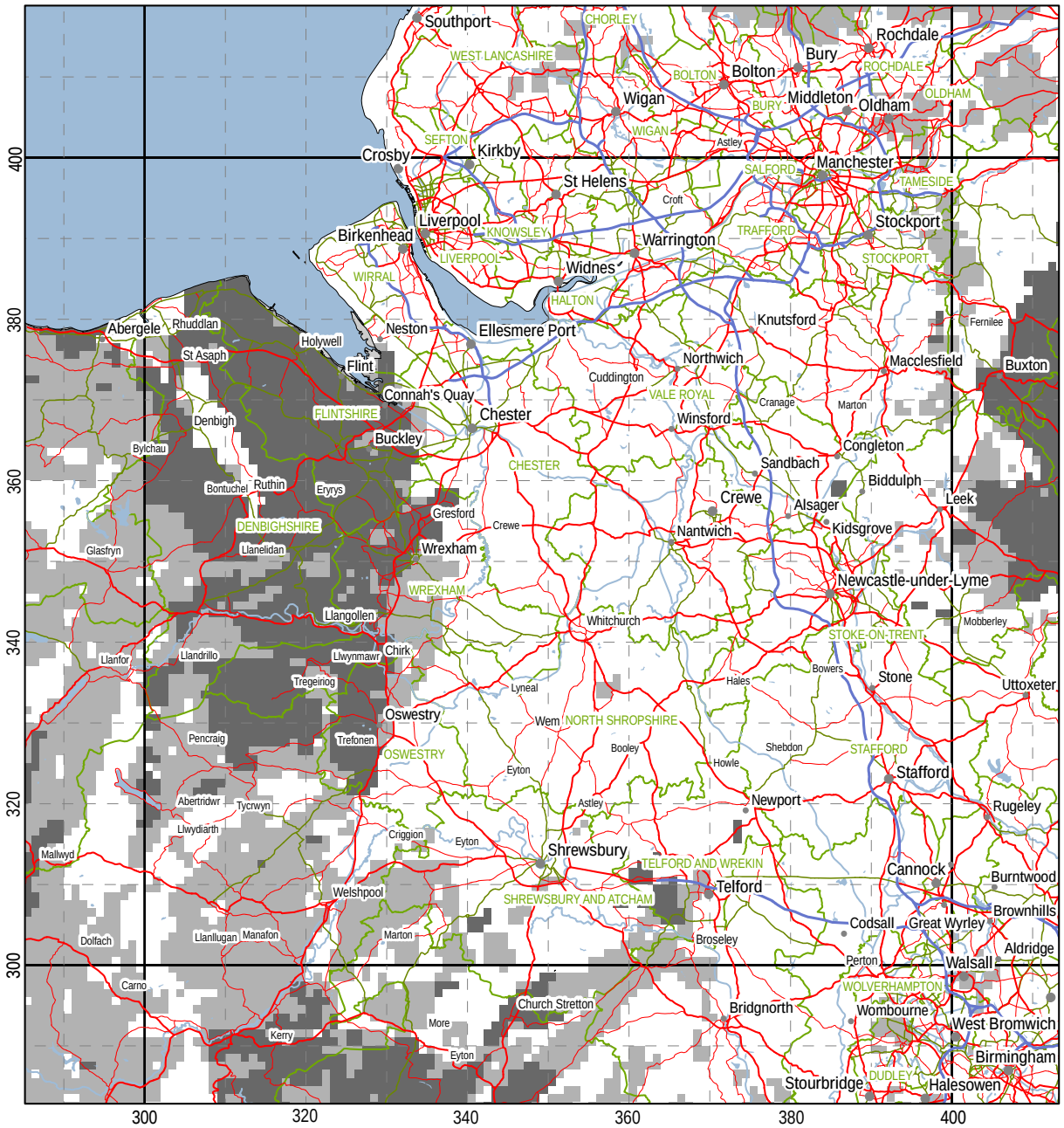
National Grid

- 100-km
- 10-km

Other Features

- LOCAL ADMINISTRATIVE DISTRICT
- Water features

MAP 13 Northern Welsh Marches and Liverpool, 100-km grid square SJ (axis numbers are the coordinates of the national grid)



The shading indicates the maximum requirements for radon protective measures in any location within each 1-km grid square to satisfy the guidance in Building Regulations Approved Document C. The requirement for an existing building with a valid postal address can be obtained for a small charge from www.ukradon.org. The requirement for a site without a postal address is available through the British Geological Survey GeoReports service, http://shop.bgs.ac.uk/GeoReports/.

Level of protection required
- None
- Basic
- Full

Settlements
- Chester
- Oswestry
- Rhuddlan
- Bowers

Roads
- Motorways
- Primary Roads
- A Roads
- B Roads

National Grid
- 100-km
- 10-km

Other Features
- LOCAL ADMINISTRATIVE DISTRICT
- Water features

Map 13 Northern Welsh Marches and Liverpool, 100-km grid square SJ (axis numbers are the coordinates of the National Grid)

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APPENDIX 7

WINDOW SAMPLE LOGS AND PHOTOGRAPHS

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Window Sample Log

ver. 1.5

Window Sample No.
HDP01
Sheet 1 of 1

Project Name: Slate Wharf	Co-ords:	383066E - 397488N	Project No. 3548
Location: Manchester	Level (m AOD):	26.33	Logged By AJ
Client: Prestbury Estates Ltd.	Date:	09/08/2021	Checked By LM
	Weather:	Sunny	

Well / Backfill	Water Strikes	Sample and In Situ Testing Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
		0.20	ES				Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets and occasional cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%), suspected slag (10%) and concrete (10%). TOPSOIL
					0.30	26.03	
		0.40	ES				Brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse of red brick (30%), sandstone (50%), concrete (10%) and slate (10%). MADE GROUND
					0.60	25.73	
					0.70	25.63	Weathered SANDSTONE, recovered as very dense, reddish brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse of extremely weak sandstone. CHESTER FORMATION

Window Sample terminated at 0.70m.

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Remarks:

Hand pit undertaken to obtain samples for chemical testing.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry					

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Window Sample Log

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Window Sample No.
WS01
Sheet 1 of 1

Project Name:	Slate Wharf	Co-ords:	383056E - 397493N
Location:	Manchester	Level (m AOD):	26.68
Client:	Prestbury Estates Ltd.	Date:	09/08/2021
		Weather:	Sunny

Project No.: 3548
Logged By: AJ
Checked By: LM

Well / Backfill	Water Strikes	Sample and In Situ Testing Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
					0.25	26.43	Dark brown, slightly gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse red brick (80%) and concrete (20%). TOPSOIL
		0.30	ES		0.45	26.23	Brown, gravelly, fine to coarse SAND with occasional cobbles and red brick fragments. Gravel is angular to subangular, fine to coarse of red brick (80%), suspected slag (10%) and slate (10%). MADE GROUND
		0.50	ES		0.85	25.83	Dark grey, gravelly, fine to coarse SAND with rare timber fragments. Gravel is angular to subrounded, fine to coarse of slate (30%), suspected slag (30%), red brick (20%) and sandstone (20%). MADE GROUND
		0.90	SPT	50 (25 for 70mm/50 for 75mm)	1.04	25.64	Weathered SANDSTONE, recovered as very dense, reddish brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse of extremely weak sandstone CHESTER FORMATION
							Window Sample terminated at 1.04m.

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Remarks:

Window sample hole terminated at 1.04m bgl on refusal in sandstone. Falling head test undertaken.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry					

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Window Sample No.
WS02
Sheet 1 of 1

Project Name:	Slate Wharf	Co-ords:	383060E - 397498N
Location:	Manchester	Level (m AOD):	26.56
Client:	Prestbury Estates Ltd.	Date:	09/08/2021
		Weather:	Sunny

Project No.: 3548
Logged By: AJ
Checked By: LM

Well / Backfill	Water Strikes	Sample and In Situ Testing Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
					0.25	26.31	Dark brown, slightly gravelly, slightly clayey SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (80%) and concrete (20%). TOPSOIL
					0.50	26.06	Reddish brown, gravelly, fine to coarse SAND with occasional cobbles and half red bricks. Gravel is angular to subangular, fine to coarse of red brick (80%) and concrete (20%). MADE GROUND
		0.60	ES				Dark brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse of red brick (30%), sandstone (30%), concrete (30%) and slate (10%). MADE GROUND
		0.70	SPT	50 (25 for 70mm/50 for 40mm)	0.70	25.86	Weathered SANDSTONE, recovered as very dense, reddish brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse of extremely weak sandstone CHESTER FORMATION
					0.81	25.75	Window Sample terminated at 0.81m.

Remarks:
Window sample hole terminated at 0.81m bgl on refusal on sandstone.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry					

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Window Sample Log

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Window Sample No.
WS03
Sheet 1 of 1

Project Name:	Slate Wharf	Co-ords:	383045E - 397503N
Location:	Manchester	Level (m AOD):	27.15
Client:	Prestbury Estates Ltd.	Date:	09/08/2021
		Weather:	Sunny

Project No.: 3548
Logged By: AJ
Checked By: LM

Well / Backfill	Water Strikes	Sample and In Situ Testing: Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
		0.00 - 0.30	B				Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
					0.20	26.95	Dark brown, gravelly, fine to coarse SAND with occasional cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%), suspected slag (10%) and concrete (10%). TOPSOIL
					0.50	26.65	*Suspected concrete slab encountered at 0.50m bgl.*
							Window Sample terminated at 0.50m.

Remarks:
Window sample hole terminated at 0.50m bgl on suspected concrete slab.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry					

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Window Sample Log

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Window Sample No.
WS03A
Sheet 1 of 1

Project Name:	Slate Wharf	Co-ords:	383047E - 397502N
Location:	Manchester	Level (m AOD):	27.15
Client:	Prestbury Estates Ltd.	Date:	09/08/2021
		Weather:	Sunny

Project No.: 3548
Logged By: AJ
Checked By: LM

Well / Backfill	Water Strikes	Sample and In Situ Testing: Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
					0.10	27.05	Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
							Dark brown, gravelly, fine to coarse SAND with occasional cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%), suspected slag (10%) and concrete (10%). MADE GROUND
					0.50	26.65	*Suspected concrete slab encountered at 0.50m bgl.*
							Window Sample terminated at 0.50m.

Remarks:
Window sample hole terminated at 0.50m bgl on suspected concrete slab.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry	0.50	200			

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Window Sample Log

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Window Sample No.
WS03B
Sheet 1 of 1

Project Name:	Slate Wharf	Co-ords:	383044E - 397505N
Location:	Manchester	Level (m AOD):	27.15
Client:	Prestbury Estates Ltd.	Date:	10/08/2021
		Weather:	Sunny

Project No.: 3548
Logged By: AJ
Checked By: LM

Well / Backfill	Water Strikes	Sample and In Situ Testing Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
					0.10	27.05	Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
							Dark brown, gravelly, fine to coarse SAND with occasional cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%), suspected slag (10%) and concrete (10%). MADE GROUND
					0.50	26.65	CONCRETE.
		0.60 - 0.70	ES		0.60	26.55	MADE GROUND
		0.70 - 1.00	B		0.75	26.40	Brown, gravelly, fine to coarse SAND with occasional red brick fragments. Gravel is angular to subanguar, fine to coarse of red brick (70%) and concrete (30%). MADE GROUND
		0.70 - 1.00	ES				Dense, dark grey, gravelly, fine to coarse, ashy SAND. Gravel is angular to subangular, fine to coarse of suspected slag (40%), red brick (20%), slate (20%) and concrete (20%). MADE GROUND
		1.00	SPT	50 (6,7/50 for 150mm)	1.10	26.05	Very dense, reddish brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse of extremely weak sandstone. WEATHERED SANDSTONE
					1.30	25.85	Window Sample terminated at 1.30m.

Remarks:
Window sample hole terminated at 1.30m bgl on refusal on sandstone.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry					

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Window Sample Log

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Window Sample No.
WS04
Sheet 1 of 1

Project Name:	Slate Wharf	Co-ords:	383040E - 397491N
Location:	Manchester	Level (m AOD):	26.91
Client:	Prestbury Estates Ltd.	Date:	09/08/2021
		Weather:	Sunny

Project No.: 3548
Logged By: AJ
Checked By: LM

Well / Backfill	Water Strikes	Sample and In Situ Testing: Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
					0.10	26.81	Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
							Dark brown, gravelly, fine to coarse SAND with occasional cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%), suspected slag (10%) and concrete (10%). MADE GROUND
					0.50	26.41	*Suspected concrete slab at 0.50m bgl.*
							Window Sample terminated at 0.50m.

Remarks:
Window sample hole terminated at 0.50m bgl due to suspected concrete slab.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry					

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Window Sample No.
WS04A
Sheet 1 of 1

Project Name:	Slate Wharf	Co-ords:	383039E - 397490N
Location:	Manchester	Level (m AOD):	26.90
Client:	Prestbury Estates Ltd.	Date:	09/08/2021
		Weather:	Sunny

Project No.: 3548
Logged By: AJ
Checked By: LM

Well / Backfill	Water Strikes	Sample and In Situ Testing: Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
					0.10	26.80	Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
							Dark brown, gravelly, fine to coarse SAND with occasional cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%), suspected slag (10%) and concrete (10%). MADE GROUND
					0.50	26.40	*Suspected concrete slab at 0.50m bgl.*
							Window Sample terminated at 0.50m.

Remarks:
Window sample hole terminated at 0.50m bgl on concrete slab.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry					

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Window Sample Log

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Window Sample No.
WS04B
Sheet 1 of 1

Project Name:	Slate Wharf	Co-ords:	383041E - 397490N
Location:	Manchester	Level (m AOD):	26.90
Client:	Prestbury Estates Ltd.	Date:	10/08/2021
		Weather:	Sunny

Project No.: 3548
Logged By: AJ
Checked By: LM

Well / Backfill	Water Strikes	Sample and In Situ Testing Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
					0.10	26.80	Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
							Dark brown, gravelly, fine to coarse SAND with occasional cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%), suspected slag (10%) and concrete (10%). MADE GROUND
					0.50	26.40	CONCRETE.
		0.60 - 0.80	B		0.60	26.30	MADE GROUND
							Dark brown, gravelly, fine to coarse SAND with occasional red brick fragments. Gravel is angular to subangular, fine to coarse of red brick (30%), concrete (30%), slate (20%) and suspected slag (20%). MADE GROUND
		0.80	SPT	50 (10,16/50 for 125mm)			
					1.10	25.80	Very dense, reddish brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse of extremely weak sandstone. WEATHERED SANDSTONE
					1.27	25.63	Window Sample terminated at 1.27m.

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Remarks:
Window sample hole terminated at 1.07m bgl on refusal in sandstone.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry					

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Window Sample Log

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Window Sample No.
WS05
Sheet 1 of 1

Project Name:	Slate Wharf	Co-ords:	383050E - 397515N
Location:	Manchester	Level (m AOD):	27.03
Client:	Prestbury Estates Ltd.	Date:	09/08/2021
		Weather:	Sunny

Project No.: 3548
Logged By: AJ
Checked By: LM

Well / Backfill	Water Strikes	Sample and In Situ Testing Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
		0.00 - 0.70	B		0.10	26.93	Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
		0.60	ES				Dark brown, gravelly, fine to coarse SAND with occasional whole and half bricks and cobbles. Cobbles are subangular of concrete (100%). Gravel is angular to subrounded, fine to coarse of red brick (40%), concrete (40%), slate (10%) and suspected slag (10%). MADE GROUND
					0.70	26.33	*Suspected concrete slab at 0.70m bgl.*
							Window Sample terminated at 0.70m.

Remarks:
Window sample hole terminated at 0.70m bgl on suspected concrete slab.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry					

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Window Sample Log

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Window Sample No.
WS06
Sheet 1 of 1

Project Name:	Slate Wharf	Co-ords:	383034E - 397513N
Location:	Manchester	Level (m AOD):	27.40
Client:	Prestbury Estates Ltd.	Date:	10/08/2021
		Weather:	Sunny

Project No.: 3548
Logged By: AJ
Checked By: LM

Well / Backfill	Water Strikes	Sample and In Situ Testing Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
					0.10	27.30	Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
		0.50	ES				Dark brown, very gravelly, fine to coarse SAND with frequent cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%), MADE GROUND
							Concrete obstruction at 0.50m bgl, extended pit north to avoid.
							Concrete obstruction at 0.70m bgl, extended pit west to avoid.
					1.10	26.30	*Suspected concrete slab at 1.10m bgl.*
							Window Sample terminated at 1.10m.

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Remarks:
Window sample hole terminated at 1.10m bgl on suspected concrete slab.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry	1.10	200			

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Window Sample Log

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Window Sample No.
WS06A
Sheet 1 of 1

Project Name: Slate Wharf	Co-ords:	383032E - 397512N	Project No. 3548
Location: Manchester	Level (m AOD):	27.43	Logged By AJ
Client: Prestbury Estates Ltd.	Date:	10/08/2021	Checked By LM
	Weather:	Sunny	

Well / Backfill	Water Strikes	Sample and In Situ Testing: Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
					0.10	27.33	Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
							Dark brown, very gravelly, fine to coarse SAND with frequent cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%), MADE GROUND
					0.65	26.78	*Concrete obstruction at 0.65m bgl.*
							Window Sample terminated at 0.65m.

Remarks:

Window sample hole terminated at 0.65m bgl on concrete obstruction.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry					

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Window Sample Log

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Window Sample No.
WS06B
Sheet 1 of 1

Project Name:	Slate Wharf	Co-ords:	383033E - 397511N
Location:	Manchester	Level (m AOD):	27.43
Client:	Prestbury Estates Ltd.	Date:	10/08/2021
		Weather:	Sunny

Project No.: 3548
Logged By: AJ
Checked By: LM

Well / Backfill	Water Strikes	Sample and In Situ Testing: Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
					0.10	27.33	Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
							Dark brown, very gravelly, fine to coarse SAND with frequent cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%), MADE GROUND
					0.65	26.78	*Concrete obstruction at 0.65m bgl.*
							Window Sample terminated at 0.65m.

Remarks:
Window sample hole terminated at 0.65m bgl on concrete obstruction.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry					

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Window Sample No.
WS07
Sheet 1 of 1

Project Name:	Slate Wharf	Co-ords:	383038E - 397523N
Location:	Manchester	Level (m AOD):	27.45
Client:	Prestbury Estates Ltd.	Date:	10/08/2021
		Weather:	Sunny

Project No.: 3548
Logged By: AJ
Checked By: LM

Well / Backfill	Water Strikes	Sample and In Situ Testing Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
					0.20	27.25	Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
		0.40 0.40	B ES				Dark brown, very gravelly, fine to coarse SAND with frequent cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), concrete (30%), slate (20%) and suspected slag (10%). MADE GROUND
		1.00	SPT	50 (25 for 0mm/50 for 0mm)	1.00	26.45	*SPT attempted at 1.00m bgl however barrel bouncing, concrete fragments within SPT liner.*
							Window Sample terminated at 1.00m.

Remarks:

Window sample hole terminated at 1.00m bgl on refusal on suspected concrete slab.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry					

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Window Sample Log

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Window Sample No.
WS08
Sheet 1 of 1

Project Name:	Slate Wharf	Co-ords:	383047E - 397522N
Location:	Manchester	Level (m AOD):	27.35
Client:	Prestbury Estates Ltd.	Date:	10/08/2021
		Weather:	Sunny

Project No.: 3548
Logged By: AJ
Checked By: LM

Well / Backfill	Water Strikes	Sample and In Situ Testing Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
		0.00 - 0.50	B		0.10	27.25	Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
							Dark brown, very gravelly, fine to coarse SAND with frequent cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%), MADE GROUND
		1.00	SPT	50 (25 for 0mm/50 for 75mm)	1.00	26.35	*Suspected concrete slab at 1.00m bgl.*
							Window Sample terminated at 1.00m.

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Remarks:

Window sample hole terminated at 1.00m bgl on refusal on suspected concrete slab.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry					

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Window Sample Log

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Window Sample No.
WS08A
Sheet 1 of 1

Project Name:	Slate Wharf	Co-ords:	383046E - 397524N
Location:	Manchester	Level (m AOD):	27.33
Client:	Prestbury Estates Ltd.	Date:	10/08/2021
		Weather:	Sunny

Project No.: 3548
Logged By: AJ
Checked By: LM

Well / Backfill	Water Strikes	Sample and In Situ Testing: Depth(m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
					0.10	27.23	Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
							Dark brown, very gravelly, fine to coarse SAND with frequent cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%), MADE GROUND
					1.00	26.33	*Suspected concrete slab at 1.00m bgl.*
							Window Sample terminated at 1.00m.

Remarks:
Window sample hole terminated at 1.00m bgl on suspected concrete slab.

Water Strike		Casing Details		Sample Sleeve Runs		
Depth Strike	Remarks	Depth Base	Diameter	Depth Top (m)	Depth Base (m)	Diameter (mm)
	Dry					

APPENDIX 8

TRIAL PIT LOGS AND PHOTOGRAPHS

Office 11, Bartle House, Oxford Court
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tel: 0161 914 9170

Trial Pit Log

ver. 1.1

Trial Pit No. TP01

Sheet 1 of 1

Project Name:	Slate Wharf	**Level (mAOD):**	27.25	**Date:**	12/10/2021
Location:	Manchester	**Weather:**	Overcast		
Client:	Prestbury Estates Ltd.	**Co-ords:**	383042E - 397504N		

Project No. 3548

Logged By AJ

Checked By JH

Water Strike	Samples & In Situ Testing			Depth (mbgl)	Level (mAOD)	Stratum Description
	Depth (m)	Type	Results			
				0.10	27.15	Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
				0.50	26.75	Dark brown, gravelly, fine to coarse SAND with occasional cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%), suspected slag (10%) and concrete (10%). MADE GROUND
				0.65	26.60	CONCRETE. MADE GROUND
	0.80	B	5kg			Dark grey, gravelly, fine to coarse, ashy SAND. Gravel is angular to subangular, fine to coarse of suspected slag (40%), red brick (20%), slate (20%) and concrete (20%). MADE GROUND
				1.30	25.95	Reddish brown, slightly gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse of sandstone. CHESTER FORMATION
	1.40	B	5kg	1.40	25.85	
				1.50	25.75	Very weak to weak, reddish brown, fine to medium grained SANDSTONE recovered as gravel to cobble sized fragments. CHESTER FORMATION
						Trial Pit terminated at 1.50m.

1 2 3 4 5

Water Strike

Depth Strike (mbgl)	Remarks
	Dry

Stability:
Occasional collapses

Remarks:
Trial pit terminated at 1.50m bgl due to hard digging on sandstone.

Trial Pit Photos

TP01

Slate Wharf



Image 1.



Image 2.

Office 11, Bartle House, Oxford Court
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web: www.igeconsulting.co.uk
tel: 0161 914 9170

Trial Pit Log

ver. 1.1

Trial Pit No. TP02

Sheet 1 of 1

Project Name: Slate Wharf	**Level (mAOD):** 26.20	**Date:** 12/10/2021	**Project No.** 3548
Location: Manchester	**Weather:** Overcast		**Logged By** AJ
Client: Prestbury Estates Ltd.	**Co-ords:** 38070E - 397489N		**Checked By** JH

Water Strike	Samples & In Situ Testing			Depth (mbgl)	Level (mAOD)	Stratum Description
	Depth (m)	Type	Results			
				0.10	26.10	Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
	0.50	B	5kg	0.50	25.70	Dark brown, gravelly, fine to coarse SAND with occasional cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%), suspected slag (10%) and concrete (10%). MADE GROUND
				0.75	25.45	CONCRETE. MADE GROUND
	1.00	B	5kg	0.95	25.25	Dark grey, gravelly, fine to coarse SAND. Gravel is angular to subrounded, fine to coarse of red brick (30%), sandstone (20%), concrete (20%), suspected slag (10%) and mixed natural lithologies (20%). MADE GROUND
				1.10	25.10	SANDSTONE SLAB. MADE GROUND
				1.70	24.50	Firm, reddish brown, slightly gravelly, slightly sandy CLAY with rare cobbles. Cobbles are angular to subrounded of sandstone. Gravel is anglar to subrounded, fine to coarse of mixed natural lithologies. SUSPECTED REWORKED NATURAL DEPOSITS
				1.80	24.40	Firm, grey, mottled brownish grey, slightly gravelly, slightly sandy, silty CLAY. Gravel is angular to well rounded, fine to coarse of mixed natural lithologies. SUSPECTED REWORKED NATURAL DEPOSITS
				2.00	24.20	Very weak to weak, reddish brown, fine to medium grained SANDSTONE recovered as gravel to cobble sized fragments in a matrix of reddish brown, fine to coarse sand. CHESTER FORMATION
						Trial Pit terminated at 2.00m.

1 2 3 4 5

Water Strike

Depth Strike (mbgl)	Remarks
	Dry

Stability:
Stable

Remarks:
Trial pit terminated at 2.00m bgl at target depth. Sandstone and reworked cohesive deposits were noted to bank upwards towards the north west, as shown in photographs.

Trial Pit Photos

TP02

Slate Wharf



Image 1.



Image 2.

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tel: 0161 914 9170

Trial Pit Log

ver. 1.1

Trial Pit No. TP03

Project Name:	Slate Wharf	**Level (mAOD):**	27.50	**Date:**	12/10/2021
Location:	Manchester	**Weather:**	Overcast		
Client:	Prestbury Estates Ltd.	**Co-ords:**	383033E - 397516N		

Project No. 3548

Logged By AJ

Checked By JH

Water Strike	Samples & In Situ Testing			Depth (mbgl)	Level (mAOD)	Stratum Description
	Depth (m)	Type	Results			
				0.10	27.40	Dark brown, gravelly, slightly clayey, fine to coarse SAND with frequent rootlets. Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%) and concrete (20%). TOPSOIL
						Dark brown, gravelly, fine to coarse SAND with occasional cobbles and red brick fragments. Cobbles are subangular of concrete (100%). Gravel is angular to subangular, fine to coarse of red brick (40%), sandstone (40%), suspected slag (10%) and concrete (10%). MADE GROUND
				0.70	26.80	COBBLES and BOULDERS in a matrix of dark greyish brown, gravelly, fine to coarse SAND. Cobbles and boulders are angular to subangular of concrete (70%) and sandstone (30%). Gravel is angular to subrounded, fine to coarse of concrete (40%), red brick (30%), plastic (20%) and suspected slag (10%). MADE GROUND
				1.00	26.50	*Concrete slab at 1.00m bgl.*
						Trial Pit terminated at 1.00m.

Water Strike

Depth Strike (mbgl)	Remarks
	Dry

Stability:
Stable

Remarks:
Trial pit terminated at 1.00m bgl on concrete slab, unable to break through.

Trial Pit Photos

TP03

Slate Wharf



Image 1.



Image 2.

APPENDIX 9

FALLING HEAD TEST RESULTS

Window Sample Hole Falling Head Test

WS01 Run 1

FIELD MEASUREMENTS

Time (min)	Water Depth (m below top of casing)	Head (from water level) (m)
0.00	0.290	0.660
0.10	0.330	0.620
0.30	0.360	0.590
1.00	0.410	0.540
2.00	0.440	0.510
4.00	0.470	0.480
5.00	0.490	0.460
10.00	0.560	0.390
15.00	0.600	0.350
20.00	0.640	0.310
37.00	0.720	0.230
52.00	0.760	0.190
111.00	0.800	0.150
120.00	0.810	0.140

INPUT PARAMETERS

Borehole Depth	0.950	m
Casing Depth	0.000	m
Difference in Length between bottom of casing/boreholes, L	0.950	m
Water Depth	0.660	m
Casing Diameter,D	0.150	m
Cross Sectional area of casing, A	0.018	m^2
Height of casing above ground level	0.000	m
Approximate long term water table (or base of BH see rules)	0.950	m
Borehole End Condition (important to get right)	d	
a= Soil flush with bottom at impervious boundary	0.300	
b= Soil flush with bottom in uniform soil	0.413	
c= Well point or hole extended at impervious boundary	2.078	
d= Well point or hole extended in uniform soil	0.800	
e= Soil in casing with bottom at impervious boundary	0.018	
f= Soil in casing with bottom in uniform soil	0.018	
Intake factor, F (Select correct end condition)	0.800	
Variable Head, H^1	0.660	m
Time, T^1	0.000	min
Variable Head, H^2	0.140	m
Time, T^2	120.000	min

K unsat (m/s)

2.86E-04

RULES

1. A borehole location MUST be entered to generate *k*.
2. Enter all values in shaded cells: *A, F, L* and k are calculated automatically in the spreadsheet.
3. Head is measured to the base of the BH, or use WL if higher.
4. End conditions referenced in *BS 5930* see notes. Usually d. *Formula for uncased hole.*
5. If groundwater level is below test, k is not true permeability, but indicative only.
6. Usually $T^1=0$ and $T^2=60$ or at $H^1=25\%$ and $H^2=75\%$ of effective depth, input H at these times.
7. Where 75% of effective depth cannot be calculated, an extrapolated value where $T^1=60$ and $T^2=240$ can be produced.

Window Sample Hole Falling Head Test

WS01 Run 2

FIELD MEASUREMENTS

Time (min)	Water Depth (m below top of casing)	Head (from water level) (m)
0.00	0.210	0.740
1.00	0.270	0.680
2.00	0.310	0.640
3.00	0.340	0.610
5.00	0.380	0.570
10.00	0.460	0.490
36.00	0.640	0.310
53.00	0.700	0.250
77.00	0.720	0.230
85.00	0.750	0.200
120.00	0.760	0.190

INPUT PARAMETERS

Borehole Depth	0.950	m
Casing Depth	0.000	m
Difference in Length between bottom of casing/boreholes, L	0.950	m
Water Depth	0.660	m
Casing Diameter,D	0.150	m
Cross Sectional area of casing, A	0.018	m^2
Height of casing above ground level	0.000	m
Approximate long term water table (or base of BH see rules)	0.950	m
Borehole End Condition (important to get right)	d	
a= Soil flush with bottom at impervious boundary	0.300	
b= Soil flush with bottom in uniform soil	0.413	
c= Well point or hole extended at impervious boundary	2.078	
d= Well point or hole extended in uniform soil	0.800	
e= Soil in casing with bottom at impervious boundary	0.018	
f= Soil in casing with bottom in uniform soil	0.018	
Intake factor, F (Select correct end condition)	0.800	
Variable Head, H^1	0.740	m
Time, T^1	0.000	min
Variable Head, H^2	0.190	m
Time, T^2	120.000	min

K unsat (m/s)

2.50E-04

RULES

1. A borehole location MUST be entered to generate *k*.
2. Enter all values in shaded cells: *A, F, L* and k are calculated automatically in the spreadsheet.
3. Head is measured to the base of the BH, or use WL if higher.
4. End conditions referenced in *BS 5930* see notes. Usually d. *Formula for uncased hole.*
5. If groundwater level is below test, k is not true permeability, but indicative only.
6. Usually $T^1=0$ and $T^2=60$ or at $H^1=25\%$ and $H^2=75\%$ of effective depth, input H at these times.
7. Where 75% of effective depth cannot be calculated, an extrapolated value where $T^1=60$ and $T^2=240$ can be produced.

Window Sample Hole Falling Head Test

WS01 Run 3

FIELD MEASUREMENTS

Time (min)	Water Depth (m below top of casing)	Head (from water level) (m)
0.00	0.610	0.340
78.00	0.740	0.210
120.00	0.790	0.160

INPUT PARAMETERS

Borehole Depth	0.950	m
Casing Depth	0.000	m
Difference in Length between bottom of casing/boreholes, L	0.950	m
Water Depth	0.660	m
Casing Diameter,D	0.150	m
Cross Sectional area of casing, A	0.018	m^2
Height of casing above ground level	0.000	m
Approximate long term water table (or base of BH see rules)	0.950	m
Borehole End Condition (important to get right)	d	
a= Soil flush with bottom at impervious boundary	0.300	
b= Soil flush with bottom in uniform soil	0.413	
c= Well point or hole extended at impervious boundary	2.078	
d= Well point or hole extended in uniform soil	0.800	
e= Soil in casing with bottom at impervious boundary	0.018	
f= Soil in casing with bottom in uniform soil	0.018	
Intake factor, F (Select correct end condition)	0.800	
Variable Head, H^1	0.340	m
Time, T^1	0.000	min
Variable Head, H^2	0.160	m
Time, T^2	120.000	min

K unsat (m/s)

1.39E-04

RULES

1. A borehole location MUST be entered to generate *k*.
2. Enter all values in shaded cells: *A, F, L* and k are calculated automatically in the spreadsheet.
3. Head is measured to the base of the BH, or use WL if higher.
4. End conditions referenced in *BS 5930* see notes. Usually d. *Formula for uncased hole.*
5. If groundwater level is below test, k is not true permeability, but indicative only.
6. Usually $T^1=0$ and $T^2=60$ or at $H^1=25\%$ and $H^2=75\%$ of effective depth, input H at these times.
7. Where 75% of effective depth cannot be calculated, an extrapolated value where $T^1=60$ and $T^2=240$ can be produced.

APPENDIX 10

CHEMICAL AND GEOTECHNICAL LABORATORY TEST RESULTS

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Analytical Report Number : 21-92719

Project / Site name:	Slate Wharf	**Samples received on:**	12/08/2021
Your job number:	3548	**Samples instructed on/ Analysis started on:**	12/08/2021
Your order number:	300621 02	**Analysis completed by:**	20/08/2021
Report Issue Number:	1	**Report issued on:**	20/08/2021
Samples Analysed:	8 soil samples		

Signed:

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 21-92719
Project / Site name: Slate Wharf
Your Order No: 300621 02

Lab Sample Number				1971242	1971243	1971244	1971245	1971246
Sample Reference				HDP01	HDP01	WS02	WS07	WS03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.40	0.60	0.40	0.00-0.30
Date Sampled				11/08/2021	11/08/2021	11/08/2021	11/08/2021	11/08/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	14	9.9	9.5	7.1	9.6
Total mass of sample received	kg	0.001	NONE	1.2	1.2	1.0	1.2	1.2
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.8	8.2	8.4	8.8	8.6
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	%	0.005	MCERTS	-	-	0.090	-	-
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	26	40	170	150	73
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.013	0.020	0.084	0.076	0.037
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	12.9	19.9	84.3	75.5	36.6
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	9.3	-	-
Total Sulphur	%	0.005	MCERTS	-	-	0.080	-	-
Ammoniacal Nitrogen as NH4	mg/kg	0.5	MCERTS	-	-	< 0.5	-	-
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	-	< 0.05	-	-
Organic Matter (automated)	%	0.1	MCERTS	5.9	2.3	5.3	1.5	4.4
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-	-	< 2.0	-	-
Water Soluble Nitrate (2:1) as NO3	mg/kg	2	NONE	4.4	5.2	< 2.0	25	3.5
Water Soluble Nitrate (2:1) as NO3 (leachate equivalent)	mg/l	5	NONE	< 5.0	< 5.0	< 5.0	12	< 5.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.59
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.72	0.27	0.38	0.22	2.3
Fluorene	mg/kg	0.05	MCERTS	0.61	0.20	0.44	0.36	2.0
Phenanthrene	mg/kg	0.05	MCERTS	7.3	2.4	3.5	2.9	14
Anthracene	mg/kg	0.05	MCERTS	1.9	0.69	0.78	0.79	3.1
Fluoranthene	mg/kg	0.05	MCERTS	9.0	4.0	4.5	4.5	15
Pyrene	mg/kg	0.05	MCERTS	8.0	3.7	4.5	4.2	13
Benzo(a)anthracene	mg/kg	0.05	MCERTS	4.8	2.3	2.6	2.3	7.3
Chrysene	mg/kg	0.05	MCERTS	4.1	2.1	2.4	1.9	6.3
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	3.7	2.3	2.2	2.1	8.6
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	2.8	0.85	1.5	1.5	2.5
Benzo(a)pyrene	mg/kg	0.05	MCERTS	4.4	2.2	2.6	2.5	8.2
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	2.2	0.99	1.2	1.2	4.1
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.67	0.35	0.41	0.35	1.1
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	2.3	1.1	1.5	1.4	4.9

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	52.3	23.6	28.6	26.2	93.0

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 21-92719
Project / Site name: Slate Wharf
Your Order No: 300621 02

Lab Sample Number				1971242	1971243	1971244	1971245	1971246
Sample Reference				HDP01	HDP01	WS02	WS07	WS03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.40	0.60	0.40	0.00-0.30
Date Sampled				11/08/2021	11/08/2021	11/08/2021	11/08/2021	11/08/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	26	16	44	14	24
Barium (aqua regia extractable)	mg/kg	1	MCERTS	200	130	210	200	360
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.1	0.80	3.0	0.71	1.0
Boron (water soluble)	mg/kg	0.2	MCERTS	0.6	0.3	0.6	0.4	0.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	0.6	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	15	19	20	21
Copper (aqua regia extractable)	mg/kg	1	MCERTS	61	53	130	48	68
Lead (aqua regia extractable)	mg/kg	1	MCERTS	190	150	210	130	330
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.8	0.5	< 0.3	1.9	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	17	53	19	22
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	36	25	61	19	30
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	130	95	110	120	120
Magnesium (water soluble)	mg/kg	5	NONE	-	-	< 5.0	-	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	< 2.5	-	-
Petroleum Hydrocarbons								
Petroleum Range Organics (C6 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH C10 - C40	mg/kg	10	MCERTS	110	110	120	180	180
TPH2 (C6 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH C6 - C40	mg/kg	10	NONE	110	110	120	180	180
TPH (C10 - C25)	mg/kg	10	MCERTS	49	49	51	77	73
TPH (C25 - C40)	mg/kg	10	MCERTS	56	62	73	100	110

U/S = Unsuitable Sample I/S = Insufficient Sample

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 21-92719
Project / Site name: Slate Wharf
Your Order No: 300621 02

Lab Sample Number				1971247	1971248	1971249
Sample Reference				WS05	WS03	WS01
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.60	1.00	0.90
Date Sampled				11/08/2021	12/08/2021	12/08/2021
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	9.5	5.5	4.9
Total mass of sample received	kg	0.001	NONE	1.1	0.40	0.40
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.6	8.2	8.4
Total Cyanide	mg/kg	1	MCERTS	< 1.0	-	-
Free Cyanide	mg/kg	1	MCERTS	< 1.0	-	-
Total Sulphate as SO4	%	0.005	MCERTS	0.090	0.127	0.012
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	60	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.030	0.060	0.015
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	29.9	59.7	14.9
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	2.9	4.2	2.3
Total Sulphur	%	0.005	MCERTS	0.055	0.059	0.007
Ammoniacal Nitrogen as NH4	mg/kg	0.5	MCERTS	< 0.5	< 0.5	< 0.5
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Organic Matter (automated)	%	0.1	MCERTS	3.1	-	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0
Water Soluble Nitrate (2:1) as NO3	mg/kg	2	NONE	< 2.0	-	-
Water Soluble Nitrate (2:1) as NO3 (leachate equivalent)	mg/l	5	NONE	< 5.0	-	-

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	-
Acenaphthene	mg/kg	0.05	MCERTS	0.22	-	-
Fluorene	mg/kg	0.05	MCERTS	0.25	-	-
Phenanthrene	mg/kg	0.05	MCERTS	2.2	-	-
Anthracene	mg/kg	0.05	MCERTS	0.49	-	-
Fluoranthene	mg/kg	0.05	MCERTS	3.7	-	-
Pyrene	mg/kg	0.05	MCERTS	3.7	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.1	-	-
Chrysene	mg/kg	0.05	MCERTS	1.8	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	1.7	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.4	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.2	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.1	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.34	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.3	-	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	22.4	-	-

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 21-92719
Project / Site name: Slate Wharf
Your Order No: 300621 02

Lab Sample Number				1971247	1971248	1971249
Sample Reference				WS05	WS03	WS01
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.60	1.00	0.90
Date Sampled				11/08/2021	12/08/2021	12/08/2021
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	25	-	-
Barium (aqua regia extractable)	mg/kg	1	MCERTS	160	-	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.2	-	-
Boron (water soluble)	mg/kg	0.2	MCERTS	0.2	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	-	-
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	18	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	86	-	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	250	-	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	24	-	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	-
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	30	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	160	-	-
Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	5.4	< 5.0
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	2.7	< 2.5
Petroleum Hydrocarbons						
Petroleum Range Organics (C6 - C10)	mg/kg	0.1	MCERTS	< 0.1	-	-
TPH C10 - C40	mg/kg	10	MCERTS	62	-	-
TPH2 (C6 - C10)	mg/kg	0.1	MCERTS	< 0.1	-	-
TPH C6 - C40	mg/kg	10	NONE	62	-	-
TPH (C10 - C25)	mg/kg	10	MCERTS	28	-	-
TPH (C25 - C40)	mg/kg	10	MCERTS	44	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 21-92719
Project / Site name: Slate Wharf

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1971242	HDP01	None Supplied	0.2	Brown loam with gravel and vegetation.
1971243	HDP01	None Supplied	0.4	Brown loam and sand with gravel and vegetation.
1971244	WS02	None Supplied	0.6	Brown loam and sand with gravel and vegetation.
1971245	WS07	None Supplied	0.4	Brown loam and sand with gravel and vegetation.
1971246	WS03	None Supplied	0.00-0.30	Brown loam with gravel and vegetation.
1971247	WS05	None Supplied	0.6	Brown loam and sand with gravel and vegetation.
1971248	WS03	None Supplied	1	Brown sand with clinker and gravel
1971249	WS01	None Supplied	0.9	Brown sand with gravel.

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Analytical Report Number : 21-92719
Project / Site name: Slate Wharf

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Nitrate, water soluble, in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	D	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
PRO (Soil)	Determination of hydrocarbons C6-C10 by headspace GC-MS.	In-house method based on USEPA8260	L088-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
TPH2 (Soil)	Determination of hydrocarbons C6-C10 by headspace GC-MS.	In-house method based on USEPA8260	L088-PL	W	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Ammonium as NH4 in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS
TPH Oils (Soils)	Determination of extractable hydrocarbons in soil by GC-MS/FID.	In-house method with silica gel split/clean up.	L076-PL	D	MCERTS

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Analytical Report Number : 21-92719
Project / Site name: Slate Wharf

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
DRO (Soil)	Determination of extractable hydrocarbons in soil by GC-MS/FID.	In-house method with silica gel split/clean up.	L076-PL	D	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
TPH C6 - C40 (soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method.	L076-PL	W	NONE
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Water Soluble Nitrate (leachate equivalent)	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

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Analytical Report Number : 21-16219

Project / Site name:	Slate Wharf	**Samples received on:**	13/10/2021
Your job number:	3548	**Samples instructed on/ Analysis started on:**	13/10/2021
Your order number:	300621-02	**Analysis completed by:**	21/10/2021
Report Issue Number:	1	**Report issued on:**	21/10/2021
Samples Analysed:	3 soil samples		

Signed:

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 21-16219
Project / Site name: Slate Wharf
Your Order No: 300621-02

Lab Sample Number				2046159	2046160	2046161
Sample Reference				TP01	TP02	TP03
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.80	1.00	1.10
Date Sampled				13/10/2021	13/10/2021	13/10/2021
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	12	17	10
Total mass of sample received	kg	0.001	NONE	1.0	0.90	1.0
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
General Inorganics						
pH - Automated	pH Units	N/A	MCERTS	8.2	7.2	8.2
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	140	69	130
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.069	0.035	0.064
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	69.1	34.7	64.4
Organic Matter (automated)	%	0.1	MCERTS	4.4	1.2	4.3
Water Soluble Nitrate (2:1) as NO3	mg/kg	2	NONE	3.5	< 2.0	3.5
Water Soluble Nitrate (2:1) as NO3 (leachate equivalent)	mg/l	5	NONE	< 5.0	< 5.0	< 5.0
Speciated PAHs						
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.89	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.73	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	7.2	< 0.05	2.7
Anthracene	mg/kg	0.05	MCERTS	1.8	< 0.05	0.68
Fluoranthene	mg/kg	0.05	MCERTS	13	< 0.05	5.0
Pyrene	mg/kg	0.05	MCERTS	12	< 0.05	5.0
Benzo(a)anthracene	mg/kg	0.05	MCERTS	6.9	< 0.05	2.8
Chrysene	mg/kg	0.05	MCERTS	5.4	< 0.05	2.7
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	6.7	< 0.05	2.8
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	2.1	< 0.05	1.5
Benzo(a)pyrene	mg/kg	0.05	MCERTS	6.1	< 0.05	3.0
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	2.9	< 0.05	1.5
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.92	< 0.05	0.48
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	3.6	< 0.05	1.9
Total PAH						
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	70.0	< 0.80	30.0
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	23	4.7	20
Barium (aqua regia extractable)	mg/kg	1	MCERTS	200	130	210
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.1	0.83	1.0
Boron (water soluble)	mg/kg	0.2	MCERTS	0.8	0.5	0.7
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20	29	21
Copper (aqua regia extractable)	mg/kg	1	MCERTS	59	26	57
Lead (aqua regia extractable)	mg/kg	1	MCERTS	180	18	170
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	26	22
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	30	32	29
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	100	87	95

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Analytical Report Number: 21-16219
Project / Site name: Slate Wharf
Your Order No: 300621-02

Lab Sample Number				2046159	2046160	2046161
Sample Reference				TP01	TP02	TP03
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.80	1.00	1.10
Date Sampled				13/10/2021	13/10/2021	13/10/2021
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Petroleum Hydrocarbons						
Petroleum Range Organics (C6 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1
TPH C10 - C40	mg/kg	10	MCERTS	97	< 10	39
TPH2 (C6 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1
TPH C6 - C40	mg/kg	10	NONE	97	< 10	39
TPH (C10 - C25)	mg/kg	10	MCERTS	50	< 10	20
TPH (C25 - C40)	mg/kg	10	MCERTS	46	< 10	19

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number : 21-16219
Project / Site name: Slate Wharf

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2046159	TP01	None Supplied	0.8	Brown loam and clay with gravel and vegetation.
2046160	TP02	None Supplied	1	Brown clay and sand with gravel.
2046161	TP03	None Supplied	1.1	Brown loam and clay with gravel and vegetation.

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Analytical Report Number : 21-16219
Project / Site name: Slate Wharf

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Nitrate, water soluble, in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	D	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
PRO (Soil)	Determination of hydrocarbons C6-C10 by headspace GC-MS.	In-house method based on USEPA8260	L088-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
TPH2 (Soil)	Determination of hydrocarbons C6-C10 by headspace GC-MS.	In-house method based on USEPA8260	L088-PL	W	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
TPH Oils (Soils)	Determination of extractable hydrocarbons in soil by GC-MS/FID.	In-house method with silica gel split/clean up.	L076-PL	D	MCERTS
DRO (Soil)	Determination of extractable hydrocarbons in soil by GC-MS/FID.	In-house method with silica gel split/clean up.	L076-PL	D	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	W	MCERTS

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 21-16219
Project / Site name: Slate Wharf

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
TPH C6 - C40 (soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method.	L076-PL	W	NONE
Water Soluble Nitrate (leachate equivalent)	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client IGE Consulting Ltd

Address 14-32 Hewitt Street
Manchester
M15 4GB

Contract Slate Wharf

Job Number MRN 4112/13
Date of Issue 27 October 2021
Pages 1 of 2

Approved Signatories

S J Hutchings, O P Davies

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.

3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.

5 The results included within the report are representative of the samples submitted for analysis.

6 This certificate should not be reproduced, except in full, without the express permission of the laboratory.

M U R R A Y R I X

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

DETERMINATION OF POINT LOAD STRENGTH INDEX OF ROCK
METHOD IN ACCORDANCE WITH ASTM STANDARD D 5731

CLIENT	IGE Consulting Ltd
SITE	Slate Wharf
JOB NUMBER	MRN 4112/13

SAMPLE LABEL	TP01 at 1.40m	DATE SAMPLED	13-Oct-21
LAB SAMPLE No	105484-105486	DATE RECEIVED	14-Oct-21
DATE TESTED	26-Oct-21	SAMPLED BY	Client

MATERIAL	Sandstone Rock Core
ADVISED SOURCE	Site Investigation Sample

Depth (m)	Test Type	D (mm)	*W (mm)	Load (P) (kN)	D_e^2 (mm^2)	D_e (mm)	Is (MPa)	F	$I_{s(50)}$ (MPa)
N/A	Block	30.0	29.5	0.2	1126.82	33.57	0.18	0.84	0.15
N/A	Block	28.0	28.0	0.1	998.22	31.59	0.10	0.81	0.08
N/A	Block	29.5	29.0	0.2	1089.26	33.00	0.18	0.83	0.15
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00
					0.00	0.00	0.00	0.00	0.00

*W Entry required if test type is not Diametrical

REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 27-Oct-21

APPENDIX 11

GROUND GAS AND GROUNDWATER DEPTH MONITORING RESULTS

Gas Monitoring

Site:	Slate Wharf			Recent weather:	Rain	Precipitation:	None	2hr pre-visit pressure*:	1030
Job No.:	3548	Date:	20.08.21	Air temperature:	22°	Ground condition:	Damp		
Engineer:	MB	Start time:	17:10	Cloud cover:	10%	Pressure trend*:	Steady	2hr post-visit pressure*:	1030
Visit No.:	1	End time:	18:05	Wind velocity and direction:	7mph ENE	On-site activities (e.g.construction):	None	*based on Mean Sea Level Pressure (MSLP)	

Exploratory hole	Time	Response zone range	Water level	Base level	Atm. pressure	CH_4		LEL		Hex		CO_2		O_2			H_2S		CO		Total Volatiles (PID)		PID CF	Flow	
		(m bgl)	(m bgl)	(m bgl)	(mbar)	(%)		(%)		(%)		(%)		(%)			(ppm)		(ppm)		(ppm)			(l/hr)	
						peak	steady	peak	steady	peak	steady	peak	steady	high	steady	low	peak	steady	peak	steady	peak	steady		peak	steady
WS02	17:22	0.25-0.75	-	-	1026	0.0	0.0	0.0	0.0	0.017	0.017	4.0	4.0	20.2	16.0	16.0	0	0	0	0	0.0	0.0	1.0	0.0	0.0
WS03B	17:39	0.50-1.00	-	-	1026	0.0	0.0	0.0	0.0	0.016	0.016	4.7	4.7	20.3	11.8	11.8	0	0	11	0	0.0	0.0	1.0	0.0	0.0
WS07	17:52	0.50-1.00	Dry	0.93	1026	0.0	0.0	0.0	0.0	0.016	0.016	1.3	1.3	21.7	14.9	14.9	0	0	0	0	0.0	0.0	1.0	0.0	0.0

Comments: Bung could not be removed from WS02 or WS03.

Gas Monitoring

Site:	Slate Wharf			Recent weather:	Clear	Precipitation:	None	2hr pre-visit pressure*:	1026
Job No.:	3548	Date:	27.08.21	Air temperature:	17	Ground condition:	Dry		
Engineer:	JH	Start time:	11:50	Cloud cover:	80%	Pressure trend*:	Rising	2hr post-visit pressure*:	1026
Visit No.:	2	End time:	12:25	Wind velocity and direction:	5mph NNE	On-site activities (e.g.construction):	Excavation		

*based on Mean Sea Level Pressure (MSLP)

Exploratory hole	Time	Response zone range	Water level	Base level	Atm. pressure	CH_4		LEL		Hex		CO_2		O_2			H_2S		CO		Total Volatiles (PID)		PID CF	Flow	
		(m bgl)	(m bgl)	(m bgl)	(mbar)	(%)		(%)		(%)		(%)		(%)			(ppm)		(ppm)		(ppm)			(l/hr)	
						peak	steady	peak	steady	peak	steady	peak	steady	high	steady	low	peak	steady	peak	steady	peak	steady		peak	steady
WS02	11:50	0.25-0.75	Dry	0.66	1021	0.0	0.0	0.0	0.0	0.015	0.015	4.1	4.1	20.1	16.4	16.4	0	0	0	0	3.4	1.2	1.0	0.0	0.0
WS03B	11:55	0.50-1.00	Dry	0.91	1020	0.0	0.0	0.0	0.0	0.014	0.014	4.4	4.4	20.5	13.6	13.6	0	0	0	0	3.2	1.9	1.0	0.0	0.0
WS07	12:15	0.50-1.00	Dry	0.97	1020	0.0	0.0	0.0	0.0	0.015	0.015	1.6	1.6	20.3	15.4	15.4	0	0	0	0	2.3	1.4	1.0	0.0	0.0

Comments:

Gas Monitoring

Site:	Slate Wharf			Recent weather:	Showers	Precipitation:	None
Job No.:	3548	Date:	14.09.21	Air temperature:	17°C	Ground condition:	Dry
Engineer:	JH	Start time:	15:00	Cloud cover:	100%	Pressure trend*:	Steady
Visit No.:	3	End time:	15:35	Wind velocity and direction:	7mph NE	On-site activities (e.g.construction):	Earthworks

2hr pre-visit pressure*: 1014

2hr post-visit pressure*: 1014

*based on Mean Sea Level Pressure (MSLP)

Exploratory hole	Time	Response zone range	Water level	Base level	Atm. pressure	CH_4		LEL		Hex		CO_2		O_2			H_2S		CO		Total Volatiles (PID)		PID CF	Flow	
		(m bgl)	(m bgl)	(m bgl)	(mbar)	(%)		(%)		(%)		(%)		(%)			(ppm)		(ppm)		(ppm)			(l/hr)	
						peak	steady	peak	steady	peak	steady	peak	steady	high	steady	low	peak	steady	peak	steady	peak	steady		peak	steady
WS02	15:00	0.25-0.75	Dry	0.68	998	0.0	0.0	0.0	0.0	0.01	0.01	3.4	3.4	18.8	17.9	17.9	0.0	0.0	0.0	0.0	0.9	0.0	1.0	0.0	0.0
WS03B	15:00	0.50-1.00	Dry	0.93	998	0.0	0.0	0.0	0.0	0.01	0.01	4.2	4.2	20.6	14.7	14.7	0.0	0.0	0.0	0.0	2.0	0.9	1.0	0.0	0.0
WS07		0.50-1.00				Could not monitor - well damaged during previous earthworks																			

Comments: _____

Gas Monitoring

Site:	Slate Wharf			Recent weather:	Overcast	Precipitation:	None	2hr pre-visit pressure*:	1019.8
Job No.:	3548	Date:	23/9/21	Air temperature:	17°C	Ground condition:	Dry		
Engineer:	JH	Start time:	16:20	Cloud cover:	90%	Pressure trend*:	Steady	2hr post-visit pressure*:	1019.3
Visit No.:	4	End time:	16:30	Wind velocity and direction:	8mp W	On-site activities (e.g.construction):	None	*based on Mean Sea Level Pressure (MSLP)	

Exploratory hole	Time	Response zone range	Water level	Base level	Atm. pressure	CH_4		LEL		Hex		CO_2		O_2			H_2S		CO		Total Volatiles (PID)		PID CF	Flow	
		(m bgl)	(m bgl)	(m bgl)	(mbar)	(%)		(%)		(%)		(%)		(%)			(ppm)		(ppm)		(ppm)			(l/hr)	
						peak	steady	peak	steady	peak	steady	peak	steady	high	steady	low	peak	steady	peak	steady	peak	steady		peak	steady
WS02	16:20	0.25-0.75	Dry	0.68	1013	0.0	0.0	0.0	0.0	0.012	0.012	3.0	3.0	20.1	18.5	18.5	0	0	0	0	1.4	0.2	1.0	0.0	0.0
WS03B		0.50-1.00				Could not monitor - well damaged during previous earthworks																			
WS07		0.50-1.00																							

Comments: _____

Gas Monitoring

Site:	Slate Wharf			Recent weather:	Overcast	Precipitation:	None	2hr pre-visit pressure*:	1025
Job No.:	3548	Date:	########	Air temperature:	14°C	Ground condition:	Dry		
Engineer:	AJ	Start time:	11:30	Cloud cover:	90%	Pressure trend*:	Steady	2hr post-visit pressure*:	1025
Visit No.:	5	End time:	11:40	Wind velocity and direction:	7mp SE	On-site activities (e.g.construction):	Enabling Works	*based on Mean Sea Level Pressure (MSLP)	

Exploratory hole	Time	Response zone range	Water level	Base level	Atm. pressure	CH_4		LEL		Hex		CO_2		O_2			H_2S		CO		Total Volatiles (PID)		PID CF	Flow	
		(m bgl)	(m bgl)	(m bgl)	(mbar)	(%)		(%)		(%)		(%)		(%)			(ppm)		(ppm)		(ppm)			(l/hr)	
						peak	steady	peak	steady	peak	steady	peak	steady	high	steady	low	peak	steady	peak	steady	peak	steady		peak	steady
WS02	11:31	0.25-0.75	Dry	0.68	1021	0.0	0.0	0.0	0.0	0.01	0.017	4.6	4.6	20.8	13.8	13.8	0	0	0	0	0.0	0.0	1.0	0.0	0.0
WS03B		0.50-1.00				Could not monitor - well damaged during previous earthworks																			
WS07		0.50-1.00																							

Comments:

TEST DATE AND CONDITIONS	
Date	26/10/20
Atmospheric Pressure	981mB
Ambient Temp	20.6°C
Environics Serial No.	2633

GAS DATA LTD
Pegasus House
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LB
Tel 02476303311 Fax 02476307711

GFM436-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

INSTRUMENT DETAILS	
Serial No	Customer
13397	IGE Consulting Ltd

INSTRUMENT CHECKS			
Keyboard	✓	Pump Flow	500cc/min
Display Contrast	✓	Pump Flow @ -200mB	300cc/min
Clock Set / Running	✓	S/W Version	G436.0027/0010
Labels Fitted	✓	Recalibration Date	26/10/21

GAS CHECKS

Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	CH4 (%)	tol. (% vol.)	CO2 (%)	tol. (% vol.)	O2 (%)	tol. (% vol.)
N2	100%	0.0	0.0	0.0	0.0	0.0	+/-0.1
CH4	5%	4.9	+/-0.3	0.0	0.0	0.0	+/-0.1
	60%	59.7	+/-3.0	0.0	0.0	0.0	+/-0.1
CO2	5%	0.0	0.0	5.1	+/-0.3	0.0	+/-0.1
	40%	0.0	0.0	40.4	+/-3.0	0.0	+/-0.1
O2	20.9%	0.0	0.0	0.1	+0.1	20.9	+/-0.5

OPTIONAL GAS CHECKS

Calibration Gas		Instrument Gas Channels Read						
Gas Type	Applied Conc.	Label	H2S	CO	[illegible]	[illegible]	Hexane	tol. (% vol.)
		Range	5000ppm	2000ppm	[illegible]	[illegible]	2.00%	
N2	100%	[illegible]	0	0	[illegible]	[illegible]	0	0.0
H2S	1500ppm	[illegible]	1500	0	[illegible]	[illegible]	[illegible]	+/- 5.0
CO	1000ppm	[illegible]	50	1000	[illegible]	[illegible]	[illegible]	+/- 5.0
Hexane	2.00%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.868	+/- 10.0

PRESSURE CHECKS

Calibration Pressure		Instrument Pressure Channels Read					
Pressure @	Applied Pressure	Atmospheric [Ap] (mB)	tol. (mB)	[illegible]	[illegible]	[illegible]	[illegible]
All Ports	Current Atmospheric	980	+/-2.0	[illegible]	[illegible]	[illegible]	[illegible]
Ap Port (Internal)	+800mB(a)	797	+/-5.0	[illegible]	[illegible]	[illegible]	[illegible]
	+1200mB(a)	1202	+/-5.0	[illegible]	[illegible]	[illegible]	[illegible]

TEST DATE AND CONDITIONS	
Date	26/10/20
Atmospheric Pressure	981mB
Ambient Temp	20.6°C
Environics Serial No.	2633

GAS DATA LTD
Pegasus House
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LB
Tel 02476303311 Fax 02476307711

GFM436-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

FLOW CHECKS

Calibration Flow		Instrument Flow Channels Read			
Applied Flow (l/hour)	Applied Pressure (Pa)	Flow [Flow] (l/hour)	tol. (l/hour)	Differential Pressure [Dp] (Pa)	tol. (Pa)
-30.0	-295	-30.8	+/-3.0	-303	+/-50
-3.0	-19	-3.4	+/-1.0	-21	+/-6
0.0	0	0.0	0.0	0	0.0
+3.0	16	3.1	+/-0.5	18	+/-3
+30.0	328	29.8	+/-3.0	332	+/-50
+60.0	991	60.2	+/-6.0	1002	+/-130
+90.0	1961	90.4	+/-9.0	2020	+/-250

TEMPERATURE CHECK

Calibration Temperature	Instrument Temperature Channel Read	
Applied Equivalent Temperature (°C)	Temperature [Temp] (°C)	tol. (°C)
-10.0	-10.5	+/- 2.0
0.0	0.0	+/- 1.0
30.0	30.0	+/- 1.0
60.0	60.0	+/- 1.0
100.0	100.0	+/- 1.0

Notes:

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2015 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated. The results displayed on the instrument at each stage are recorded above.

Gas Data Ltd is certified to BS EN ISO9001:2015. Certificate NQA 8374. Valid until 22/03/2019

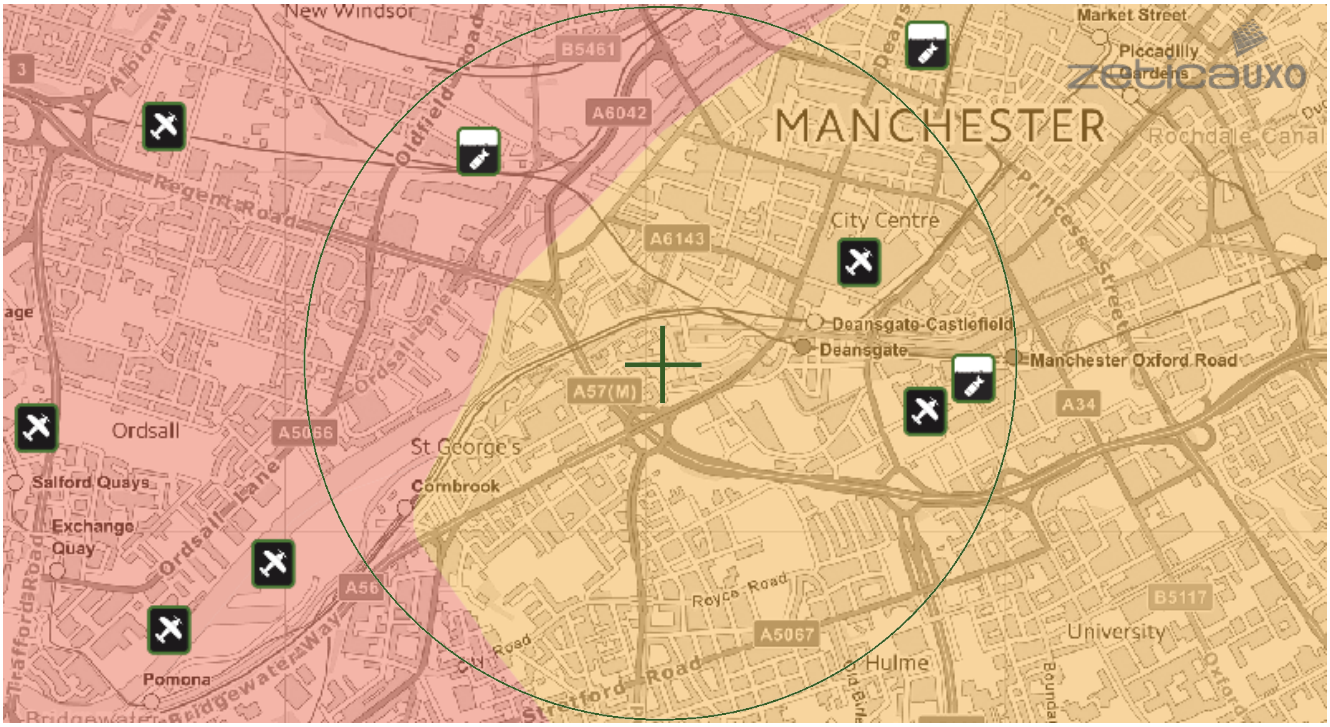
APPENDIX 12

ZETICA UXO RISK MAP, PRELIMINARY UXO RISK ASSESSMENT AND DETAILED UXO RISK ASSESSMENT REPORTS

UNEXPLODED BOMB RISK MAP

SITE LOCATION

Location: M15 4ST,
Map Centre: 383055,397467



LEGEND

- **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.
- **Moderate:** Areas indicated as having a bombing density of 15 to 49 bombs per 1000acre.
- **Low:** Areas indicated as having 15 bombs per 1000acre or less.

miltary | **industry** | **UXO find**
transport | **dock** | **Luftwaffe targets**
utilities | **Bombing decoy** | **other**

How to use your Unexploded Bomb (UXB) risk map?

The map indicates the potential for Unexploded Bombs (UXB) to be present as a result of World War Two (WWII) bombing.

You can incorporate the map into your preliminary risk assessment* for potential Unexploded Ordnance (UXO) for a site. Using this map, you can make an informed decision as to whether more in-depth detailed risk assessment* is necessary.

What do I do if my site is in a moderate or high risk area?

Generally, we recommend that a detailed UXO desk study and risk assessment is undertaken for sites in a moderate or high UXB risk area.

Similarly, if your site is near to a designated Luftwaffe target or bombing decoy then additional detailed research is recommended.

More often than not, this further detailed research will conclude that the potential for a significant UXO hazard to be present on your site is actually low.

Never plan site work or undertake a risk assessment using these maps alone. More detail is required, particularly where there may be a source of UXO from other military operations which are not reflected on these maps.

If my site is in a low risk area, do I need to do anything?

If both the map and other research confirms that there is a low potential for UXO to be present on your site then, subject to your own comfort and risk tolerance, works can proceed with no special precautions.

A low risk really means that there is no greater probability of encountering UXO than anywhere else in the UK.

If you are unsure whether other sources of UXO may be present, you can ask for one of our **pre-desk study assessments (PDSA)**

If I have any questions, who do I contact?

tel: **+44 (0) 1993 886682**

email: **uxo@zetica.com**

web: **www.zeticauxo.com**

The information in this UXB risk map is derived from a number of sources and should be used in conjunction with the accompanying notes on our website: **(https://zeticauxo.com/downloads-and-resources/risk-maps/)**

Zetica cannot guarantee the accuracy or completeness of the information or data used and cannot accept any liability for any use of the maps. These maps can be used as part of a technical report or similar publication, subject to acknowledgment. The copyright remains with Zetica Ltd.

It is important to note that this map is not a UXO risk assessment and should not be reported as such when reproduced.

*Preliminary and detailed UXO risk assessments are advocated as good practice by industry guidance such as CIRIA C681 'Unexploded Ordnance (UXO), a guide for the construction industry'.



BRIMSTONE
SITE INVESTIGATION

DETAILED
UXO RISK ASSESSMENT

INTEGRITY | PROFESSIONALISM | KNOWLEDGE

STAGE 2 DETAILED UXO RISK ASSESSMENT

Client:	IGE Consulting Ltd
Project Ref:	IGE26R
Site:	Slate Wharf, Castlefield, Manchester
Report Ref:	DRA-21-1302-IGE26R-SlateWharf,Castlefield,Manchester
Revision:	0
Status:	Final
Release Date:	8th September 2021

Written By:	Harry Smith	Project Researcher	harry.smith@brimstoneuxo.com
Reviewed By:	Will Hunnisett	Project Researcher	will.hunnisett@brimstoneuxo.com
Authorised By:	Aaron Florence	Managing Director	

EXECUTIVE SUMMARY

RESULT: Brimstone Site Investigation concludes that UXO poses a **LOW-MODERATE RISK** to the proposed works.

THE SITE: The Site (approximately centred on the National Grid Ref: SJ 83047 97508) is located in the Castlefield area of Manchester, within Greater Manchester, approximately 360m west of Deansgate railway station. The Site comprises open ground consisting of grass. It is bound to the north by multi-storey residential apartments, to the east by hard surfaced ground and Bridgewater canal, to the south by The Wharf public house and to the west by Slate Wharf.

THE PROPOSED WORKS: An SI is proposed, comprising five No. 100mm diameter boreholes to 5.5m bgl. The proposed development comprises a four-storey residential apartment block. Piled foundations may be required.

UXO RISK ASSESSMENT:

German UXO:

- Greater Manchester was the 11th most heavily bombed British conurbation during WWII. Like today, the Site occupied a relatively central location during the Blitz with confirmed Luftwaffe bombing targets in the vicinity. Consequently, it experienced a high bombing density, the result of four major raids (defined as >100 tonnes of HE bombs dropped) and some medium scale attacks.
- A bomb plot and damage map covering all air raids on the city was analysed, as was a bomb map displaying all bomb strikes resulting in at least one fatality. These do not record any bombing incidents within the study area or vicinity. The nearest bomb strike was located approximately 150m to the east.
- The high density of bombing makes it impossible to identify individual bombload alignments in relation to the Site. The records of exploded and unexploded HE bombs dropped during the Manchester Blitz give a failure rate of 16.6%; a significantly higher figure than the widely accepted 10% average for Britain as a whole.
- At the commencement of the Blitz, the Site was entirely occupied by open ground, likely used as an unloading bay with a warehouse to the west, moving cranes to the south and a footbridge directly east. A comparison of the historical records confirms that the vast majority of the surrounding area survived the war intact with no significant damage sustained to structures.
- As an undeveloped area of ground, the Site is not anticipated to have been subject to regular access during the war. It is conceivable that a UXB could have fallen unnoticed and unrecorded within open ground. Although, given the ground cover and surrounding area, the Site is anticipated to have been accessed at times during the war, therefore increasing the possibility of evidence of UXO
- To summarise; due to the lack of bomb strikes and bomb damage as well the possible usage of the Site, the risk is not considered to be significantly elevated and proactive risk mitigation measures are not recommended. However, as the Site was occupied by open ground within a relatively central area of Manchester and located nearby several Luftwaffe targets extra vigilance and UXO safety awareness briefings should be considered when carrying out intrusive works on Site

British / Allied UXO:

- Numerous (>30) permanent HAA batteries were active within range of the Site during WWII. Luftwaffe activity was frequent and intense over the wider area and therefore these guns would have expended a vast quantity of ammunition. Consequently, it is quite possible that an unexploded AA shell struck the Site. However, for the same reason as above, any such UXO would likely not have gone unnoticed and unrecorded.
- No evidence of historic military activity within the Site boundary has been found and it is highly unlikely that any has occurred historically. Consequently, the risk from associated UXO is low.

Likelihood of UXO Remaining and UXO Encounter:

- The Site has undergone several stages of development post-WWII. Foundations for structures developed across the Site likely disturbed ground to shallow depths. It is not thought likely that any previous structures developed on Site will have required deep foundations.
- The risk associated with any deep buried German UXBs will likely not have been mitigated at all across the Site. The risk associated with any shallow and very shallow buried items of UXO will have largely been mitigated as a result of the post-war works, including the development, and the subsequent removal, of structures and resurfacing across the Site.

RECOMMENDED RISK MITIGATION MEASURES: The measures detailed below are recommended to mitigate the risk to ALARP level.

Risk Mitigation Measure	Recommendation
UXO Safety Awareness Briefings	Prior to all intrusive works commencing within both risk zones.

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FIGURE 6: Manchester Consolidated Bomb Plot and Damage Mapping

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APPENDIX 1: Recent UXO Incidents and Historical Analysis

APPENDIX 2: Data Sheets - German WWII Air-Delivered Munitions

APPENDIX 3: Data Sheet - British WWII Anti-Aircraft Munitions

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QUALITY MANAGEMENT

Brimstone Site Investigation is committed to the provision of UXO risk mitigation services, including the safe removal and disposal, in the UK and overseas. Since our inception in 2016 it has been our goal to provide unsurpassed UXO risk mitigation services. Brimstone is a client-driven organisation, we aim to provide the client the services they need, to the agreed requirement, in accordance with national and international standards.

We are committed to providing a safe, cost-effective and quality service, underpinned by our three core values;

- Integrity in advice, information and the manner in which we conduct ourselves and our operations,
- Professionalism in the way we handle our operations, people and processes, and
- Knowledge in new skills and information, to ensure we remain at the forefront of innovation and strategy.

We are committed to the applicable requirements of the ISO 9001 standards. We set and review quality monitoring objectives to measure the performance of our quality management system. Brimstone wholly endorses the ethos of 'continual improvement efforts' and allocates resources to meet this requirement.

This policy applies to the whole of the Brimstone Site Investigation Ltd services and affects roles from the managing director down. All staff are responsible for helping manage quality, seeking improvement through constant review, and by encouraging supplier and subcontractor involvement. We are committed to achieving customer satisfaction using quality procedures, which will be operated to meet or exceed the applicable requirements of ISO 9001.



Aaron Florence
Founder and Managing Director
Brimstone Site Investigation Ltd.

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1 INTRODUCTION

1.1 Background

IGE Consulting Ltd (the Client) has commissioned BSI to carry out a Stage 2 Detailed Unexploded Ordnance Risk Assessment (DRA) of the proposed redevelopment works at the Slate Wharf, Manchester Site (the Site).

1.2 Legislation

There are no regulations that specifically govern the UXO risk mitigation industry in the UK. There are however two pieces of legislation that require consideration. It is industry best practice (and common sense) to frame your site in the context of UXO, and to put in place measures to protect people from risks. In 2009, CIRIA published Unexploded Ordnance (UXO) - A Guide for the Construction Industry C681. This publication, though not legally binding, provides the gold-standard framework to which UXO and construction companies operate.

1.2.1 Construction Design and Management Regulations (CDM) 2015

The regulations identify the client, the CDM coordinator, the designer, and the principal contractor as responsible parties. Under the regulations, responsible parties are held accountable for the way a construction project is managed and for the health and safety of workers. Responsible parties must:

- Provide an appropriate assessment of potential UXO risks, or ensure an assessment is completed by another party.
- Put in place appropriate risk mitigation measures if necessary.
- Supply all parties with information relevant to the risks.
- Ensure the preparation of an emergency response plan.

1.2.2 The Health and Safety at Work Act 1974

The Health and Safety at Work Act 1974 had a transformative impact on health and safety, saving thousands of lives since its enactment. Employers must consider their employees, workers not in their employment, and members of the public. The act places a duty on every employer 'as far as is reasonably practicable' to protect workers from risks. It also says that information must be provided about aspects of health and safety that affect their role.

1.3 Commercial Contractor and the Authorities

1.3.1 Commercial Contractors

If your site has been given a moderate or high-risk rating, then control measures will be recommended. The measures will be specific to the scope of works on site, usually in relation to the depth and extent of excavations, piling and similar activities. There are a range of different methods at BSI's disposal, including:

- Non-intrusive surveying (including drone surveying)
- Intrusive surveying
- Search and clear
- Watching brief
- Support to geotechnical investigations
- Target investigation
- Site-specific training packages
- Site safety briefings

Our UXO Engineers can assess suspicious items on site when they are found. This will avoid unnecessary site evacuations. If our engineer(s) decide the item is UXO, they will coordinate with the authorities, manage disruptions, and advise on control measures, such as evacuations and a cordon.

1.3.2 UK Authorities

If BSI is not on site and a suspicious item is found, the local police must be immediately called on the non-emergency number. Police will visit the site. They will then inform the Joint Services Explosive Ordnance Disposal (JSEOD) office, which will coordinate the callout of an army or navy response team.

A precautionary cordon will initially be put into effect, with possible evacuation of homes and businesses, road and rail closures. The cordon may be extended following the advice from JSEOD's response team.

To manage their resources, JSEOD triages incidents. A consideration of the type, size and location of the UXO is made. If an incident is not given a high priority rating, a team may not be available for up to two days following the initial report.

The use of JSEOD is under the Military Aid to Civil Authorities (MACA) framework, therefore the budget and personnel is limited, and there are no statutory obligations made of the MOD. Often the MOD will recommend involvement of a commercial UXO contractor to manage the ongoing risk – this is especially true of former airfields and training areas where contact with land service ammunition can be frequent.

1.4 UXO Risk in the UK

Fortunately, to the best of our knowledge, there has not been a single post-war incident in the UK where a construction worker has been killed or injured because of an item of UXO exploding. There have been cases in mainland Europe where UXO had been struck and then exploded, killing workers. In 2019 a WWII general purpose bomb spontaneously detonating in a field north of Frankfurt, Germany.

However, the incident in Frankfurt is not comparable to the UK, due to the way different countries manufactured ordnance. Bombs made in different countries have different associated hazards. British WWII bombs, for example, have a fuzing system which uses chemicals which makes them very unsafe. Please see **APPENDIX 1** for recent examples of UK UXO incidents.

Between 2013 and 2016 JSEOD responded to 7,500 callouts. These callouts range from falsely identified objects, inert objects, small items of UXO and large WWII German unexploded bombs (UXBs). Each year the construction industry inadvertently unearths UXO; often this goes unreported. UXO contamination comes from three main sources:

- **Enemy action:** during WWI and WWII the air forces of Germany, and to a lesser extent Italy, bombed targets throughout the UK. The German navy bombarded several coastal targets in eastern England during WWI and then in WWII German long-range artillery on the French coast bombarded parts of Kent.
- **Allied military activity:** during WWI and WWII several Allied nations used the UK as a staging area for military action in the European Theatre; predominantly the US and Canada.
- **UK military activity:** domestic British Army, Royal Air Force (RAF) and Royal Navy (RN) training activities during peacetime and conflict as well as anti-aircraft gun and rocket batteries during WWI and WWII.

1.5 UXO Detonations

A detonation is a violent chemical reaction which creates a huge volume of gas. This reaction appears to happen instantaneously – the velocity of the shockwave moving is up to 9000m per second. This chemical reaction is started using a small amount of very sensitive explosives called primary explosives. These types of explosives are highly sensitive to shock, friction, heat, and spark. As the explosive charge undergoes high order decomposition (detonation), the brisance, or shattering effect, causes the casing to splinter, projecting razor-sharp shrapnel across long distances.

The blast wave effect and the shrapnel effect can cause significant damage. Calculating safety distances is a complex process. As a rule of thumb, in open ground, a 250kg explosive charge (as would be found inside a typical 500kg bomb) would require an omnidirectional safety distance of at least 1.6km.

Bombs work by amplifying the explosive charge from the sensitive primary explosive through to the main charge or fill of the item. This process is called an explosive train, if any link in that chain is broken, the item will fail to

function as intended. This can be due to mechanical, electrical, or manufacturing tolerances or faults. Amongst other reasons, detonation of UXO could occur under the following circumstances:

- **UXO body impact:** A substantial impact onto the main body of a UXO; borehole rigs, piling rigs, jack hammers and mechanical excavator buckets.
- **Fuse impact:** Environmental conditions during decades of burial can result in the primary explosives located in the fuse pocket to crystallise and become shock sensitive. It would then take a relatively small impact or friction impact to cause the fuse to function and detonate the UXO.
- **Re-starting a timer:** A small proportion of German WWII bombs used clockwork fuses. In 2002 an Army EOD Engineer reported that the clockwork fuse in a UXB re-started. Decades of burial cause substantial corrosion in WWII German UXBs and therefore an incident such as this is extremely rare.

2 ASSESSMENT METHODOLOGY

2.1 Introduction

This assessment has been produced in accordance with the relevant CIRIA guidelines; *Unexploded Ordnance (UXO) - A Guide for the Construction Industry C681* (published in 2009). CIRIA C681 is a publication which originated from round table best practice discussions from industry leaders.

2.2 SPRC Risk Model

The Source, Pathway, Receptor, Consequence (SPRC) risk model can be applied to buried UXO as follows:

- **Sources:** UK and allied UXO sources include military firing ranges, bases, storage depots, munitions factories, anti-aircraft batteries, amongst others. There are many wartime causes of UXO contamination. The source for enemy contamination is overwhelmingly from WWII German air raids.
- **Pathways:** the pathway describes how the UXO reaches receptors. Usually UXO is buried and therefore pathways can be any activity which involve breaking ground. Examples include ground investigation works, site enabling works and excavations.
- **Receptors:** receptors are the people, assets and infrastructure that can be adversely affected by UXO exposure. This includes site personnel, plant, equipment, buildings, the general public, , and the environment.
- **Consequence:** the consequences of an inadvertent UXO detonation are catastrophic. They include injury and loss or life, as well as damage to property. Fortunately, the likelihood of UXO detonating is low, even when it is uncovered during works. Another consequence to consider however is delays to works, which itself can be a risk.

2.3 Assessment Structure

In accordance with CIRIA C681 this assessment addresses the following considerations in the appropriate order:

- The likelihood that the site was contaminated with UXO.
- The type of UXO that could have contaminated the site, and their associated hazards.
- The likelihood that UXO remains on the site.
- Theoretical bomb penetration depths.
- The likelihood that UXO will be uncovered during the proposed works.
- Risk rating and risk mapping (as appropriate).
- Risk mitigation recommendations.

2.4 Information Sources

To complete this risk assessment BSI has gathered information from a wide range of sources. BSI's research team has completed detailed historical research, including access of original archived records. The following is a general list of information sources that are consulted during the research process:

- The National Archives,
- Local archive centres,
- Ministry of Defence,
- The Council for British Archaeology,
- Groundsure mapping services,
- Historical aerial photography (Historic England, Britain From Above, Bluesky),
- Google open source mapping,
- The British Geological Society,
- Open sources; published book, articles, web resources,
- Site specific information supplied by the Client,
- BSI's library and historical database, and
- BSI's former armed forces employees.

2.5 ALARP Principle

The ALARP (as low as reasonably practicable) principle corresponds to the actions that should be taken to reduce risks. The term 'ALARP' is in the Health and Safety at Work Act 1974, which says that risks must be controlled in a reasonable way.

Infinite time, effort and money could be spent trying to eliminate risk entirely. HSE uses the example that spending £1m to prevent five employees bruising their knees is disproportionate, whereas spending the same amount to prevent an explosion which could kill 150 people is proportionate.

Using this principle, BSI aims to reduce client costs by recommending strategies that are proportionate to the assessed risks, if any elevated risk is found at all.

2.6 Risk Tolerances

The BSI risk assessment process divides UXO risk into two tolerances:

- **Tolerable:** negligible risk or low risk ratings are tolerable. Where the risk cannot be completely discounted, it may be a useful strategy to opt for a low-cost measure, such as a UXO safety briefing from a qualified UXO engineer.
- **Intolerable:** moderate risk or high-risk ratings are intolerable. Proactive risk mitigation measures should be put in place. Various strategies are at BSI's disposal to meet your project-specific needs.

2.7 Reliance and Limitations

This report has been prepared using published information and information provided by the Client. BSI is not liable for any information which has become available following the publication of this report. No third-party liability or duty of care is extended. Any third-party using information contained in this assessment do so at their own risk.

3 THE PROJECT

3.1 The Site

The Site (approximately centred on the National Grid Ref: SJ 83047 97508) is located in the Castlefield area of Manchester, within Greater Manchester, approximately 360m west of Deansgate railway station.

The Site comprises open ground consisting of grass. It is bound to the north by multi-storey residential apartments, to the east by hard surfaced ground and Bridgewater canal, to the south by The Wharf public house and to the west by Slate Wharf.

FIGURE 1: Site Location Maps **FIGURE 2:** Recent Aerial Photograph

3.2 The Proposed Works

An SI is proposed, comprising five No. 100mm diameter boreholes to 5.5m bgl.

The proposed development comprises a four-storey residential apartment block. Piled foundations may be required.

FIGURE 3: Existing Site Pan

4 SITE HISTORY

4.1 Introduction

Site-specific history can be assessed by reviewing historical mapping, historical aerial photography and by carrying out additional Site-specific research where appropriate. Below are descriptions of a selection of records relevant to the Site:

4.2 Mapping

Period	Map Date	Map Scale	Review
Pre-WWI	1894-1896	1:10,560	The Site is wholly comprised by open ground. Open ground borders the north and south. Bridgewater canal is located to the east of the Site. A warehouse is bound to the west.
	1908	1:2,500	No significant changes have occurred within the Site or in the vicinity. Travelling Cranes are located directly south and to the north. A footbridge is located adjacent to the east, connecting the Site area and surrounding open ground with the other side of Bridgewater canal.
Pre-WWII	1922	1:2,500	No significant changes have occurred on Site or in the vicinity. The area directly south, potentially including the Site, has been labelled as Timber Yard.
	1938	1:10,560	**FIGURE 4.1:** Although this map is of a large scale and lacks detail, it can be said that no significant changes have occurred on Site. The warehouse adjacent to the west has been enlarged.
Post-WWII	1950-1951	1:2,500	**FIGURE 4.2:** No further changes have occurred on Site and it is still occupied by open ground. No significant changes have occurred to structures in the surrounding area, indicating a lack of visible bomb damage in the nearby area.

	1953-1955	**1:2,500**	Two warehouse structures are present on Site and in the vicinity. The northern and southern extremities of the Site boundary are now covered by warehouse structures and the rest of the Site is still occupied by open ground. A warehouse has also been developed to the north west.
	1980	**1:10,000**	Although this map is of large scale and lacks detail, it can be said that the Site now almost entirely comprises structures. A large warehouse structure occupies the majority of the study area with the southern section still occupied by a warehouse. The warehouse to the west has been cleared and now comprises open ground.
	1994	**1:10,000**	All structures on Site and in the vicinity have been cleared and the Site is now labelled as a Depot. No significant changes have occurred in the vicinity.

4.3 Aerial Photography

Period	Photo Date	Review
WWII	**Aug 1939**	**FIGURE 5.1:** This oblique view photograph showing the Site from the south-east was taken at the beginning of WWII. The Site and surrounding area is occupied by open ground, which is anticipated to be part of the unloading bay and appears to be well maintained. A warehouse is located adjacent to the west.
Post-WWII	**7th May 1946**	**FIGURE 5.2:** This aerial image does not cover the study area but does display the Site's surrounds, to the east and south. Although this image prevents accurate detection of bomb damage on Site, there does not appear to be any obvious signs of damage in the visible surrounding area.
	1952	**FIGURE 5.3:** While the quality of the photograph limits detailed analysis, it appears that the Site has undergone development. Structures are present in the northern and southern sections of the Site. Open ground is still present in the central area. There does not appear to be any evidence of significant damage in the immediate vicinity, although the development of structures on Site will likely have cleared any potential evidence of damage.

4.4 Additional Site-Specific History

Some sites will have been occupied by landmarks or significant buildings historically and in such cases specific written histories including significant wartime details are occasionally available in the public domain. However, research has not located any relevant Site-specific details.

5 UXO RISK - GERMAN BOMBING

5.1 WWII Bombing History of the Site

5.1.1 Greater Manchester

Greater Manchester was home to a number of vital wartime industries during WWII, many of which were located in Trafford Park. Infrastructure of strategic importance was also present in the form of Manchester Docks and the Manchester Ship Canal.

Between 29th July 1940 and 30th July 1942, Greater Manchester experienced 41 air raids, most of which were small in scale, often executed by a solitary bomber. At least nine relatively insignificant raids were carried out

during the autumn of 1940, with the first medium scale raid affecting a wide area, occurring on the 28th August. Then on 1st October, a medium to heavy raid was executed.

The Luftwaffe mounted consecutive major attacks on the nights of 22nd/23rd and 23rd/24th December 1940 (the 'Christmas Blitz'). These left large areas of Manchester, Salford and Stretford devastated. NB: a major attack was a Luftwaffe designation for a raid delivering >100 tonnes of HE (in addition to incendiaries) to a target area.

In total, these two attacks involved 441 German bombers dropping 272 tonnes of HE on the first night and 195 tonnes of HE on the second night. Seven conflagrations and 600 smaller fires were reported, the result of tens of thousands of small incendiary bombs (IBs). The Christmas Blitz caused the total destruction of >4,000 houses as well as serious damage to a further 12,000. 805 HE bombs were reported across Manchester, Salford, Stretford and Manchester Docks, including 134 UXBs.

During 1941, two additional major* raids was launched on 9th January and 1st June. Although each involved half as many aircraft as the 22nd December 1940 raid, they still delivered a further 208 tonnes of HE bombs and numerous IBs onto the city and surrounding area. Three medium scale raids were also mounted in 1941, during the spring.

*The fourth and final major raid actually only delivered 97 tonnes of HE. However, it is close enough to 100 tonnes to be considered 'major'.

5.1.2 Site Specific

In addition to Salford Docks and the heavy industries of Trafford Park, Manchester city centre was part of the Luftwaffe's primary aiming point for raids on the wider conurbation. Original Luftwaffe target maps of Manchester highlight several facilities within 1km of the Site including Central Station (approximately 240m to the north-east) and a gas works (approximately 500m to the east). Consequently, the Site would have been particularly vulnerable to indiscriminate carpet-bombing as well as accurate targeted attacks.

5.1.3 Bombing Decoy Sites

In mid-1940 bombing decoys were introduced. The decoys used either;

- A system of lighting to simulate an urban area or a military airfield's runway
- Deliberately started fires to simulate a previously bombed target
- Dummy buildings and vehicles to simulate a military facility

792 static decoy sites were built at 593 locations in Britain. They were estimated to have drawn at least 5% of the total weight of bombs away from their intended targets. No decoys were operational within a significant radius of the Site during WWII. The closest was approximately 9km to the south-east.

5.2 WWII Bombing Records

5.2.1 Introduction

The bomb census recorded the location and type of bomb strikes to help with intelligence gathering and planning. It was compiled using information recorded by ARP wardens. These records were gathered by the Ministry of Home Security to calculate bombing density within administrative areas.

The bomb census was unreliable in the early stages of the war, though by 1941 procedures had been standardised. The quality of the census records also depended on where in the UK the records were produced. Some records are held at the National Archives and some are held at local borough archives.

Relevant records held at the National Archives and Manchester Archives were obtained for this risk assessment.

5.2.2 Bombing Density Statistics

The table below records the Ministry of Home Security's bombing density calculation for the County Borough of Manchester. It gives a breakdown of the types of large German bombs reported and is understood to not include UXBs.

Area Acreage	**27,255**
High Explosive Bombs (all types/weights)	712
High Explosive Parachute Mines	18
Flam (Oil) Bombs	17
40kg Phosphorus Incendiary Bombs (IBs)	0
40kg 'Fire Pot' IBs	0
V1 Flying Bomb	1
V2 Long Range Rocket	0
Total (excluding V-Weapons and 1kg / 2kg IBs)	737
Bombs Per 1,000 Acres	**27**

1kg / 2kg incendiary bombs (IBs) and 2kg anti-personnel (AP) bombs were often too numerous to record accurately and therefore are not included in the above figures. The latter were not dropped on London. Small IBs were however dropped in vast numbers (>100,000) over the capital.

5.2.3 Manchester Bomb Plot & Damage Map: 1940-1941

BSI has reviewed an original bomb plot and damage map for the wider study area. This map was produced by Manchester City Council's Architect's Department (Building Surveyor's Division) during the war and was updated throughout the conflict to reflect all raids on the city. No original legend / key accompanies this map, however a contemporary description does confirm some symbols. No symbol for UXBs was identified and any IB strike symbol with a number written within it represents the number of individual IBs falling at that location. Three categories of damage are illustrated on this map: solid red, hatched red and red outline. These are likely to represent 'total destruction or severe damage', 'moderate damage' and 'minor blast damage' respectively.

A small section of the map covering the study area is presented at **FIGURE 6** and described below.

- No bombing incidents or damage has been recorded on Site or in the vicinity. The closest HE strike was located approximately 150m east of the Site.
- Approximately 12 HE bombs, four 'fire bombs' and three IBs were recorded within a 500m radius of the Site.
- The closest bomb damage was recorded approximately 75m east of the study area.

5.2.4 Manchester Civilian Fatalities Map

A contemporary digital map of Greater Manchester recording the locations of every Christmas Blitz bombing incident that resulted in at least one fatality, was reviewed. This map (published by the Manchester Evening News) was compiled using data from the Commonwealth War Graves Commission; however, it only covers the two heaviest air raids on the city. Although a potentially significant source of bombing incident locations, many bombs did not cause a fatality and therefore this map should not be viewed as comprehensive.

No fatalities were recorded at or adjacent to the Site. The nearest plotted incident is described as 'Egerton Street, Hulme, Manchester, 1 fatality' (approximately 250m south-west of the Site). This approximate location does correspond to bomb damage on the consolidated bomb plot / damage map.

5.2.5 Abandoned Bomb Register

Due to the overstretched bomb disposal units during WW2, many bombs were intentionally left undisturbed. UXBs were triaged based on where they were and how big they were. If they didn't pose a significant risk they were 'abandoned'. The locations of these bombs were recorded on the abandoned bomb register.

The abandoned bomb register is a public record document held at the Parliamentary Archives of the House of Commons, from which BSI has obtained a copy. The register should not be relied on for completeness or accuracy. No abandoned bombs are recorded on or near the Site.

5.3 Likelihood of UXB Contamination

Where detailed bombing records exist, it is possible to predict whether any UXBs could be found on a site. This likelihood is discussed in the following table:

Density of Bombing	
Number of Air Raids in the Vicinity:	A comparison of the bombing incident records confirms that at least two air raids affected the study area.
Intensity of these Air Raids:	Almost all bombs dropped locally were likely part of large-scale indiscriminate carpet-bombing raids, almost all of which were carried out at night. Targeted raids on nearby Luftwaffe targets may have also affected the area.
Bomb Strike Positions	
Closest Bomb Strikes	HE bombs: Approximately 150m east. 1kg / 2kg IBs: None within a significant distance of the Site.
Alignment of recorded Bomb Strikes:	It has not been possible to identify alignment of bomb strikes due to the lack of a comprehensive record set.
Bomb Failure Rate	
Evidence to suggest that the generally accepted failure rate of 10% differs in the vicinity of the site:	Records of exploded and unexploded HE bombs dropped on Manchester, Salford and Stretford during the Christmas Blitz give a failure rate of 16.6% (Smith. P, J, C, 2003). This is higher than the national average of 10%.
UXBs recorded in close proximity to the site:	None plotted in the wider Site area.

5.4 Likelihood of Subsequent UXB Detection

A range of circumstances determine whether a UXB strike location would have been identified, during and after the war. This is discussed in the following table.

Historic Access
A UXB falling on a site which was frequently accessed would have had a better chance of being found. ARP Wardens actively searched for UXBs in heavily bombed residential areas. The importance of a site or nearby buildings and infrastructure was also a factor. Many industrial facilities had fire watchers tasked with extinguishing incendiary bombs and reporting UXBs.
The vast majority of local air raids occurred at night when residents and workers would have been indoors and / or sheltering. As such there is generally a lower probability of anyone witnessing any UXB strike to the Site as it fell / occurred. NB: no evidence of fire watches active in the vicinity (providing night-time observation) was found. Aerial photography and historical OS mapping indicate that the Site occupied a small area of open ground with no significant usage. As a result, it cannot be assumed that the Site would have been subject to a frequent degree of access. It is conceivable therefore that any UXB dropped on Site could have fallen unnoticed. However, the Site is anticipated to have been potentially used as an unloading bay, was associated with a timber yard, had a warehouse adjacent to the east and had travelling cranes and a footbridge within the vicinity. The presence of these multitude of features would likely have increased activity on Site and in the surrounding area, reducing the possibility of a UXO strike going unnoticed.

Bomb Damage
As the bombing campaign continued, damaged areas became vulnerable to unreported UXBs. Bombsite wreckage or soil disturbance at a bomb crater could obscure evidence of a subsequent UXB strike.
No evidence has been found to suggest that the Site sustained bomb damage. Aerial photography does not indicate any evidence of HE bomb cratering within the open ground on Site, or roofing/tiling repairs on the structures in the wider area. The development of structures on small sections of the Site before available post-war imagery was taken could conceivably have removed potential evidence of bomb damage, such as cratering. However, this is not considered likely given the small size of the Site and potential usage during the war.

Ground Cover Type
A UXB which falls on open field could easily go unnoticed, whereas a UXB dropped on a hard-surfaced car park would have been easily observed.
Generally, areas of open ground are often not conducive to the detection of UXBs, and a small UXB entry hole could easily have been obscured within such ground cover. Over time, environmental conditions could have caused this hole to infill, erasing any evidence of a UXB. On the other hand, any UXB strike to the building adjacent to the Site would have caused incontrovertible evidence of its evidence as it passed through the building. The same can be said for any hard standing surfaces on or surrounding the Site, where (assuming no cratering) a HE UXB entry hole would have been present and easily recognisable.

5.5 Bombing During WWI

During WWI, an estimated 9,000 German bombs were dropped on London, Eastern England and South-Eastern England during some 51 Zeppelin airship raids and 52 fixed-wing aircraft raids. London suffered the worst of the bombing with an estimated 250 tonnes of HE and incendiary bombs recorded across the Capital, over half of which fell on the City of London district.

The WWI bombing campaign waged by Germany was on a far smaller scale than the WWII campaign, in terms of the number of raids, the weight of ordnance dropped during each attack and the size of the bombs used. When coupled with the fact that most WWI bombed locations have since been redeveloped, German WWI UXB finds are extremely rare. Furthermore, most air raids took place during daylight hours and as it was the first time Britain had experienced strategic aerial bombardment, the raids often attracted public interest and even spectators, increasing the chances of any UXBs being reported.

A complete collection of written air raid reports for the region was reviewed. These confirm that Manchester did not experience any bombing during WWI. Consequently, there is no risk associated with WWI German UXO.

6 WWII GERMAN BOMBS

6.1 Bombs Dropped on the UK

Nazi Germany used different types of ordnance against the UK for different effects. Some types were designed to cause fires, others for their destructive blast effect and other for their penetration capability. Each type of ordnance was fitted with at least one fuze. For some bombs multiple fuzes were used. Many different types of fuzes were available for use – each with its own set of associated hazards.

Data sheets on those bombs most likely to be encountered today are included at **APPENDIX 2**.

- **HE bombs – moderate NEQ (net explosive quantity):** the most common types of HE bombs dropped were the SC (general purpose - GP) and SD (semi-armour piercing - SAP) series of bombs. The NEQ is between 30-50%. SAP bombs are engineered to attack light fortifications, whereas GP bombs are used

in a mixed destructive blast and anti-personnel fragmentation role. 70% of bombs dropped on the UK were the 50kg type.

- **HE bombs – high NEQ:** blast bombs and parachute mines have bodies made of thin steel, allowing for larger HE charges. These were designed to detonate above ground, maximising the blast effect. Parachute mines were weapons slowed by parachutes and designed to detonate without penetrating the ground. Although, in some marshland areas, partially buried parachute mines have been observed. Consequently, it is highly unlikely that any unexploded blast bombs remain buried in the UK today.
- **HE bombs – low NEQ:** The PC series were armour piercing bombs used against heavy fortifications and reinforced bunkers. They were not commonly used over the UK.
- **Small incendiary bombs:** The 1kg and 2kg incendiaries were the most dropped bomb. Up to 620 x 1kg incendiaries could be packed into the largest container unit, which opened at a pre-determined height scattering its payload over a wide area. These small bombs could fully penetrate soft ground due to their small diameter. Variants of the 1kg and 2kg incendiary bombs contained a small HE charge designed for an anti-personnel role, and to increase its incendiary effect.
- **Large incendiary bombs - Thick skinned:** The C50 has a thick body and contained a mixture of incendiary liquids and white phosphorus. Another version of the C50 had a white phosphorus fill. The C50 'firepot' contained thermite incendiary containers (aka firepots) and a small HE charge.
- **Large incendiary bombs - Thin skinned:** The Flam 250 and Flam 500 models had thin steel bodies designed to break up on impact, spreading their oil-incendiary mixture, which was ignited by a small HE charge. Consequently, it is highly unlikely that any unexploded Flam bombs remain buried in the UK today. Their unreliability meant withdrawal from frontline use by January 1941.
- **Submunitions:** The SD2 'butterfly' bomb was a 2kg submunition dropped on several British cities and towns. It contained a 225gram HE charge. SD2s had no ground penetration ability so the vast majority were recovered at the time. However, SD2s are still found across Britain today.
- **V1 flying bombs and V2 rockets:** In the final year of WWII Germany began using pilotless weapons against England. Both V Weapons had 1,000kg HE warheads. Due to their light-body construction, they had no penetration ability and any impact left a noticeable debris field. As such, there is negligible risk from unexploded V weapons today.

6.2 Bomb Failures

Records from September 1940 to July 1941 show that an average of 84 UXBs were dropped on civilian targets each day. Around 8% of these were time delay bombs – designed to strike the ground and start a predetermined countdown which could last days.

There is a generally accepted 10% failure rate for WWII German HE bombs. This is estimated from records gathered by bomb disposal units. These statistics do not account for UXBs that went by unnoticed.

Failures can happen for different reasons, including:

- Equipment or human error in arming the bombs before release,
- Failure of a mechanism within the fuze (out of tolerance),
- Jettisoning payloads if the bomber was under attack or crashing, or
- Partially functioned bombs (e.g. cracks in the cast TNT)

6.3 Bomb Ground Penetration

6.3.1 Introduction

Using data gathered during WWII by the Ministry of Home Security, estimations can be made about how deep a bomb is likely to penetrate the ground. Over one thousand incidents were reported by the bomb disposal units to support this research. Further tests were carried out, dropping bombs of different sizes into chalk and measuring the depths they reached. This research is held at the National Archives. The estimates are:

Bomb weight (kg)	Ground Type (m)							
	Sand		Gravel		Chalk		Clay	
	Average	Max.	Average	Max.	Average	Max.	Average	Max.
50	2.8	7.8	2.8	7.8	3.5	7.7	4.0	9.1
250	4.8	13.7	4.8	13.7	6.0	13.1	6.8	15.8
500	6.0	17.3	6.0	17.3	7.6	16.4	8.7	19.8
1,000	7.6	21.9	7.6	21.9	9.6	20.7	10.9	24.9

Different layers of geology affect penetration depths. For example, 1m of made ground, then 1m of gravel before reaching clay – as is many areas of London – is not easily calculated from the data above.

When calculating how deep a bomb could have reached, we must make three assumptions:

- **Impact velocity:** German bombing raids were carried out at altitudes in excess of 5,000m. The velocity of impact is roughly 313ms^{-1} (not accounting for resistance). It is the same velocity regardless of mass.
- **Impact angle:** strike angles of 10 to 15 degrees to the vertical. It must be assumed that the bomb was stable at the moment of ground penetration.
- **Bomb design:** Some larger German bombs were occasionally fitted with 'kopfrings' - a metal ring, triangular in cross section, fitted around the nose of the bomb to help prevent penetration. It must be assumed that no 'kopfrings' were fitted.

6.3.2 The J-Curve Effect

During WWII BDUs reported that most buried UXBs were found horizontal or upturned. This observation confirmed the 'J-curve effect'. As an HE bomb penetrates the ground, slightly offset from the vertical, its passage underground creates a 'J' shape.

This is relevant because the J-curve effect results in a horizontal offset between the buried UXB and its point of entry. This is distance is estimated to be one third of the theoretical penetration depth. A low altitude attack, meaning a low impact angle, could produce an even greater offset, of up to 15m.

6.3.3 Site Specific Geology

BGS Mapping	**Superficial Deposits:** None recorded	**Bedrock Deposits:** Chester Formation – Sandstone
SI Data	No recent SI data was provided by the Client. However, local BGS borehole logs were available. The closest BGS SI through the same mapped geology as the Site is located approximately 250m west of the Site (BGS ID:1043492). This SI (November 1991) encountered the following ground conditions: -0.2m of topsoil. -4m of made ground, sand soil and brick. -4.5m of clay. -1.5m sandstone.	

6.3.4 Site Specific Maximum Bomb Penetration Depth

During WWII the Luftwaffe dropped many different types of HE bomb. The SC (general purpose) series was by far the most numerous and of this series, the SC 500 model (weighing 500kg) was the largest of the most commonly deployed and therefore this will be used as the benchmark weapon for the Site-specific bomb penetration depth calculations.

To calculate an approximate maximum bomb penetration depth, BSI would usually take the average of the averages of the figure for the predominant Site-specific geologies in the table above. However, due to the presence of sandstone this has not proved possible on this occasion.

NB: theoretically penetration depths could be greater if the UXB was larger, however, War Office statistics confirm that between October 1940 and May 1941 the majority of HE UXBs (>90%) were either 50kg or 250kg, with the 500kg bombs making up most of the remaining 10%.

7 UXO RISK - BRITISH/ALLIED ACTIVITY

7.1 Introduction

The table below lists potential sources of UXO (excluding enemy action). Those which are potentially relevant to the Site are discussed in the subsequent section(s).

Potential UXO Source	Potentially Significant
Army or RAF training areas / ranges	×
Military bases and other installations	×
Munitions and explosives factories	×
Military storage depots	×
Defensive fortifications	×
Wartime site requisitions	×
WWII defensive mining (landmines)	×
WWII Home Guard activity	×
Wartime anti-aircraft fire	✓

7.2 Potential Sources of UXO

7.2.1 Introduction

Research has not located any evidence of significant British or Allied army, RAF or Royal Navy activity specifically on Site and none is likely to have occurred historically. The only likely potential source of British UXO contamination is therefore WWII AA artillery fire.

7.2.2 WWII Anti-Aircraft Fire

Anti-Aircraft (AA) Command was a British Army command established in 1939 to defend the UK during the anticipated German bombing campaign. It controlled the Territorial Army AA artillery and searchlight units. From 1940 to 1945 BDUs dealt with 7,000 unexploded AA shells in Britain. There were three main types of AA battery used for home defence (see below). Data sheets on these AA defences are included at **APPENDIX 3**.

- **Heavy Anti-Aircraft (HAA):** large calibre guns (3.7" and 4.5") for engaging high altitude bomber formations. Hundreds of permanent batteries were constructed in and around major cities and military bases during the 1930s. Some 2,000 of these guns were available during the Blitz. Each gun could fire between 10 and 20 rounds per minute and consequently HAA batteries could expend large quantities of shells during each engagement.

  British time fuses were poorly manufactured during WWII and this led to high failure rate for HAA shells, up to 30%. Unexploded HAA shells had the potential to land up to 27km from their battery, although more typically landed within a 15km radius.

- **Light Anti-Aircraft (LAA):** smaller calibre guns for engaging dive bombers and low altitude intruders. As such they were mostly used to defend specific industrial and military targets which were subject to precision bomber attack. LAA guns were either .303" calibre machine guns or 20mm and 40mm calibre cannon. The latter were fitted with simply impact fuses and small incendiary or HE bursting charges.

  The 40mm Bofors gun could fire 120 x HE shells / minute to a ceiling of 1,800m. Each shell was designed to self-destruct if it didn't strike an aircraft, however, inevitably some failed and fell back to earth.

- **Z (Rocket) Batteries**: a Z-Battery comprised a grid formation of 64 rocket projectors which fired 2" and later 3" Unrotated Projectile (UP) rockets to a maximum altitude of 5,800m; a ground range of some

9,000m. They were deployed in cities all around the UK from 1941 and proved to be an effective addition to the existing AA guns.

The rockets measured 0.9m (2") and 1.8m (3") in length with four stabilising fins at the base and were fitted with 3.5kg or 8.2kg HE warheads. The larger warhead had an effective airborne blast radius of up to 20m. Some variants deployed a form of aerial mine described as a "small yellow bomb" which was designed to detach from the rocket at height and descend on a parachute with the objective of becoming snagged on target aircraft and then detonating.

Unlike bombs which were designed to strike the ground, AA projectiles and rockets were designed to function in the air. Due to their shape, and centre of gravity they would often not strike the ground nose first. This coupled with the lower mass of AA UXO resulted in shallower ground penetration depths, compared to UXBs. Although, in very soft conditions, unexploded AA projectiles have been found deeper than 1.5m bgl.

Numerous (>30) permanent HAA batteries were active within range of the Site during WWII. No evidence of permanent LAA gun batteries defending Vulnerable Points within range of the Site was found. Luftwaffe activity was frequent and intense over the wider area and therefore these guns would have expended a vast quantity of ammunition.

8 UXO RISK MITIGATING CIRCUMSTANCES

8.1 Introduction

Works on a UXO contaminated site could result in the partial or complete removal of UXO risk. Construction or earthworks may have uncovered any UXO contamination, which would then have been reported and removed by the authorities. A site may have been subject to an explosive ordnance clearance (EOC) task conducted by the armed forces. EOC tasks involve surveying, subsequent target investigation and removal of UXO. Although the effectiveness of historic EOC tasks will have often been unsatisfactory.

8.2 Explosive Ordnance Clearance Tasks

The division of EOD tasks has been complex throughout British military history. It used to be the case that anything under the water level would be dealt with by navy units, and anything on land would be dealt with by army units. In recent years RAF EOD capability has been discontinued, and now only the Royal Navy and the British Army have EOD units. In the army, the Royal Logistics Corps and Royal Engineer EOD units have been amalgamated to form 29 EOD & Search Group. Often taskings are assigned to either the naval or army elements based on where in the country the threat is and the nature of the threat.

BSI has access to a database of historic EOC tasks. This database is only complete up until the early 2000s and therefore does not include recent EOC tasks. No such database for the RAF and Royal Navy EOD units is easily accessible. A search of this database has not resulted in any Army EOC tasks in the vicinity of the Site.

UXO encounters on civilian land are often reported in the media and therefore a web search of local media outlets was also carried out. No recent incidents within close proximity to the Site were identified.

8.3 Ground Works

The Site has undergone several stages of development post-WWII. Foundations for structures developed across the Site likely disturbed ground to shallow depths. It is not thought likely that any previous structures developed on Site will have required deep foundations.

8.4 Deductions

The risk associated with any deep buried German UXBs will likely not have been mitigated at all across the Site. The risk associated with any shallow and very shallow buried items of UXO will have largely been mitigated as a result of the post-war works, including the development, and the subsequent removal, of structures and resurfacing across the Site.

9 CONCLUSION

9.1 Accuracy of Historical Records

Occasionally, the accuracy of some historical records can prove to be poor when compared with other sources of information. One significant consequence of this can be the possibility of unrecorded German bomb strikes in the study area.

- The bomb plot / damage map shows several areas of damage with no corresponding bomb strike. It is likely therefore that further bomb strikes (unrecorded) occurred in the surrounding area. However, this is not considered significant with regards to the assessment of UXO risk on Site.
- There is a nine-strike discrepancy in the number of parachute mines recorded in Manchester Borough between the Ministry of Home Security records and those included within a local history publication (Smith. P, J, C, 2003). This further highlights the difficulties in wartime ARP record keeping.

9.2 The Risk of UXO Contamination on Site

9.2.1 Key Findings - German UXO Risk

- Greater Manchester was the 11th most heavily bombed British conurbation during WWII. Like today, the Site occupied a relatively central location during the Blitz with confirmed Luftwaffe bombing targets in the vicinity. Consequently, it experienced a high bombing density, the result of four major raids (defined as >100 tonnes of HE bombs dropped) and some medium scale attacks.
- A bomb plot and damage map covering all air raids on the city was analysed, as was a bomb map displaying all bomb strikes resulting in at least one fatality. These do not record any bombing incidents within the study area or vicinity. The nearest bomb strike was located approximately 150m to the east.
- The high density of bombing makes it impossible to identify individual bombload alignments in relation to the Site. The records of exploded and unexploded HE bombs dropped during the Manchester Blitz give a failure rate of 16.6%; a significantly higher figure than the widely accepted 10% average for Britain as a whole.
- At the commencement of the Blitz, the Site was entirely occupied by open ground, likely used as an unloading bay with a warehouse to the west, moving cranes to the south and a footbridge directly east. A comparison of the historical records confirms that the vast majority of the surrounding area survived the war intact with no significant damage sustained to structures.
- As an undeveloped area of ground, the Site is not anticipated to have been subject to regular access during the war. It is conceivable that a UXB could have fallen unnoticed and unrecorded within open ground. Although, given the ground cover and surrounding area, the Site is anticipated to have been accessed at times during the war, therefore increasing the possibility of evidence of UXO
- To summarise; due to the lack of bomb strikes and bomb damage as well the possible usage of the Site, the risk is not considered to be significantly elevated and proactive risk mitigation measures are not recommended. However, as the Site was occupied by open ground within a relatively central area of Manchester and located nearby several Luftwaffe targets extra vigilance and UXO safety awareness briefings should be considered when carrying out intrusive works on Site.

9.2.2 Key Findings - British UXO Risk

- Numerous (>30) permanent HAA batteries were active within range of the Site during WWII. Luftwaffe activity was frequent and intense over the wider area and therefore these guns would have expended a vast quantity of ammunition. Consequently, it is quite possible that an unexploded AA shell struck the Site. However, for the same reason as above, any such UXO would likely not have gone unnoticed and unrecorded.
- No evidence of historic military activity within the Site boundary has been found and it is highly unlikely that any has occurred historically. Consequently, the risk from associated UXO is low.

9.3 Site-Specific UXO Hazards

Different types of UXO pose differing types of hazard, depending on their structural design, Net Explosive Quantity (NEQ), fill type and likely contamination depth. The table below lists the main types of UXO most often encountered on urban UK sites and their relative hazard levels.

UXO Type	NEQ (NEQ Range)	Likely Burial Depth	Hazard Posed
WWII German General Purpose HE Bombs	25kg - 220kg (most commonly deployed bomb weights)	Likely deep burial (>3m)	HIGH RISK
WWII British Heavy Anti-Aircraft Shells	1.1kg - 1.7kg	Shallow burial (<1.5m)	MODERATE-HIGH RISK
WWII British Land Service Ammunition	<2kg	Shallow burial (<1.5m)	
WWII German 2kg Incendiary / HE Bombs	680g incendiary hazard + ~500g explosive hazard	Shallow burial (<1.5m)	
WWII German 1kg IBs	680g (incendiary, not explosive hazard)	Shallow burial (<1.5m)	MODERATE RISK
WWII British Light Anti-Aircraft Shells	4g - 70g	Very shallow burial (<1m)	LOW-MODERATE RISK

9.4 The Likelihood of UXO Encounter

9.4.1 Introduction

This report assesses the risk of UXO in relation to the proposed works, not simply the risk that UXO remains buried on site. The likelihood of UXO encounter during intrusive ground works will vary depending on the type of UXO and the type of construction methods employed during the project. With increased soil disturbance i.e. more excavations, the likelihood of encountering UXO increases.

Within an area of elevated UXO contamination likelihood, the sub-surface volume of potential UXO contamination will comprise the natural soil / geology in between WWII ground level and the maximum bomb penetration depth. Therefore, any intrusions into this layer will be at risk of UXO encounter.

Any post-WWII fill material deposited on a site is unlikely to be contaminated with UXO and therefore the risk of encountering UXO on such a site could vary with depth.

In the wake of the initial nine-month Blitz, many cities and towns were left with vast quantities of bomb site rubble that required removal and relocation. This material was put to use for in a variety of ways, for example >750,000 tons of London's rubble was used to build runways for new RAF and USAAF airfields and much of Liverpool's rubble was used to create and maintain sea / flood defences throughout Merseyside.

It is quite possible that unexploded British AA projectiles and German 1kg incendiaries were overlooked during removal, resulting in UXO contaminated fill material ending up on otherwise low UXO risk sites, possibly many miles from any high bombing density areas.

9.4.2 German UXBs

Although most German UXBs came to rest several metres below WWII ground level, these weapons can be found at any level between just below WWII ground level and the maximum bomb penetration depth. There are a number of reasons why these heavy bombs might be found at surprisingly shallow depths.

- **Tip and run:** When enemy aircraft had to take evasive action to escape RAF fighter intercepts or AA defences, they often dropped their bomb loads from a reduced height, potentially resulting in extreme J-curve effect.

- **Deflection:** the shape of German bomb nose sections meant they were susceptible to deflection when striking surface or shallow sub-surface obstacles, occasionally resulting in shallow burial or even UXBs skidding across hardstanding.
- **Aircraft Crash Site:** if an aircraft was unable to dump its bomb load before impacting the ground, due to mechanical fault, any externally fitted bombs could have become buried on impact.

German 1kg / 2kg incendiaries were cylindrical and approximately 50mm in diameter. They had tail sections, and so landed nose first. Within soft ground this could result in full penetration of the bomb below the surface. Such UXBs are usually found close to the surface.

9.4.3 British / Allied UXO

The nature of British/Allied military activity involving LSA and SAA and the smaller size of these munitions (in relation to German HE bombs) indicates that any resulting UXO contamination on a site will be limited to shallow depths, usually within 1.5m of the surface, notwithstanding added material to raise the ground level.

Domestic military LSA and SAA contamination will either be the result of expending blinds (dud ammunition) which bury into the ground on impact or munitions purposefully buried, for a number of reasons. Either way, these types of UXO are all found at shallow depth.

9.4.4 Deductions

As no significant deep intrusive works are anticipated to have taken place on Site post-WWII, it is conceivable that a UXB could be encountered during any shallow or deep mechanical excavations beneath the existing ground level in this location. However, it must be noted that the risk of such an encounter is not considered to be significant.

10 OVERALL RISK RATING

Ratings for the likelihood of UXO contaminating the Site, remaining within the Site up to the present day and being encountered during the proposed works, inform the overall risk rating. The UXO risk to the proposed works has been assessed as **Low-Moderate.**

<table>
<tr><th colspan="5">Risk Table: Low-to-Moderate Risk</th></tr>
<tr><th>UXO TYPE (ASSOCIATED HAZARD)</th><th>LIKELIHOOD OF UXO CONTAMINATION</th><th>LIKELIHOOD OF UXO REMAINING</th><th>LIKELIHOOD OF ENCOUNTER</th><th>OVERALL RISK RATING</th></tr>
<tr><td>WWII German ‘Iron’ Bombs</td><td>Low-to-Moderate</td><td>Moderate</td><td>Low-to-Moderate</td><td rowspan="2">Low-to-Moderate</td></tr>
<tr><td>WWII British Heavy Anti-Aircraft Shells</td><td>Low-to-Moderate</td><td>Moderate</td><td>Low-to-Moderate</td></tr>
<tr><td>WWII British Land Service Ammunition</td><td>Low</td><td colspan="2">n/a</td><td rowspan="4">Low</td></tr>
<tr><td>WWII German 2kg Incendiary / HE Bombs</td><td>Low</td><td colspan="2">n/a</td></tr>
<tr><td>WWII German 1kg Incendiary Bombs</td><td>Low</td><td colspan="2">n/a</td></tr>
<tr><td>WWII British Light Anti-Aircraft Shells</td><td>Low-to-Moderate</td><td>Low</td><td>n/a</td></tr>
</table>

11 RISK MITIGATION RECOMMENDATIONS

BSI has identified an elevated UXO risk to some of the proposed works. The measures detailed below are recommended to mitigate the risk to ALARP level.

Risk Mitigation Measure	Recommendation
UXO Safety Awareness Briefings: To all personnel conducting intrusive works on Site. An essential part of the Health & Safety Plan for a site. Conforms to the requirements of CDM2015.	Prior to all intrusive works commencing.

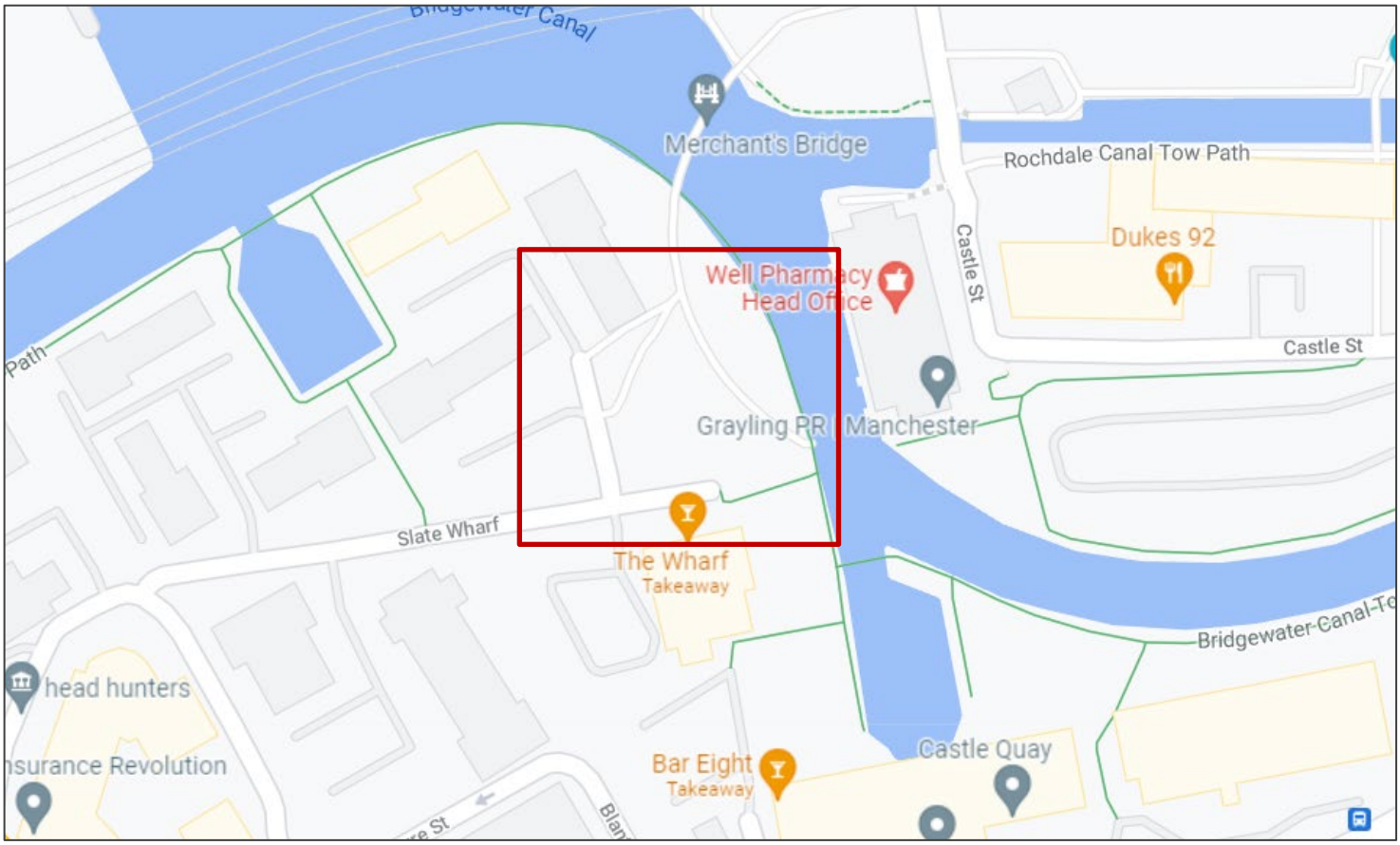
Figures: 1 - 6

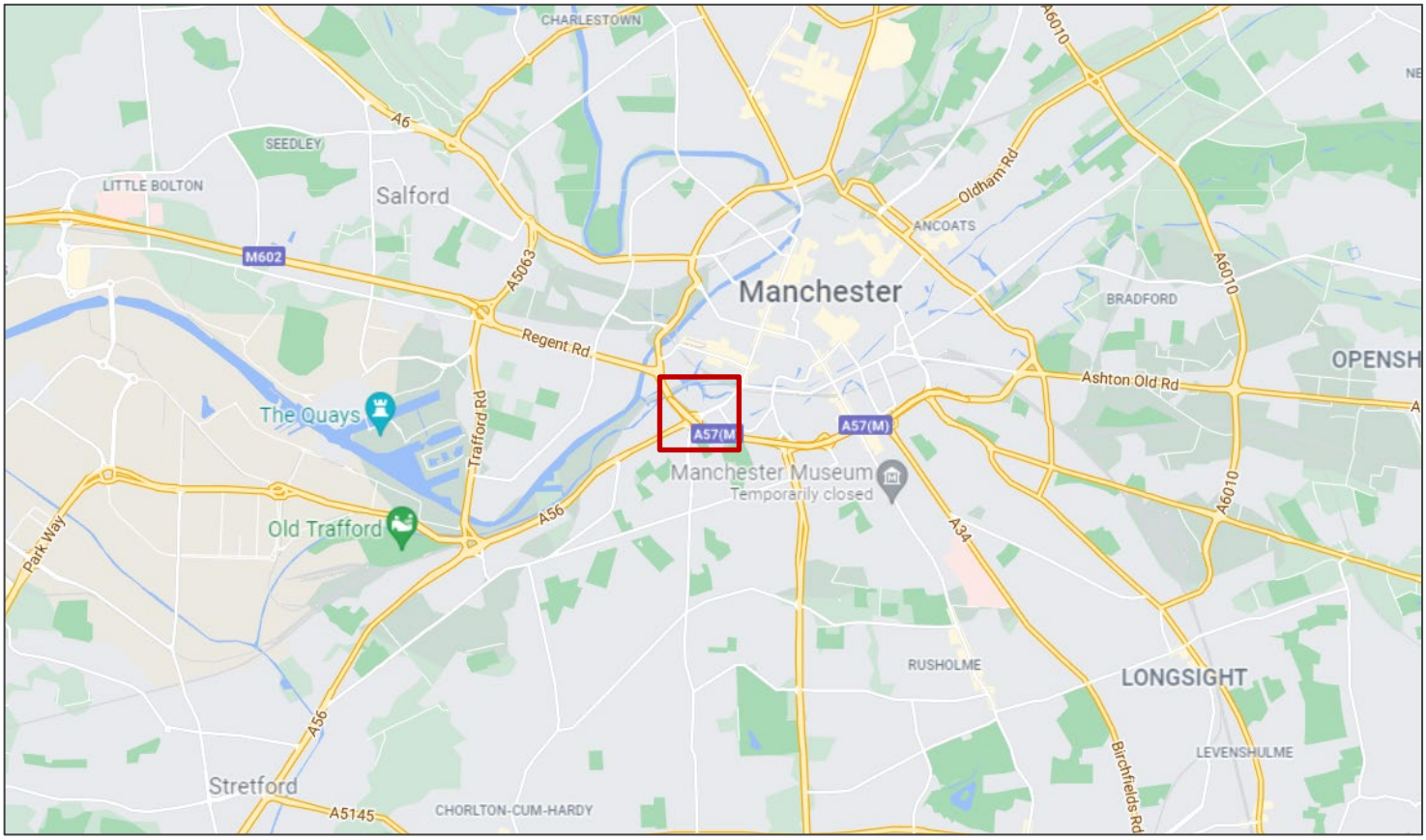
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www.brimstoneuxo.com
enquire@brimstoneuxo.com

Title:	Site Location Maps	FIGURE: 1





N	Project	Slate Wharf, Castlefield, Manchester	
	Client:	IGE Consulting Ltd	
	Report Ref:	DRA-21-1302	
	General Site Location	Info Source:	Google (open-source)

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Title:	Recent Aerial Photograph	FIGURE: 2

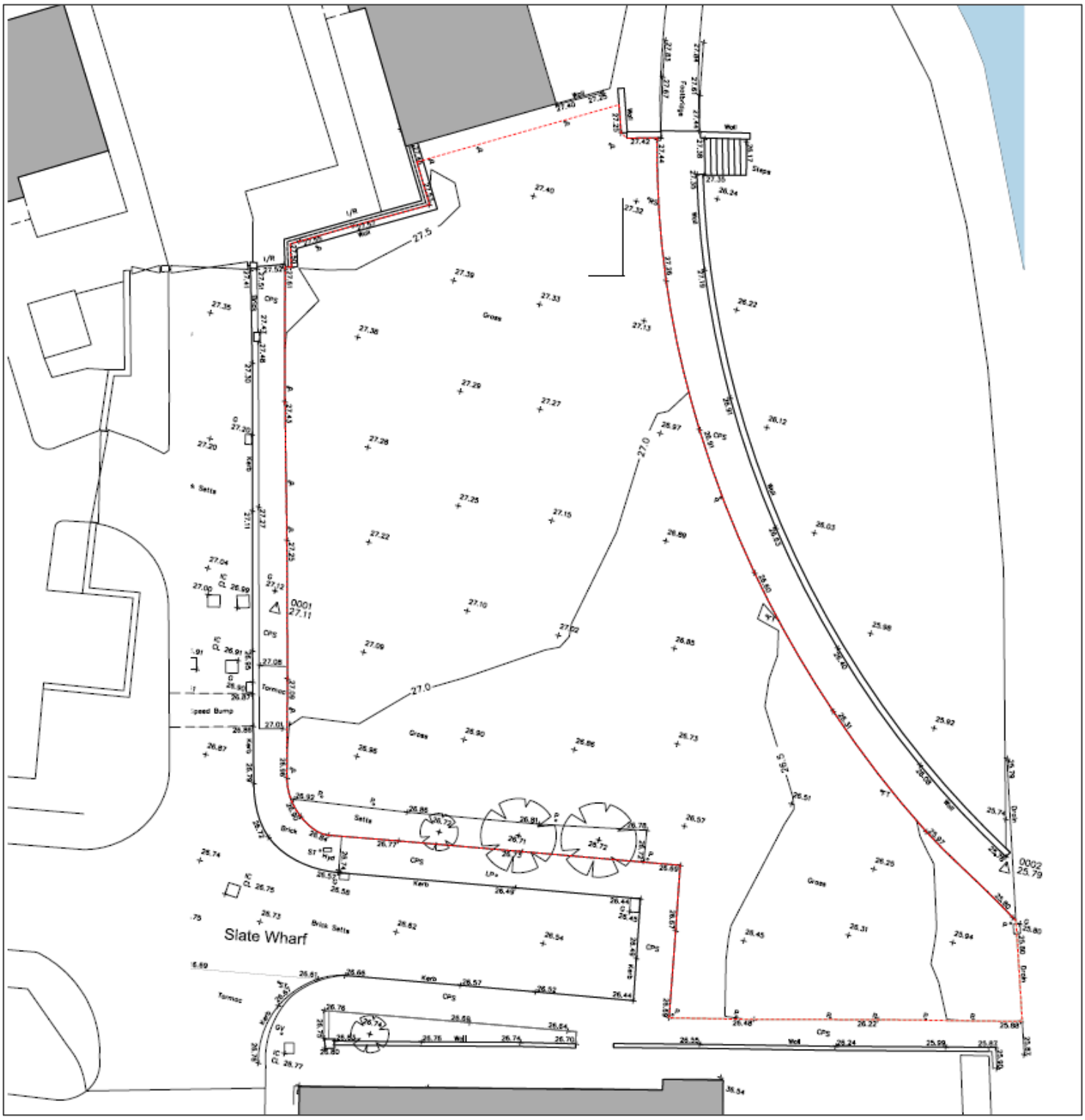


N

Project	Slate Wharf, Castlefield, Manchester
Client:	IGE Consulting Ltd
Report Ref:	DRA-21-1302
Approx. Site Boundary	Info Source: Google (open-source)

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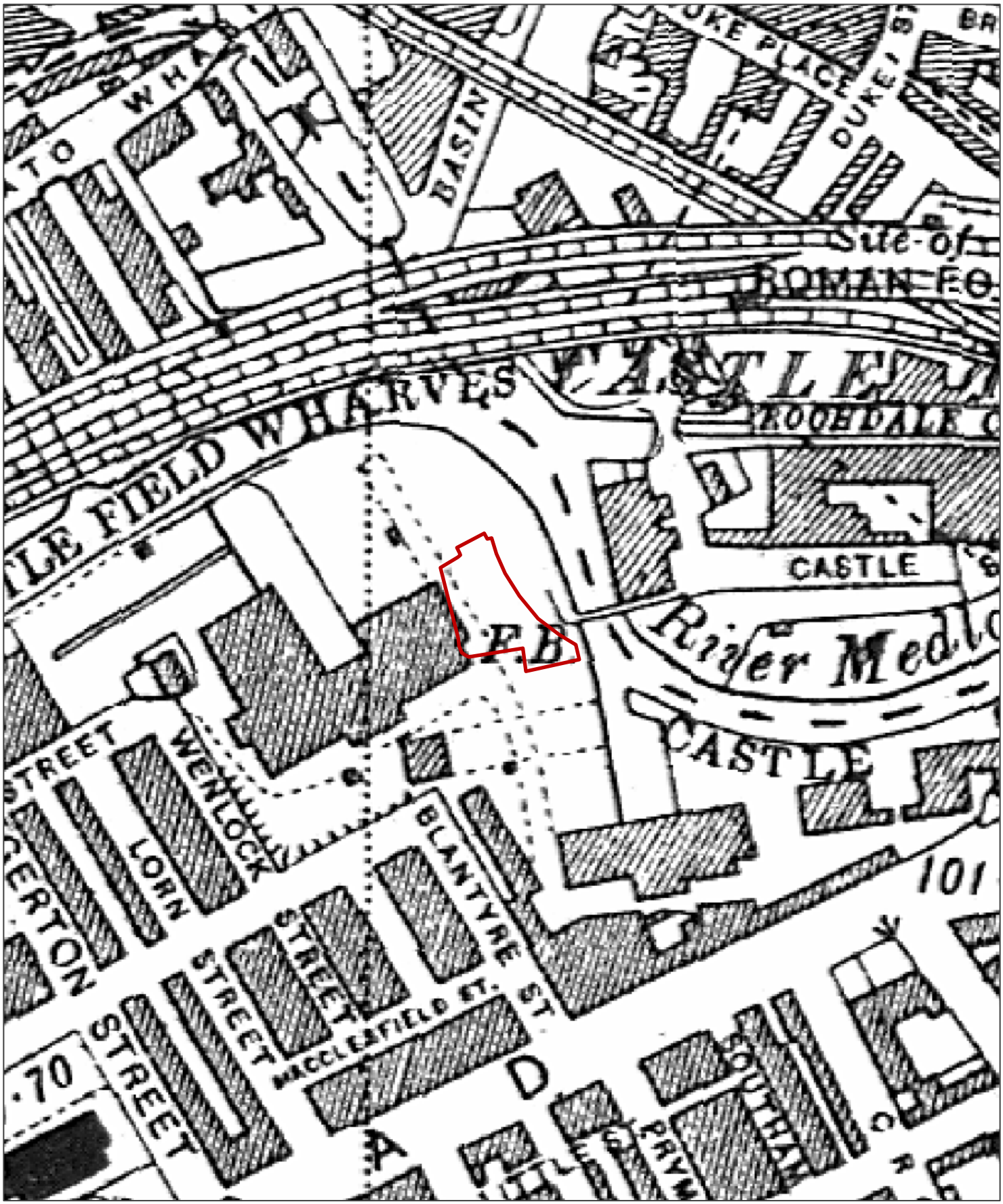
Title:	Existing Site Plan	FIGURE: 3



N	Project	Slate Wharf, Castlefield, Manchester	
	Client:	IGE Consulting Ltd	
	Report Ref:	DRA-21-1302	
	Site Boundary	Info Source:	IGE Consulting Ltd

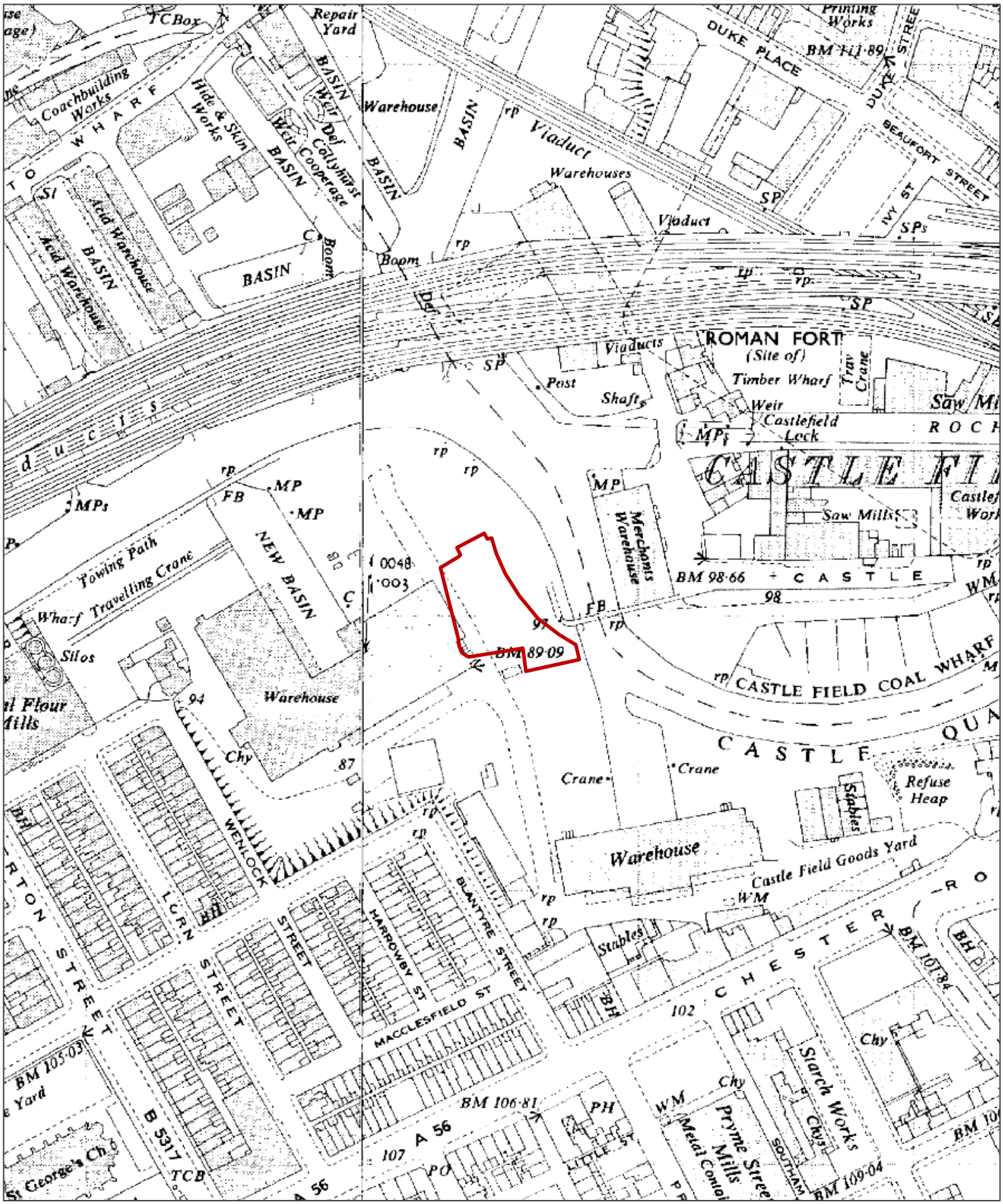
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Title:	Historical OS Mapping - 1939	FIGURE: 4.1



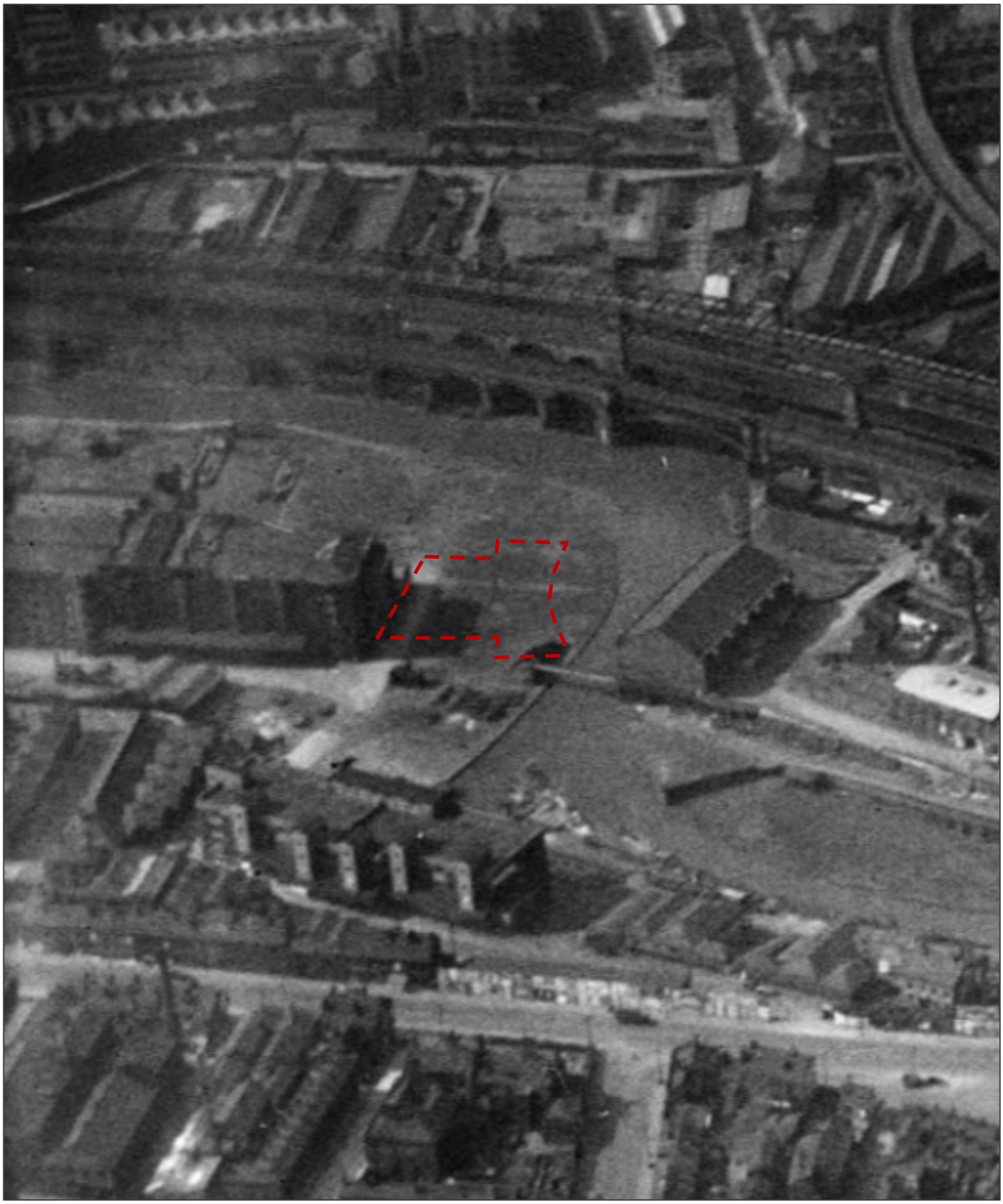
N	Project	Slate Wharf, Castlefield, Manchester	BRIMSTONE SITE INVESTIGATION
	Client:	IGE Consulting Ltd	Suite 6, Delta House Laser Quay, Culpeper Close Rochester, Kent ME2 4HU
	Report Ref:	DRA-21-1302	+44 (0) 207 117 2492 www.brimstoneuxo.com enquire@brimstoneuxo.com
	Approx. Site Boundary	Info Source: Landmark Maps	

Title:	Historical OS Mapping – 1950-1951	FIGURE: 4.2



N	Project	Slate Wharf, Castlefield, Manchester	BRIMSTONE SITE INVESTIGATION
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	Approx. Site Boundary	Info Source: Landmark Maps	

Title:	Historical Aerial Photography - August 1939	FIGURE: 5.1



N	Project	Slate Wharf, Castlefield, Manchester
	Client:	IGE Consulting Ltd
	Report Ref:	DRA-21-1302
	Approx. Site Boundary	Info Source: Britain From Above

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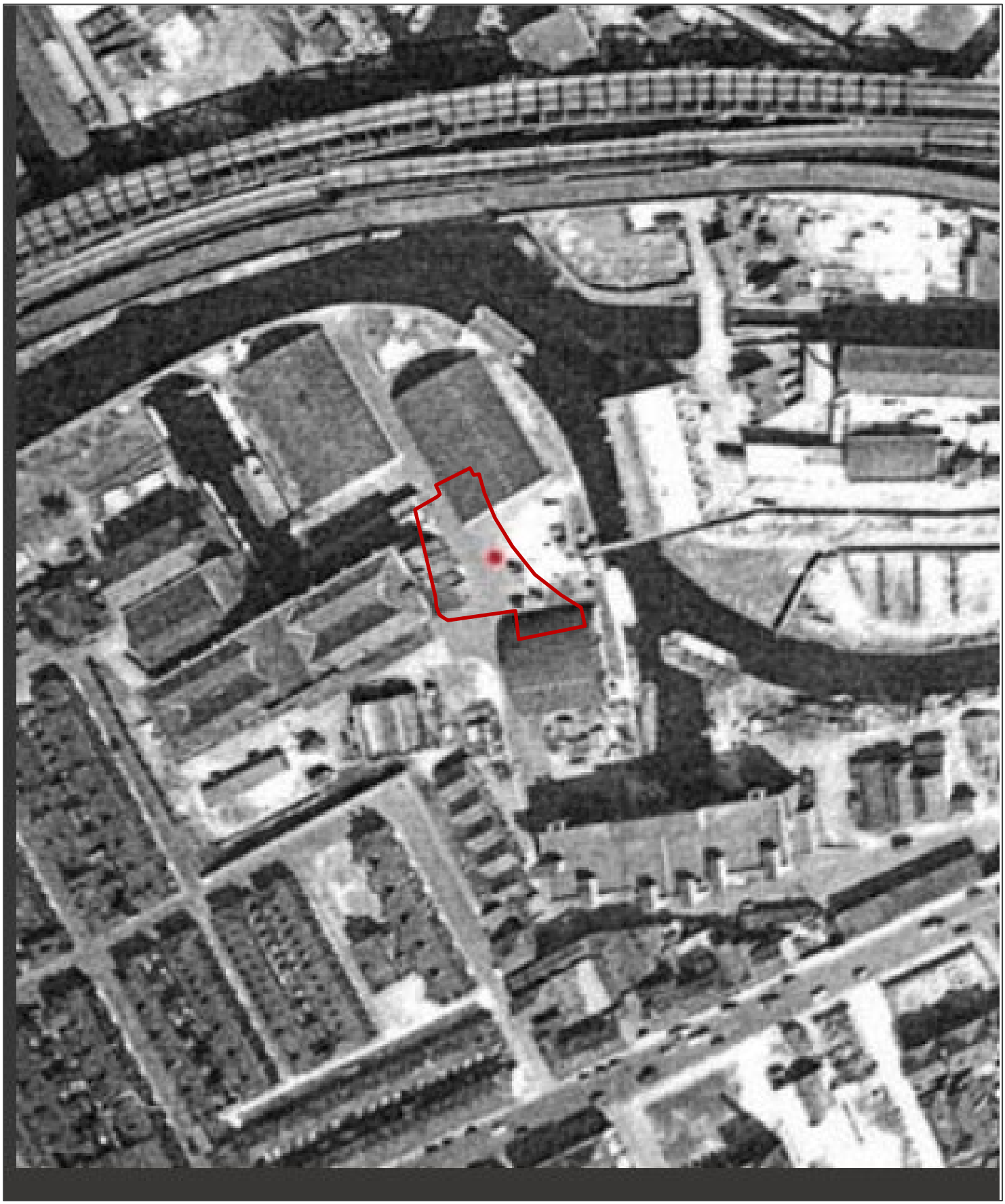
Title:	Historical Aerial Photography – 7th May 1946	FIGURE: 5.2



Project	Slate Wharf, Castlefield, Manchester	
Client:	IGE Consulting Ltd	
Report Ref:	DRA-21-1302	
	Info Source:	Historic England

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Title:	Historical Aerial Photography – 1952	FIGURE: 5.3

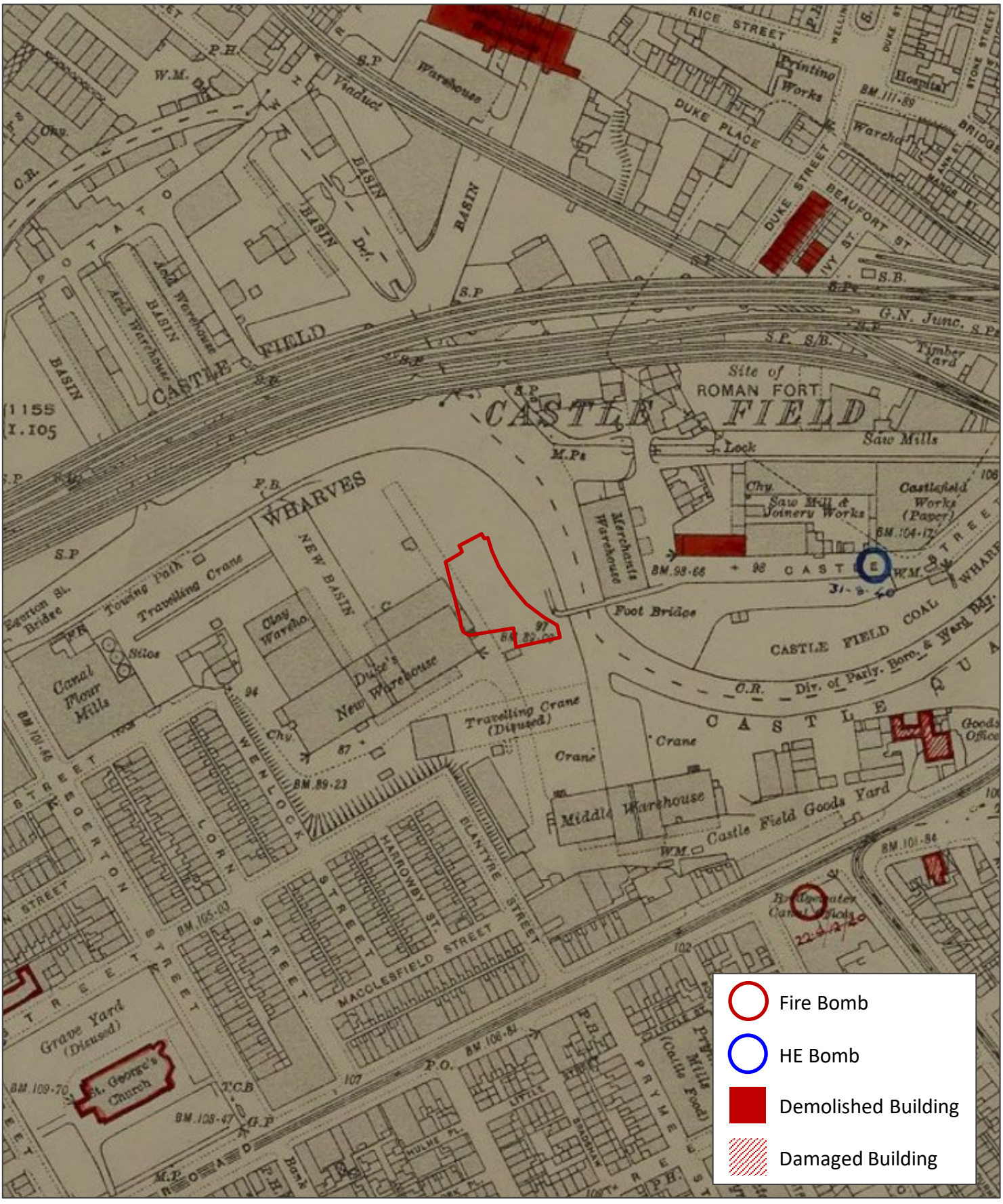


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Project	Slate Wharf, Castlefield, Manchester
Client:	IGE Consulting Ltd
Report Ref:	DRA-21-1302
Approx. Site Boundary	Info Source: Historic England

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Title:	Manchester Consolidated Bomb Plot and Damage Mapping	FIGURE: 6



N

Project	Slate Wharf, Castlefield, Manchester
Client:	IGE Consulting Ltd
Report Ref:	DRA-21-1302
Approx. Site Boundary	Info Source: Manchester City Archives

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Appendices: 1 - 5

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Recent German UXB Finds in the UK + Historical Analysis

- ***23rd May 2019*** - An SC250 (standard 250kg HE bomb) was found during shallow excavations at a building site in Kingston upon Thames, London. *Historical Analysis: The UXB landed in a small residential back garden belonging to an undamaged terraced house. It came to rest approximately 3 to 4m bgl.*
- ***15th May 2017*** - An SC250 (standard 250kg HE bomb) was found during shallow excavations at a building site in Aston, Birmingham. *Historical Analysis: The UXB landed in a small back garden belonging to a terraced house, part of a row. It J-Curved under a neighbouring garden and came to rest at just 1.4m bgl. NB: These houses had not sustained bomb damage.*
- ***2nd March 2017*** - A 250kg HE bomb was found during deep excavations at a building site in Brondesbury Park, London. *Historical Analysis: UXB landed in a large residential back garden. A single storey building was built on top of the UXB post-WWII.*
- ***19th January 2017*** - An SD50 (semi-armour piercing 50kg HE bomb) was dredged from the Thames during barge dredging works near Westminster Bridge, London.
- ***12th May 2016*** - A 500kg HE bomb was found buried just 1m below the playground of the former Royal High Junior School in Bath. *Historical Analysis: The UXB landed in a plot of neglected, unmaintained vegetation in between the school gym and main school building.*
- ***23rd September 2015*** - A 1,000kg HE bomb was encountered by a mechanical excavator on a building site in Paradise Street, Coventry. *Historical Analysis: the UXB landed in a large residential back garden occupied by dense vegetation. A two storey building was built on top of the UXB post-WWII.*
- ***10th August 2015*** - A 250kg HE bomb was found immediately beneath a basement floor during refurbishment works in Temple Street, Bethnal Green (London). *Historical Analysis: The UXB struck a house that had been damaged beyond repair during a previous air raid. The existing house was then built on top of UXB post-WWII.*
- ***21st May 2015*** - An SC50 (general purpose 50kg HE bomb) was found during deep excavations at a construction site in Wembley, London. *Historical Analysis: UXB landed in a large residential back garden.*
- ***23rd March 2015*** - A 250kg HE bomb was found during deep excavations at a building site in Grange Walk, Bermondsey (London). *Historical Analysis: inconclusive - reported UXB position is likely inaccurate.*

NB: Domestic UXO finds in the UK are too numerous to list. Between 2006 and 2009, over 15,000 items of British / Allied UXO (excluding small arms ammunition) were found on UK construction sites (CIRIA).

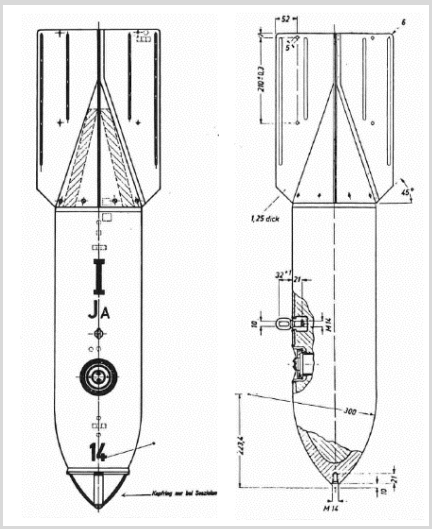
Initiation of WWII Allied Bombs

- ***6th January 2014*** - Mechanical excavator stuck a WWII bomb in Euskirchen (Germany) causing it to explode, killing the operator and injuring 13 more, two critically. The explosion was so large it damaged buildings 400m away.
- ***1st March 2013*** - During piling at a construction site in Ludwigshafen (Germany) a small buried WWII bomb exploded, injuring one worker.
- ***2nd June 2010*** - A British 500kg bomb detonated whilst being defused, killing three EOD engineers in Goettingen, Germany. The bomb was found as builders dug the foundations for a new sports hall. Several houses had their fronts blown off by the blast.
- ***19th September 2008*** - Seventeen people were injured and buildings were damaged when an excavator apparently drove over and set off a 250kg American bomb at a construction site in Hattingen, Germany.
- ***23rd October 2006*** - A construction worker breaking up tarmac at the side of a highway near the south-western German town of Aschaffenburg was killed when his machine struck and detonated a WWII bomb. In addition, the blast injured several motorists who were driving past.
- ***2006*** - A piling rig and dump truck were destroyed when a piling rig struck an Allied bomb on a construction site in Austria.
- ***2003*** - In the Austrian city of Salzburg, two people were killed while attempting to defuse a 250kg Allied bomb.
- ***1994*** - At a central Berlin construction site a piling rig struck a large WWII Allied bomb. 3 were killed and 14 more were injured. Dozens of cars in a 250m radius were wrecked, the top 10 floors of neighbouring office building collapsed and human remains were found 100m away.
- ***1990*** - In Wetzlar (Germany) two EOD engineers were blown up as they removed the detonator of an allied WWII UXB.

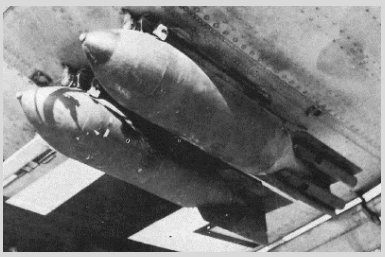
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SC 50

Bomb Weight:	40-54kg (110-119lb)
Explosive Weight:	25kg (55lb)
Filling:	TNT, Amatol or Trialen
Charge/Weight Ratio:	46%
Fuse Type:	Electrical impact fuse or mechanical delayed action fuse
Body Dimensions:	1,100mm length x 200mm diameter
Appearance:	Bomb body and tail painted grey/green with a yellow stripe on the tail unit. Steel construction.
Variants:	8 x variants. Additional fittings: Kopfring nose for limited penetration and Stabbo nose for dive-bombing.

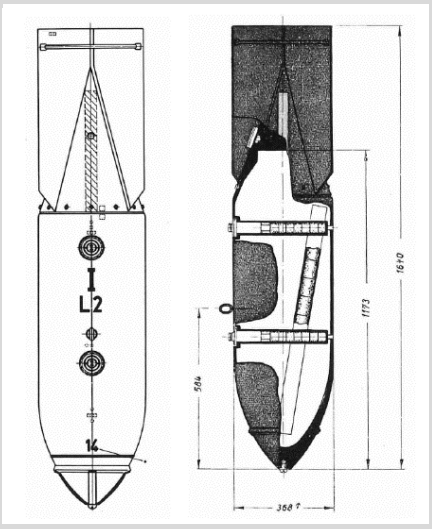






SC 250

Bomb Weight:	245-256kg (540-564lb)
Explosive Weight:	125-130kg (276-287lb)
Filling:	TNT, Amatol and Trialen mix
Charge/Weight Ratio:	44%
Fuse Type:	1 or 2 electrical impact fuse(s) or mechanical delayed action fuse(s)
Body Dimensions:	1,173mm length x 368mm diameter
Appearance:	Bomb body and tail painted grey/green with a yellow stripe on the tail unit. Steel construction.
Variants:	8 x variants. Kopfring nose for limited penetration. Stabbo nose for dive-bombing.

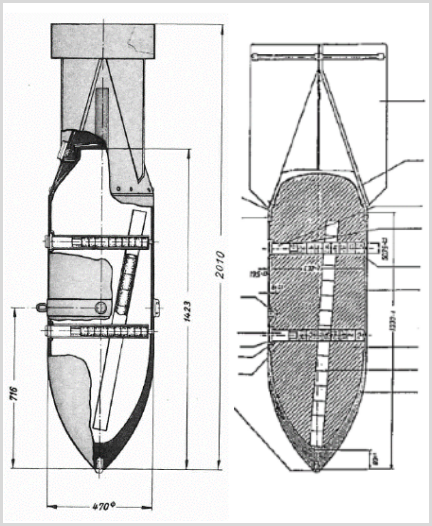






SC 500

Bomb Weight:	480-520kg (1,058-1,146lb)
Explosive Weight:	220kg (485lb)
Filling:	TNT, Amatol and Trialen mix
Charge/Weight Ratio:	44%
Fuse Type:	2 electrical impact fuses or mechanical delayed action fuses
Body Dimensions:	1,423mm length x 470mm diameter
Appearance:	Bomb body and tail painted grey/green or buff with a yellow stripe on the tail unit. Steel construction.
Variants:	3 x variants. Kopfring nose for limited penetration.



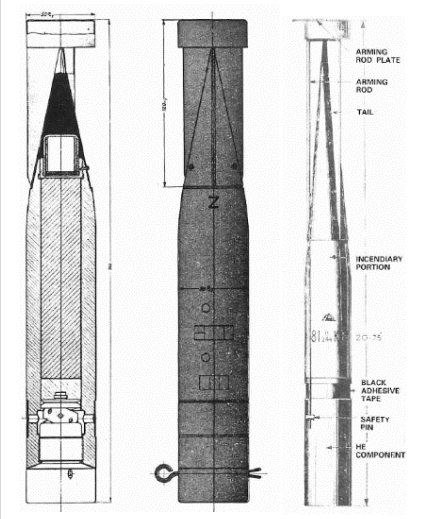




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B-1E Sub-Munition

Bomb Weight:	1-1.3kg (2.2-2.87lb)
Incendiary Weight:	680g (1.4lb)
Filling:	Thermite
Fuse Type:	Simple impact fuse
Body Dimensions:	247mm length x 50mm diameter
Appearance:	Grey body and dark green painted tail unit. Magnesium alloy case.
Operation:	Small percussion charge ignites Thermite (>1,000°C burn).
Variants:	Most common variant: B 2EZ (2kg) included a small HE charge
Remarks:	Drop containers varied in size. The smallest cluster bomb held 36 x B-1Es and the largest 620 x B-1Es.

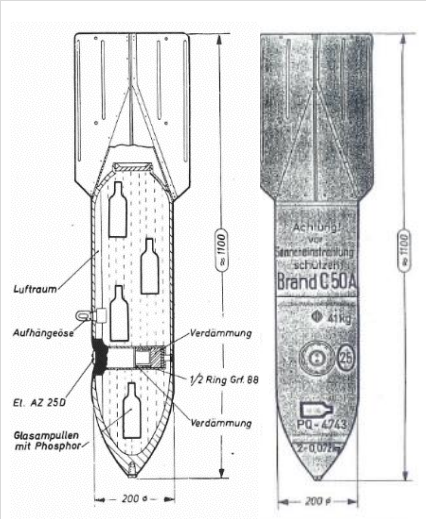






Brand C50

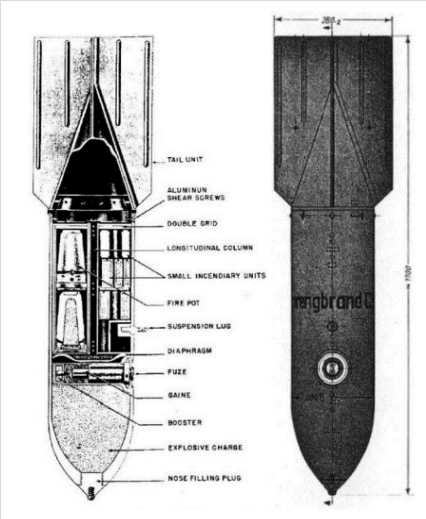
Bomb Weight:	41kg (90.4lb)
Incendiary Weight:	13kg (30lb)
Filling:	Main fill (86% Benzine, 10% Rubber) plus 4% Phosphorus in glass bottles
Fuse Type:	1 x electrical impact fuse
Bomb Dimensions:	762mm length x 203mm diameter
Appearance:	bomb body and tail painted grey or green with the rear of the bomb painted red and a red band around the centre of the body.
Variants:	C 50 B: 77% White Phos fill C 250 A: 87.7% Petroleum, 11.7% Polystyrene, 0.5% White Phos (185kg version)

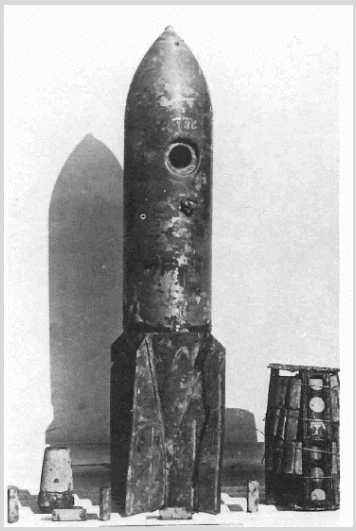




Spreng-Brand C50 - *Fire Pot*

Bomb Weight:	34kg (75lb)
Explosive Weight:	9kg (20lb)
Filling:	TNT burster charge, 6 x Thermite containers (fire pots) and 67 x small triangular incendiary elements.
Fuse Type:	1 x electrical impact fuses or aerial burst fuse
Bomb Dimensions:	711mm length x 203mm diameter
Appearance:	Bomb body and tail painted grey/green or pale blue with red base plug and red or green incendiary markings. Steel construction.
Operation:	A charge blows off the base plate, firing a plume of incendiary mixture 100 yds. Approx 1 second later the HE charge detonates.



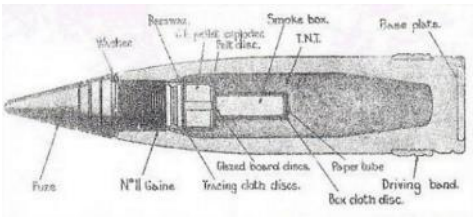


Project	**Slate Wharf, Castlefield, Manchester**	
Client:	**IGE Consulting Ltd**	
Report Ref:	**DRA-21-1302**	
	Info Source:	*W, Ramsey.1988 / various news sources*

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HAA Battery - 3.7" QF Shell

Shell Weight:	12.7kg
Shell Dimensions:	94mm x 438mm
Fill Weight:	1.1kg
Fill Type:	TNT
Fuse Type:	Mechanical Time Delay fuse
Appearance:	Grey body, copper driving bands, brass neck
Rate of Fire:	10 - 20 rpm
Ceiling:	9,000 - 18,000m
Variants:	HE or shrapnel shells. Note, the 4.5" gun was also used in an HAA role throughout the UK.

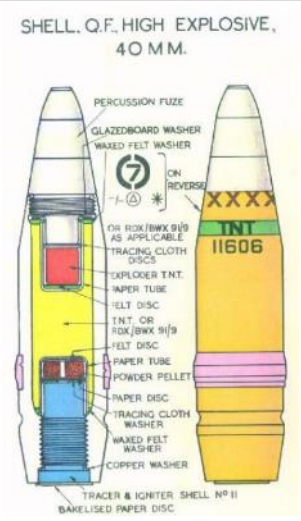






LAA Battery - 40mm Bofors Shell

Shell Weight:	0.84kg
Shell Dimensions:	40mm x 180mm
Fill Weight:	70g
Fill Type:	TNT
Fuse Type:	Impact fuse
Appearance:	Grey body, copper driving bands, brass neck
Rate of Fire:	120 rpm
Ceiling:	7,000m
Variants:	HE or AP shells. Both with rear tracer compartment



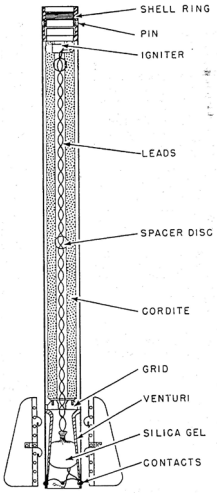






Z Battery - 3" U.P Rocket

Rocket Weight:	24.5kg
Warhead Weight:	1.94kg
Filling:	TNT warhead. Black Powder solid fuel rocket motor.
Fuse Type:	Mechanical Time Delay fuse
Rocket Dimensions:	1,930mm x 76mm
Ceiling:	6,770m
Operation:	Fired from single, tandem and (later) 36 x rail launchers (Z Batteries). Limited use throughout the UK.





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AA	*Anti-Aircraft (defences)*
AFS	*Auxiliary Fire Service*
AP	*Anti-Personnel*
ARP	*Air Raid Precautions*
ASW	*Anti-Submarine Warfare*
BDU	*Bomb Disposal Unit (historic term for EOD)*
Bgl	*Below Ground Level*
EOC	*Explosive Ordnance Clearance*
EOD	*Explosive Ordnance Disposal*
FP	*Fire Pot (German bomb)*
GI	*Ground Investigation*
HAA	*Heavy Anti-Air (gun battery)*
Ha	*Hectare (10,000m2)*
HE	*High Explosive*
IB	*Incendiary Bomb*
Kg	*Kilogram*
LAA	*Light Anti Air (gun battery)*
LCC	*London County Council*
LRRB	*Long Range Rocket Bomb (V2)*
LSA	*Land Service Ammunition*
Luftwaffe	*German Air Force*
OB	*Oil Bomb (German bomb)*
PM	*Parachute Mine (German bomb)*
RAF	*Royal Air Force*
RFC	*Royal Flying Corps*
RN	*Royal Navy (British)*
RNAS	*Royal Naval Air Service*
ROF	*Royal Ordnance Factory*
SAA	*Small Arms Ammunition*
SD2	*2kg AP bomb (German bomb)*
SI	*Site Investigation*
U/C	*Unclassified (German) bomb*
UP	*Unrotating Projectile (British 3" AA rocket)*
USAAF	*United States Army Air Force*
UX	*Unexploded*
UXB	*Unexploded Bomb*
UXO	*Unexploded Ordnance*
V1	*German Flying (pilotless) bomb - "Doodlebug"*
V2	*German LRRB - "Big Ben"*
WAAF	*Women's Auxiliary Air Force*
WWI	*World War One*
WWII	*World War Two*

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- ***Bates. H. E***, Flying Bombs Over England, Frogletts Publications Ltd, 1994.
- ***Bulloch. G***, Steeds J E, Green K, Sainsbury M G, Brockwell J S & Slade N J, Land Contamination: Technical Guidance on Special Sites: MoD Land, Environment Agency, 2001.
- ***Castle. I,*** London 1914-17: The Zeppelin Menace, Osprey Publishing Ltd, 2008.
- ***Castle. I,*** London 1917-18: The Bomber Blitz, Osprey Publishing Ltd, 2010.
- ***CIRIA***, C681: Unexploded Ordnance (UXO), A Guide for the Construction Industry, 2009.
- ***Clarke. N. J***, Luftwaffe Target Reconnaissance, German Aerial Photography 1939-1942, 1996.
- ***Clarke. N. J***, Adolf's British Holiday Snaps: Luftwaffe Aerial Reconnaissance Photographs of England, Scotland and Wales, 2012.
- ***Cocroft. W. D***, Dangerous Energy, Historic England, 2000.
- ***Dobinson. C. S,*** AA Command: Britain's Anti-Aircraft Defences of the Second World War, Methuen Publishing Ltd, 2001.
- ***Dobinson. C. S***, Fields of Deception - Britain's Bombing Decoys of World War II, Methuen Publishing Ltd, 2013.
- ***Fleischer. W***, German Air-Dropped Weapons to 1945, Midland Publishing. 2004.
- ***Jappy. M. J,*** Danger UXB: The Remarkable Story of the Disposal of Unexploded Bombs during the Second World War. Channel 4 Books, 2001.
- ***Morris. J***, German Air Raids on Britain: 1914-1918, Nonsuch Publishing, 2007.
- ***Price. A***, Blitz on Britain 1939-45, Sutton Publishing Ltd, 2000.
- ***Ramsey. W,*** The Blitz Then and Now: Vol 1, Battle of Britain Prints International Limited, 1987.
- ***Ramsey. W,*** The Blitz Then and Now: Vol 2, Battle of Britain Prints International Limited, 1988.
- ***Ramsey. W,*** The Blitz Then and Now: Vol 3, Battle of Britain Prints International Limited, 1990.
- ***Whiting. C***, Britain Under Fire: The Bombing of Britain's Cities 1940-1945, Pen & Sword Books Ltd, 1999.

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STAGE 1 PRELIMINARY UXO RISK ASSESSMENT

REPORT REF: PRA-21-1456 | Revision: 0

Client: IGE Consulting Ltd
Project: Slate Wharf, Castlefield, Manchester
Date: 12/05/2021

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INTRODUCTION

The Stage 1 Preliminary Risk Assessment is an initial screening assessment designed to highlight any sources of unexploded ordnance (UXO) with the potential to contaminate a given site.

The aim of the Stage 1 assessment is to identify or discount the need for further detailed research - a Stage 2 Detailed UXO Risk Assessment.

This desktop assessment has been researched and written by a dedicated Researcher / Risk Assessor and produced in accordance with the CIRIA C681 Guidelines: 'Unexploded Ordnance, a Guide for the Construction Industry' (published in 2009).

In preparation for this assessment, original wartime records, historic OS mapping and the *Brimstone UXO Sources Database* have been reviewed. The latter incorporates multiple datasets plotting the positions of a variety of domestic military sites and confirmed historic German bombing targets.

The Stage 1 Preliminary Risk Assessment considers the following:

1. The Proposed Works
2. Enemy Action during WWI and WWII
3. British / Allied Military Activity
4. Historic Site Occupancy
5. Risk Mitigating Factors

THE SITE

The Site (centred on the National Grid Ref: SJ 83047 97508) is located in the Castlefield area of Manchester, within Greater Manchester, approximately 360m west of Deansgate railway station. The Site comprises open ground consisting of grass. It is bound to the north by multi-storey residential apartments, to the east by hard surfaced ground and a canal, to the south by The Wharf public house and to the west by Slate Wharf.



THE PROPOSED WORKS

An SI is proposed, comprising five No. 100mm diameter boreholes to 5.5m bgl.
Development works comprise a 4 storey residential apartment block. Piled foundations may be required.

ENEMY ACTION DURING WWI AND WWII

Potential Source of UXO	Significant?	Details	
WWI German Bombing	✗	No raids affected Manchester during WWI.	
WWII German Bombing	✓	British District Bombing Density Statistics	The Site is located in the WWII-era County Borough of Manchester, which sustained 27 bombs / 1,000 acres, a low-to-moderate bombing density. The Site was located within 500m of the administrative border area of the WWII-era County Borough of Salford, which sustained 86.7 bombs / 1,000 acres, a moderate-to-high bombing density.
		Evidence of bomb strikes / damage	Evidence of bombing identified approximately 290m to the north-east in the vicinity of Rice Street.

			No historic mapped evidence of bomb damage in the immediate vicinity.
		Local Bombing Decoy Sites	None within a significant distance of the Site. The closest was located approximately 8.9km south-east of the Site.
		Local German Bombing Targets	Luftwaffe target photography indicates that Salford docks, approximately 1.9km west, was identified as a primary target. Industrial facilities comprising the Site and its immediate surrounds may also have been identified as a target.
WWII German Cross Channel Artillery Shelling	×	n/a	
BRITISH / ALLIED MILITARY ACTIVITY			
Potential Source of UXO	**Significant?**	**Details**	
WWII Home Guard (HG) activity	×	Soldiers of the 48th, 49th, 50th, 56th, 57th, 58th, 59th, 61st and 63rd Lancashire (Manchester) HG Battalions will have been active locally during WWII. However, they are unlikely to have accessed the Site or utilised it in any significant way.	
Site requisitioned for wartime military use	×	n/a	
Existing or historic Army or RAF training area / weapons range	×	n/a	
Existing or historic military bases and other installations	×	n/a	
Existing or historic munitions or explosives factories	×	n/a	
Existing or historic military storage depots	×	n/a	
Existing or historic military defensive fortifications	×	n/a	
WWII light and / or heavy anti-aircraft (LAA and HAA) fire	✓	Numerous (<30) permanent HAA batteries were active within range of the Site during WWII. LAA guns likely defended vulnerable points within the city too. Luftwaffe activity in the region was relatively frequent. It is possible that an unexploded AA shell struck the Site.	
WWII pipe-mined locations and beach minefields	×	n/a	
SITE HISTORY			
What was the Site occupancy historically, especially during WWI and WWII?	During WWII, the Site comprised undeveloped ground possibly used as a timber yard, as identified in pre-WWII OS mapping, assumed to be associated with industrial facilities situated in the immediate vicinity.		
RISK MITIGATING FACTORS			
Post-conflict ground works	By 1953, a warehouse had been constructed encompassing the north of the Site. By 1969, the warehouse had been extended southwards, occupying the rest of the Site as part of a depot. By 1994, the warehouse had been demolished. Due to the low-rise nature of this development, the associated excavations for foundations were likely to shallow depths. No deep excavations of WWII-era soil are likely to have occurred.		
Likelihood of UXO remaining	The risk associated with (any) very shallow and shallow buried UXO will have been largely mitgated on Site. The risk associated with (any) deep buried UXO almost certainly remains unmitigated.		

CONCLUSIONS
German UXO: • Manchester was subjected to medium and small-scale air raids during WWII. Although the wartime figures for the wider borough suggest a low-to-moderate bombing density, the Site was positioned within the city centre target area and therefore the local bombing density was likely higher than this figure suggests. • Furthermore, confirmed Luftwaffe targets were located within 2km of the Site (chiefly Salford docks). Bombing incidents are recorded within a 500m radius of the Site. Therefore, it is quite possible that wayward bombs (potential UXBs) were dropped in the immediate vicinity of the Site. • The Site was occupied by open ground during WWII, possibly used as a timber yard, and may have experienced infrequent levels of access. At this stage, the possibility of minor or moderate damage to the Site cannot be discounted. Subsequent UXBs falling in any areas of damage may have been overlooked and remained in situ. • As piling works may be required, the project could potentially be exposed to encountering a large HE UXB. • The proposed SI works will disturb a relatively small volume of soil, thereby reducing the probability of a UXB encounter.
British / Allied UXO: • No evidence of significant military activity specifically on Site has been found and none is likely to have occurred. • It is quite possible that an unexploded British AA shell struck the Site during WWII, however any such incident will have likely been reported at the time. • The proposed SI works will disturb a relatively small volume of soil, thereby reducing the probability of a UXO encounter.

RECOMMENDATION(S)	
SI Works	A Stage 2 Detailed Risk Assessment is not considered necessary prior to SI works commencing. However, the possibility of UXO remaining on Site cannot be completely ruled out at desktop stage. Therefore, a **UXO Safety Awareness Briefing** to all personnel conducting SI works would be considered prudent.
Development Works	A **Stage 2 Detailed Risk Assessment** is recommended to elucidate the risk to the proposed works.

APPENDIX 13

UNITED UTILITIES RISK ASSESSMENT

Supplementary guidance for the selection of water pipes in land potentially affected by contamination

United Utilities
Water for the North West

Introduction

In January 2011, UK Water Industry Research (UKWIR) published "Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites" (Ref 10/WM/03/21; the 'UKWIR Guidance'). Its aim is to ensure that the correct materials are selected for water pipes and components to be used below ground in brownfield sites to protect the quality of drinking water whilst taking into account the service life of the water distribution system. It supersedes the Water Regulations Advisory Scheme (WRAS) Information and Guidance Note 9-04-03 "Laying Pipes in Contaminated Land" which has been withdrawn.

The UKWIR Guidance is for use by developers, self-lay organisations, water companies and consultants when planning, designing and constructing water mains and/or services in brownfield sites. It defines brownfield sites as "land or premises that have previously been used or developed. They may also be vacant or derelict. However, they are not necessarily contaminated." The UKWIR Guidance states that it does not apply to greenfield sites; however, we consider this supplementary guidance and the relevant sections of the UKWIR guidance as being equally suitable for application to those greenfield sites considered to be potentially affected by contamination. Where greenfield sites are not affected by contamination a preliminary risk assessment (see below) will suffice.

The UKWIR Guidance also states that there should be no departure from its provisions *"except where formally approved by the Water Company, such departure being technically justifiable or representing advances in knowledge or product development"*.

We have adopted the UKWIR Guidance in principle and produced this company specific supplementary guidance (the 'UUW Guidance') which includes the Risk Assessment for Water Pipes (the 'RA').

This guidance does not cover operative safety, health exposure modelling or accidental pipe damage.

Risk Assessment for Water Pipes in Land Potentially Affected by Contamination

Any application for new water supplies to a development (construction of new properties, or renovation or conversion of existing buildings) in land potentially affected by contamination shall include a completed RA.

As a minimum a desk study (preliminary risk assessment) shall be provided with the RA in accordance with the framework in Environment Agency publication "Model Procedures for the Management of Land Contamination" (ref: CLR11) that sets out whether the land through which the pipes are to be laid may be affected by contamination. The application of the source, pathway, receptor concept will be an integral part of any pipeline risk assessment. For each potential source (the contamination) and each potential receptor (the water pipe), consideration shall be given to whether a potential pathway between source and receptor exists, or may exist in the future, linking the two. There are normally only three pathways by which contamination may come into contact with water pipes. These are direct contact with the soil or backfill, an excessive vapour phase or a contaminated groundwater regime. If none of these conditions exist on site (adopting the source, pathway, receptor concept) then it is likely that extended and/or targeted soil testing will not be required and a simple risk assessment will suffice. For those sites where land may be affected by contamination appropriate testing shall be undertaken on the materials within which the pipes are to be laid, whether that be existing ground materials, remediated materials or imported capping materials. The testing requirements are as described in the following section.

The signatories of the Water Supply Application Form and the RA must ensure that all assessments of land condition have been carried out in accordance with applicable current standards and guidelines by or under the direction of a suitably qualified competent person.

We require the competent person to be a) a chartered member of an appropriate professional body (such as the Institution of Civil Engineers, the Geological Society of London or the Royal Institution of Chartered Surveyors) with relevant experience of investigating contaminated sites or b) a Specialist in Land Condition (SiLC) with appropriate geo-environmental experience.

How to contact us about the information in this leaflet



DeveloperServicesWater@uuplc.co.uk



0345 072 6067
Opening hours:
8am-5pm Mon to Thurs
8am-4.30pm Fri

Testing Requirements

The soil, rock and if appropriate groundwater tests that are required on all sites where the potential for organic contamination has been identified in the desk study and where water pipes are proposed to be laid must be accredited by United Kingdom Accreditation Service (UKAS) as a minimum and where commercially available the Environment Agency's Monitoring Certification Service (MCERTS). These accredited tests should be undertaken for:

Banded hydrocarbons EC5-EC10, EC10-EC16, EC16-EC40 (Total aliphatic and aromatic hydrocarbons for each banding may be summed). Aliphatic/aromatic fractionation and subsequent banding may be required should a more detailed site specific risk assessment be undertaken. The bandings have been amended to take into account readily available laboratory tests. The equivalent carbon number (EC) is used to assess petroleum hydrocarbon mixtures rather than the actual number of carbon atoms in the molecule in line with guidance issued by the Environment Agency (2005).

Volatile organic compounds (VOCs) (method by head space or purge & trap GCMS) with tentative identification of compounds greater than 20µg/kg. The method used should be capable of detecting a wide range of compounds listed in US EPA Method 8260C or similar. The method should include analysis of naphthalene.

BTEX (Benzene, toluene, ethyl benzene and xylenes) plus MTBE (Methyl-tertiary butyl ether) (by head space GCMS)

Semi-Volatile Organic Compounds (SVOCs) (method by GCMS) with tentative identification of compounds greater than 20µg/kg The method used should be capable of detecting the compounds listed in US EPA Method 8270D or similar. The total concentration of SVOCs excludes polycyclic aromatic hydrocarbons, ethers, nitrobenzene, ketones, aldehydes, phenols, cresols and chlorinated phenols. Phenols, cresols and chlorinated phenols which are detected by the SVOC analysis are given their own assessment criteria.

We do not consider Table G1 and Table 3.1 of the UKWIR Guidance to be a definitive guide for assessing total concentrations. Table 1 in the RA below replaces Table 3.1 of the UKWIR Guidance.

Where previous site uses include the use, storage, treatment, disposal or manufacture of any of the following, appropriate testing for these substances will be required:

- Ethers, nitrobenzene, ketones, aldehydes and amines. Note that the presence of amines on any site at the proposed pipe depth +/- 1.0m precludes the use of polyethylene. The methods of analysis and method of calculation of total concentrations of these compounds will need to be agreed with UUW.

To comply with the testing requirements, the suites of tests that are required on all brownfield sites where wrapped steel, wrapped ductile iron or copper pipes are to be laid as minimum must include:

- pH, Conductivity and redox potential

Sufficiency of Testing

Water pipes are normally laid at between 0.75 and 1.35m from finished ground level to crown of pipe. Samples taken and tested must represent both a) the soil in which the water pipes are to be laid and b) the soil down to at least 500mm below the underside of the proposed pipe. Where the proposed depth of the pipes is unknown at the time of application, soil samples representative of the ground condition between surface level and 1.5m below finished ground level shall be taken as a minimum. Where appropriate (see UKWIR Guidance) groundwater sampling and groundwater monitoring will also be necessary. Photo-ionisation detection (PID) monitoring along the proposed route of the pipeline may be employed, though this does not provide a definitive guide to the suitability of water pipe materials.

Where required a sufficient number of test results should be obtained from the material in which the pipes are to be laid. CLAIRE/CIEH 2008 "Guidance on comparing soil contamination data with a critical concentration" may be used, where appropriate, to justify the number of soil samples tested; however, this statistical model should not be used on heterogeneous materials or used to average test results from different types of materials.

Further guidance on representative sampling is contained within BS10175:2011 Code of Practice for the Investigation of Potentially Contaminated Sites, the Department of the Environment's Contaminated Land Research Report "Sampling strategies for contaminated land" prepared by The Centre for Research into the Built Environment, Nottingham Trent University (Ref: CLR 4; 1994) and the Environment Agency's "Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination" (ref: R&D Technical Report P5-066/TR; 2000).

Where remediation has been carried out on the site, the test results obtained from validation samples will be used in the assessment. Where a horizontal capping system has been or will be employed using materials spread across a site, sufficient samples will need to be taken to characterise the capping material used and the results presented to UUW. However, the sufficiency of sampling on the horizontal capping system, in which the pipeline will be placed, may be assessed on the basis of the source, quantity and type of materials used.

Detection Limits

Only positive concentrations, ie those above the limit of detection should be used in summation of VOC and SVOC (or other test groups of compounds ie phenols, cresols and chlorinated phenols). Laboratory methods shall provide a minimum limit of detection of 10µg/kg for each individual VOC or SVOC (or other test groups of compounds) quantitatively detected in accordance with the methods described above. For tentatively identified compounds (TICs), only those compounds with a concentration of 20µg/kg or greater shall be used in the summation of VOC and SVOC (or other test groups of compounds).

Protective Measures

Where polyethylene, ductile iron, steel or copper pipes are to be laid on a brownfield site or other land potentially affected by contamination (whether or not it has been remediated) and where the concentrations exceed the generic guideline values set out in Table 1 of the RA, the developer shall provide either:

a) a robust risk assessment to show how any contaminants will not significantly impact on proposed water supplies or buried assets over the lifetime of the assets; or

b) more suitable pipe materials; or

c) an engineering solution to protect the pipe work backed up by an adequate assessment of the risk.

Liquid free phase product (e.g. oil or free solvent layers) shall not remain in the ground or groundwater in the vicinity of water pipes, whether barrier pipe or any other pipe materials are used.

When designing pipe routes on land potentially affected by contamination, new preferential contamination pathways along the route of new water pipes shall not be created. Particular measures may be required to prevent the possible migration of contamination through pipe bedding and into controlled waters.

References

BS10175: 2011
"Investigation of Potentially Contaminated Sites Code of Practice"

CLAIRE/CIEH
"Guidance on comparing soil contamination data with a critical concentration" 2008

Department of the Environment Contaminated Land Research Report
"Sampling strategies for contaminated land" prepared by The Centre for Research into the Built Environment, Nottingham Trent University (Ref: CLR 4) 1994

Environment Agency
"Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination"
(ref: R&D Technical Report P5-066/TR) 2000

Environment Agency
"Model Procedures for the Management of Land Contamination" (ref: CLR11), 2004

Environment Agency P5-080/TR3
"The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils", 2005

UK Water Industry Research (UKWIR)
"Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites" (Ref 10/WM/03/21) January 2011

Water Regulations Advisory Scheme (WRAS) Information and Guidance Note 9-04-03
"Laying Pipes in Contaminated Land" 2002

Frequently asked questions

Why has UUW published supplementary guidance to the 'UKWIR Guidance for the Selection of Water Pipes to be used in Brownfield Sites'?

UUW agrees with the UKWIR Guidance in principle; we have published supplementary guidance to clarify some of the areas in which it will operate.

Does the UKWIR Guidance only apply to 'brownfield sites'?

Yes, the UKWIR Guidance does apply to brownfield sites; in addition United Utilities Water will apply this guidance and the UUW supplementary guidance to any greenfield sites which are potentially affected by contamination.

Who is responsible for completing/ signing the Risk Assessment for Water Pipes (RA)?

This may be the Developer, the Developers representative, or the competent person directing the land assessment. The signatory of the Risk Assessment for Water Pipes (RA) must ensure that all land assessments have been carried out in accordance with current standards and guidelines by or under the direction of a suitably qualified competent person. For water supply applications on land potentially affected by contamination, UUW requires the competent person to be either a chartered member of an appropriate professional body (such as the Institution of Civil Engineers, the Geological Society of London or the Royal Institution of Chartered Surveyors) with relevant experience of investigating contaminated sites or a Specialist in Land Condition (SiLC). This level of competency is intended to promote good practice and high professional standards and is no greater than that required for planning purposes by Local Authorities.

Do we need to agree the number and location of soil samples with the Water Company as indicated by the UKWIR guidance following the Preliminary Risk Assessment (PRA)?

Where a preliminary risk assessment (PRA) highlights the need for a site investigation UUW considers it is a responsibility of the qualified competent person directing the land assessment to determine the location and frequency of sampling. UUW's role would be to confirm that the appropriate choice of pipe material has been made on the basis of the information provided.

What do we do if the pipe route is not known when the Site Investigation report is commissioned?

Where the route of the pipe is not known at the site investigation stage, then any resultant pipe selection needs to take account of any contamination found on the site. Consideration should be given to identifying the route and depth of the pipeline at the site investigation stage to avoid unnecessary testing.

Is it acceptable not to undertake a site investigation and specify the use of barrier pipe which seems to be suitable for all conditions?

Not all brownfield land is contaminated, and because of that a default to barrier pipe is not an acceptable approach to UUW, due to the possibility of higher installation and future maintenance costs. The approach as to whether a site investigation is needed should be risk based. For those sites where land may be affected by contamination appropriate testing shall be undertaken on the ground materials within which the pipes are to be laid, whether that be existing ground materials, remediated materials or imported capping materials.

Examples where defaulting to barrier pipe would not be acceptable:

- Where a capping layer (non-contaminated) is introduced within which the pipes will be installed.
- Sites with a potential low risk for contamination.
- Where liquid free phase product (e.g. oil or free solvent layers) is in the ground or groundwater in the vicinity of water pipes.
- Where the route of the pipe could be diverted to another suitable location free from contamination.

Are UUW employees who will assess the Design Proposals for contaminated sites suitably qualified?

It is the role of the Developer's suitably qualified competent person to deal with or direct the assessment of land. UUW's role is to assess the Risk Assessment for Water Pipes and supporting Site Assessment Report (SAR) which is provided with any new water supply application (ie. it has been provided in the correct format, proposals for pipe selection are included, the methodology is in line with the UKWIR Guidance and UUW Supplementary Guidance, it has been directed by a suitably qualified competent person etc.). If UUW do need to provide assistance or information in deciding pipe materials then the assessment would be carried out under the direction of a suitably qualified competent person.

What happens to existing PE that is in the ground under the "old" guidelines?

The latest UKWIR guidance and UUW's supplementary guidance are intended to be used to decide what pipe materials will be used for new water mains and services. It will have no effect for developers with regard to any parts of UUW's existing network.

Will the Developer be required to submit a fully completed Risk Assessment for Water Pipes (RA) and supporting Site Assessment Report (SAR), including pipe material recommendation, for both the option of a mains requisition application and the option of a self-lay application?

Yes, UUW expect the 'Developer', as defined in UUW Supplementary Guidance, to submit a Risk Assessment for Water Pipes (RA) and supporting Site Assessment Report (SAR), including pipe material recommendation, in respect of any water pipes being installed on the development irrespective of who is to install them.

Does Table 1 in UUW's Risk Assessment for Water Pipes (RA) replace any of the tables to be completed in the Site Assessment Report (SAR) as required in the UKWIR Guidance?

UUW does not consider Table G1 and Table 3.1 of the UKWIR Guidance to be a definitive guide for assessing total concentrations. Table 1 in UUW's RA replaces Table 3.1 of the UKWIR Guidance.

Have any other Water Companies adopted the UKWIR Guidance yet?

You will need to contact the water company concerned if you are intending to install water pipes outside UUW's licensed area.

United Utilities
Water for the North West

About us

United Utilities is the North West's water company. We keep the taps flowing and toilets flushing for seven million customers every day. From Crewe to Carlisle, we work hard behind the scenes to help your life flow smoothly.

United Utilities Water Limited, Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Warrington WA5 3LP.
Registered in England and Wales. Registered Number 2366678.

LRA1A-11/19v0

11/19/SD/8483f-1

Risk assessment for water pipes (RA)

United Utilities
Water for the North West

The risk assessment for water pipes will help you choose appropriate materials for your development. We are happy to deal with a risk assessment for water pipes in advance of any formal application for a new water supply.

If you need any help completing the form please call us on **0345 072 6067.**

Section 1: Development details	
Development name *(if it has one)*	Slate Wharf, Manchester
Development address	Land off Slate Wharf, Manchester, M15 4ST
OS Grid reference *(mid point)*	383047E, 397510N
Developer's name	Prestbury Estates Ltd.
UUW reference number *(for UU use only)*	

Please provide details below of the current and historical use of the site and adjacent sites.
If your supporting information has details of the current and historical site use, please reference below the relevant sections of your report.

1848 – 1893 A smithy is recorded in the northern site section, the remainder of the site is recorded as open land associated with Castle Quay Slate Wharf.
1893 – 1932 The smithy is no longer present. The site is open land associated with Timber Wharf.
1932 – 1953 The site remains mostly open land, however the Duke's New Warehouse encroaches onto the western boundary of the site by 1932.
1953 – 1977 A second warehouse is recorded to the north of the site which extends across the northern site section by 1953.
1977 – 1990 By 1977 a warehouse occupies the entire site.
1990 – 2021 By 1990 the warehouse has been demolished and the site is open land. The site has remained relatively unchanged since.

Section 2: Preliminary risk assessment	
Has your desk study and site walkover identified any land potentially affected by contamination?	☑ Yes ☐ No

If the site is potentially affected by contamination but you have not completed any intrusive site investigation please provide details below of the rationale behind the intended pipe selection.
If your supporting information has details of the rationale behind the intended pipe selection, please reference below the relevant sections of your report.

N/A intrusive works undertaken

Section 3: Intrusive site investigation

Have you completed any intrusive site investigation?	☑ Yes ☐ No
Have you completed any none intrusive site investigation?	☐ Yes ☑ No
Date(s) when the site investigation(s) undertaken	09 08 2021 (DD MM YYYY) 12 10 2021 (DD MM YYYY)
At what level has groundwater been encountered?	metres below ground level or ☑ Not encountered

Table 1 (Pipeline Selection Risk Assessment Summary (PSRAS)) below classifies testing required where the preliminary risk assessment has identified land potentially affected by contamination. Please provide details below of any test groups which have not been tested and the rationale for not testing.

If your supporting information has details of the rationale behind not testing any particular test groups, please reference below the relevant sections of your report.

VOCs, SVOCs, BTEX, MTBE, Phenols and Cresols have not been tested as no sources have been identified.

If the intrusive site investigation has identified concentrations above the PE threshold (see PSRAS) and your intended pipe selection is PE. Please provide details below of the rationale behind the intended pipe selection.

If your supporting information has details of the rationale behind the intended pipe selection, please reference below the relevant sections of your report.

N/A. Barrier Pipe intended.

Section 4: Site remediation

Please provide details below of any site remediation (which may include a change in site levels) already completed.

If your supporting information has details of the site remediation already completed, please reference below the relevant sections of your report.

None completed

Has the PSRAS (Table 1) been completed using appropriate data after remediation?	☐ Yes ☐ No ☑ N/A

Please provide details below of any proposed site remediation and an analysis of whether this will affect your intended pipe selection.

If your supporting information has details of any proposed site remediation and whether this will affect your intended pipe selection, please reference below the relevant sections of your report.

Unknown at this stage - possible removal of some made ground, providing a betterment.

Section 5: Final use of site

Please provide details below of any chemicals (including fuel) to be stored on site and any other future contamination risks which may affect your intended pipe selection.

If your supporting information has details of potential contamination risks which may affect your intended pipe selection, please reference below the relevant sections of your report.

None. Residential development.

What water pipe materials are intended to be used on site?	☐ PE ☑ PE Barrier Pipe Type A ☐ PE Barrier Pipe Type B Other *(please specify):* x

Section 6: Additional information

Please use the section below to provide any additional details to support your intended pipe selection.

Section 7: Risk assessor

Name and relevant qualifications of person directing the risk assessment for water pipes	Mr Andrew Edwards CEnv (Institution of Environmental Science)
Name and address of risk assessor's company	IGE Consulting Ltd. Office 11, Bartle House, Oxford Court Manchester M2 3WQ
Date risk assessment performed	21 10 2021

Section 8: Declaration

I confirm I have completed this form and provided supporting information in accordance with 'UKWIR Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' and UUW's Supplementary Guidance. I also confirm that if any further site investigation is needed and carried out, I will be required to submit an additional Risk Assessment for Water Pipes with the relevant supporting information.
I understand that failure to supply any of the required information may delay my application being processed.

Name	Andrew Edwards CEnv	Company	IGE Consulting Ltd.
Telephone	07734817010	Date	21 10 2021

Please email the completed form and supporting information to **DeveloperServicesWater@uuplc.co.uk** or post to us at United Utilities Water, Developer Services, Second floor Grasmere House, Lingley Mere, Warrington WA5 3LP.

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Table 1 - Pipe selection risk assessment summary (PSRAS)

1. Testing must be undertaken on the materials within which the pipes are to be laid, whether that be existing ground materials, remediated materials or imported capping materials. Please use the appropriate testing data to complete Table 1 below.

2. If more than one pipe selection is being made, for example, for pipes in different areas of a large site, a completed PSRAS is required for each selection.

What materials have been tested to populate Table 1 below?	☑ Existing ground materials ☐ Remediated materials ☐ Imported capping materials

All concentrations in mg/kg

Test Group	Testing Required?	PE threshold	Metal Pipes/ Barrier Pipe	Laboratory Detection Limit	Testing UKAS accredited Y/N	Maximum concentration at proposed pipeline depth *See Note [2]*	Maximum site concentration *See Note [3]*	Locations and depths where concentrations exceed proposed pipeline threshold
Total VOCs	Where Preliminary Risk Assessment (PRA) has identified land potentially affected by contamination	0.5	Pass	-	-	-	-	-
Total BTEX & MTBE		0.1	Pass	-	-	-	-	-
Total SVOCs (excluding PAHs and those substances marked with an *)		2	Pass	-	-	-	-	-
EC5-EC10 aliphatic and aromatic hydrocarbons		2	Pass	0.1	Y	<0.10	<0.10	None
EC10-EC16 aliphatic and aromatic hydrocarbons		10	Pass	10	Y	77	50	All samples tested
EC16-EC40 aliphatic and aromatic hydrocarbons		500	Pass	10	Y	180	97	None
Phenols* (from SVOC analysis)		2	Pass	-	-	-	-	-
Cresols and chlorinated phenols* (from SVOC analysis)		2	Pass	-	-	-	-	-
Ethers*	Only where identified	0.5	Pass	-	-	-	-	-
Nitrobenzene*		0.5	Pass	-	-	-	-	-
Ketones*		0.5	Pass	-	-	-	-	-
Aldehydes*		0.5	Pass	-	-	-	-	-
Amines		Fail	Pass	-	-	-	-	-
Corrosive	Conductivity, Redox and pH	Pass	*See Note [1]*	-	-	-	-	-

Note [1] Threshold: For wrapped steel, corrosive if pH<7 and conductivity > 400µS/cm. For wrapped ductile iron corrosive if pH<5, Eh not neutral and conductivity > 400µS/cm. For copper, corrosive if pH<5 or >8 and Eh positive.

Note [2] Water pipes are normally laid at 0.75-1.35m below finished ground level.

Note [3] Also state if liquid free product is present in soil or groundwater.

APPENDIX 14

EHO CORRESPONDENCE

Molly Brown (IGE)

From: Graeme Souter <graeme.souter@manchester.gov.uk>
Sent: 29 October 2021 10:38
To: Molly Brown (IGE)
Cc: Lucy Harrison
Subject: RE: Slate Wharf CDN/21/0675 condition 6a

Hi Molly

Thanks for your thorough response. I can accept the comments and agree with your gas characteristic situation based on your response and also that no further gas monitoring is required.

Kind regards

Graeme.

From: Molly Brown (IGE) <mollybrown@igeconsulting.co.uk>
Sent: 28 October 2021 15:58
To: Graeme Souter <graeme.souter@manchester.gov.uk>
Cc: Angharad Jones (IGE) <angharadjones@igeconsulting.co.uk>; Andrew Edwards (IGE) <andrewedwards@igeconsulting.co.uk>
Subject: RE: Slate Wharf CDN/21/0675 condition 6a

Hi Graeme,

Have you had chance to view my below email?

Apologies to push you on this, the Client wanted to start on site by the end of the month so this is now very urgent.

Kind regards,

Molly

Molly Brown MSc FGS
Senior Geo-Environmental Engineer

IGE Consulting Ltd
Mobile 0777 0857 665
Email mollybrown@igeconsulting.co.uk
Website www.igeconsulting.co.uk

Multidisciplinary Geo-Environmental Engineering Services

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ISO 14001 Cert. No. 283032018 View our certificate ISO 9001 Cert. No. 283042018 View our certificate

From: Molly Brown (IGE)
Sent: 26 October 2021 10:57
To: Graeme Souter <graeme.souter@manchester.gov.uk>
Cc: Angharad Jones (IGE) <angharadjones@igeconsulting.co.uk>; Andrew Edwards (IGE) <andrewedwards@igeconsulting.co.uk>
Subject: RE: Slate Wharf CDN/21/0675 condition 6a

Hi Graeme,

We have since done an extra stage of SI to clear obstructions, and determined that made ground is at a maximum of 1.30m bgl in localised areas (variable depth across site).

Made ground is to be cut across site.

Please see the attached plan:
Orange area (surface water attenuation tanks) – 0.80m of MG to be removed, so just 0.30m thickness of MG to remain.
Red areas (foundations) – All MG to be removed.
Blue area (building footprint) – 0.61m to 0.10m MG to be removed, so c.0.40m to c.0.7m thickness of MG to remain across building footprint (excluding areas of foundations where all MG is to be removed).
Green area (hardscape storage) – 0.41m MG to be removed, so c. 0.59m thickness of MG to remain.
Soft landscaping, is to be cut by a minimum of 0.30m to accommodate the clean topsoil, leaving c. 0.80m thickness of MG, but only around the edges of the attenuation tank area.

As you can see, the majority of the made ground will be removed across site. An average of just 0.4m MG will remain across the site, and will be removed altogether in some places.

The below email states that the only on-site ground gas source is the made ground, albeit a low generation source given the low TOC. On this basis, we considered it appropriate to designate the site as very low risk / Characteristic Situation 1 / Green and to recommend no ground gas protection measures.

Now this low generation source will also be further reduced, concurring with the CS1 assessment.

Let me know your thoughts on this.

The other points in your response will be addressed in a revision to the Combined Phase 1 and Phase 2 Geo Env Report (3548-01, May 2021), which will be finalised following agreement of the above.

Kind regards,

Molly

Molly Brown MSc FGS
Senior Geo-Environmental Engineer

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Multidisciplinary Geo-Environmental Engineering Services

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IGE Consulting Ltd, Office 11, Bartle House, Oxford Court, Manchester M2 3WQ

From: Graeme Souter <graeme.souter@manchester.gov.uk>
Sent: 22 October 2021 15:42
To: Molly Brown (IGE) <mollybrown@igeconsulting.co.uk>
Subject: RE: Slate Wharf CDN/21/0675 condition 6a

Hi Molly

Thanks for your email and justification for reduced gas monitoring. Sorry it has taken all week to get back to you. Could you remind me if the proposals include removing the made ground at all?

Kind regards

Graeme

From: Molly Brown (IGE) <mollybrown@igeconsulting.co.uk>
Sent: 18 October 2021 13:20
To: Graeme Souter <graeme.souter@manchester.gov.uk>
Cc: Andrew Edwards (IGE) <andrewedwards@igeconsulting.co.uk>; Angharad Jones (IGE) <angharadjones@igeconsulting.co.uk>
Subject: Re: Slate Wharf CDN/21/0675 condition 6a

Hi Graeme,

Have you had chance to review my below email? I originally sent this on 6th October and have not yet received a response from you. This is now urgent. We would very much appreciate an expedited response if you can look at this as soon as possible.

Kind regards,

Molly

Molly Brown
IGE Consulting

From: Molly Brown (IGE) <mollybrown@igeconsulting.co.uk>
Sent: Monday, October 11, 2021 09:55
To: graeme.souter@manchester.gov.uk
Cc: angharadjones@igeconsulting.co.uk; Andrew Edwards (IGE)
Subject: Slate Wharf CDN/21/0675 condition 6a

Hi Graeme,

I sent you the below email last week on 6th October and got your out of office saying you are on leave 'until Friday 13th August 2021'.

Have you had chance to review my below email?

Thanks,

Molly

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From: Molly Brown (IGE)
Sent: 06 October 2021 16:34
To: graeme.souter@manchester.gov.uk
Cc: Angharad Jones (IGE) <angharadjones@igeconsulting.co.uk>; Andrew Edwards (IGE) <andrewedwards@igeconsulting.co.uk>
Subject: RE: Slate Wharf CDN/21/0675 condition 6a
Importance: High

Hi Graeme,

Hope this finds you well.

I have been forwarded your below response to CDN/21/0675 condition 6a. I just wanted to get in contact with you about point 1 below.

1. The ground gas investigation proposals have been based on 4 rounds of monitoring over a 2 month period. This is insufficient and will need to be amended to include 6 rounds of monitoring over a 3 month period. Monitoring occurrences need to include occasions during low and fall atmospheric pressure. A ground gas risk assessment has taken place with the limited monitoring undertaken to date during high atmospheric pressure but the assessment and outcome will need to be updated once additional rounds of monitoring have been completed and out criteria has been addressed.

Your points 2-5 will be addressed in a separate letter.

I understand the below response is based on the Combined Phase 1 and Phase 2 Geo Env Report (3548-01, May 2021), which contains 2 ground gas monitoring visits. Since then, a total of 4 visits have been undertaken over 2 months.

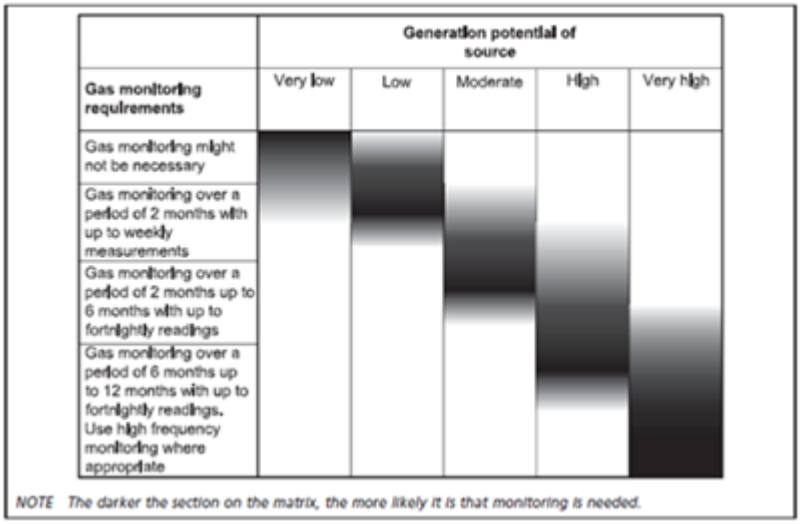
4 visits over 2 months were recommended based on the ground gas sources identified which were limited to on-site Made Ground and the off-site infilled basin (1970s) and the off-site infilled gravel pit (1900s). The following screenshots have been taken from BS 8576 (2013) and show that the sources identified ('made ground with low degradable organic content' and 'inert landfill sites' / off-site historic infilling) are likely to be very low sources of ground gas, and that gas monitoring over a period of 2 months with up to weekly measurements should be sufficient based on the sources.

BS 8576:2013 BRITISH STANDARD

Figure 6 **Decision matrix for initial monitoring**

Very low	• Natural carbonate soil and strata, e.g. chalk and limestone. • Natural soil strata with a low degradable organic content, e.g. alluvium, peat. • In-filled pond less than 15 m diameter, in-filled before 1930s to 1940s. • Made ground with low degradable organic content (e.g. up to 5% organic material such as pieces of wood, pieces of paper, rags, etc. with a high proportion of ash and no food or other easily degradable waste). • Mine workings shallow or shaft (where there is clear evidence that they are flooded). (Gas in coal is historically generated and is trapped or adsorbed so the actual current generation rate is very low but it accumulates in workings and large volumes can be emitted very quickly.) • Inert landfill sites. (Lack of regulation in the past means that most sites are never entirely inert – they can include timber, plasterboard and even domestic refuse and consequently care is needed when assessing such sites. They might require a higher risk classification.)

Figure 6 **Decision matrix for initial monitoring**



NOTE The darker the section on the matrix, the more likely it is that monitoring is needed.

The chemical testing undertaken during the ground investigation confirmed that the Made Ground has low organic content (<5%) therefore the above holds true.

The results of the 4 No. ground gas monitoring visits, under a range of atmospheric pressures, can be summarised as follows:

Gas Monitoring Well	Steady O_2 Concentration (%)	Peak CO_2 Concentration (%)	Peak CH_4 Concentration (%)	Peak H_2S Concentration (ppm)	Atmospheric Pressure (mbar)	Steady Gas Flow (l/hr)
WS02	16.0 – 17.9	3.0 – 4.1	0.0	0	998 – 1026	0.0
WS03B	11.8 – 14.7	4.2 – 4.7	0.0	0	998 – 1026	0.0
WS07	14.9 – 15.4	1.3 – 1.6	0.0	0	1020 – 1026	0.0

The results of the 4 No. ground gas monitoring visits have been assessed in accordance with BS 8485 (2015) + A1 (2019) as follows. Ground gas monitoring has recorded a maximum peak carbon dioxide concentration of 4.7% v/v in WS03. No methane was recorded above detection limit and no steady flow rates were recorded. As no steady flow rates were recorded, both the GSV and the worst case GSV can be calculated as (4.7/100)*0.1 = 0.0047 l/hr. Therefore, the site falls in-line with a Characteristic Situation 1 (CS1) / Green (CIRIA 665).

In addition to the above GSV assessment, the following CSM is also considered:

Receptor

- The receptors are the end-users of the proposed apartment block development and the building structure itself.

Sources

- On-Site Made ground – The only on-site ground gas source was determined to be the Made Ground. The depth of the made ground was found to be a maximum of just 1.10m bgl. Although concrete obstructions were recorded, based on the findings of the exploratory holes where the concrete was penetrated, the made ground is not anticipated to be present to a much greater depth than 1.10m bgl. The TOC of the Made Ground was determined to be just 1%-3% (based on the SOM measured). It should also be noted that due to the extent of the building envelope which will occupy the majority of the site and the ground floor build-up being proposed at a lower level than the current site level, a significant proportion of the existing made ground on-site will be removed, reducing the source. Additionally, the made ground was visually assessed and found to contain no putrescible components (such as soft organics, waste materials etc.), therefore, the on-site made ground is considered a low ground gas generation source.
- Off-Site Partially Infilled Basin (35m west, infilled in 1970s, 50+ years ago) – deemed to be of low ground gas generation potential given the time since infilling.
- Off-Site Infilled Gravel Pit (70m W, infilled in 1900s, 120+ years ago) – deemed to be of low ground gas generation potential given the time since infilling.

The above sources are deemed to be very low to low ground gas risk based on the above BS 8576 (2013) Decision Matrix tool, and the ground gas monitoring concurs with this.

Pathways

- No credible lateral migration pathways have been identified from the off-site sources – migration through fractures in sandstone is possible but given the granular nature of the made ground and natural soils in the area, any ground gas is much more likely to migrate vertically to atmosphere rather than laterally, as confirmed by the ground gas monitoring results and negligible flows.
- The proposed building is to be constructed on pad foundations bearing onto the sandstone at c. 1m – 2m bgl, rather than piled foundations so no future pathways will be created.

On the basis of the above lines of evidence, it is considered appropriate to designate the site as very low risk / Characteristic Situation 1 / Green. On this basis, no ground gas protection measures will be necessary.

However, we note that you state below that you would prefer 6 visits over 3 months. Unfortunately, since the time of installation, 2 of the 3 monitoring wells have been damaged by subsequent works. We can carry out a further 2 monitoring visits of the one remaining well, which is likely to deliver results in line with the CS1 findings above, however, we consider that this would not add value to the assessment. On this basis, would you accept the above risk assessment and CS1 designation, given the lines of evidence which all corroborate the 'very low' risk?

We can of course submit this within a formal revision to the report, but we would just like to agree a strategy going forward before undertaking the visits / formally submitting a revision, to expedite the process.

Feel free to give me a call to discuss this, or if you need any more information, on 07770857665.

Kind regards,

Molly

Molly Brown MSc FGS
Senior Geo-Environmental Engineer

IGE Consulting Ltd
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Website www.igeconsulting.co.uk

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IGE Consulting Ltd, Office 11, Bartle House, Oxford Court, Manchester M2 3WQ

From: Graeme Souter <graeme.souter@manchester.gov.uk>
Sent: 01 October 2021 09:46
To: Lucy Harrison <lucy.harrison@manchester.gov.uk>
Subject: Slate Wharf CDN/21/0675 condition 6a

Hi Lucy

I have reviewed the combined phase I desk study and phase II site investigation prepared by IGE dated August 2021 reference 3548-01 and I have the following comments:

1. The ground gas investigation proposals have been based on 4 rounds of monitoring over a 2 month period. This is insufficient and will need to be amended to include 6 rounds of monitoring over a 3 month period. Monitoring occurrences need to include occasions during low and fall atmospheric pressure. A ground gas risk assessment has taken place with the limited monitoring undertaken to date during high atmospheric pressure but the assessment and outcome will need to be updated once additional rounds of monitoring have been completed and out criteria has been addressed.

2. The ground conditions assessment has been based on residential public open space end use. Confirmation needs to be provided to confirm the proposals do not include private gardens for the residential development. If they do, or the proposals change, then the assessment will need to be updated accordingly to address the relevant end use criteria

3. Significant part of the investigation site were covered with concrete slabs which it is assumed will be removed during the enabling phase and expose the soils underneath. It has been reported in the above document that where the slab was broken some sampling was undertaken at one investigation site. This is insufficient and we will require further assessment of the soils below the slabs so these obstructions needs to be removed or sections made available for more suitable depth of investigation at each of the inspection areas to allow more analysis of the soils

4. The report finds an exceedance of beryllium at WS03. Was any further testing in this area considered? Will this area be used for soft landscaping or be removed as part of the enabling works?

5. A UK water supplier risk assessment will be required to confirm the proposed water supply pipe to be installed and trench construction.

The above points will need to be addressed before we can consider the outcome whether remediation is required or remediation to be recommended

Kind regards

Graeme

Graeme Souter
Environmental Protection
Environmental Health
The Neighbourhoods Directorate
Manchester City Council

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