



e3p

Phase I & II Geoenvironmental Site Assessment
Buxton Street, Heywood

Reference: 16-060-R1-1
Date: September 2022



PHASE I & II GEOENVIRONMENTAL SITE ASSESSMENT

Buxton Street
Heywood
Greater Manchester
OL10 1BS

Prepared for:
B&L Ingoe

Report Ref: 16-060-R1-1
Date Issued: 1/09/2022

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Phase I & II Geoenvironmental Site Assessment

September 2022

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EXECUTIVE SUMMARY

Site Address	Land off Buxton Street, Heywood, Greater Manchester, OL10 1BS.	
Grid Reference	E 385733, N 410193.	
Site Area	0.16 Ha.	
Proposed Development	B&L Ingoe intends to construct a low-rise residential development comprising low-rise residential housing and apartments with associated gardens, estate roads and infrastructure.	
Current Site Use	The subject site is a rectangular shaped parcel of land located to the south of Buxton Street and is currently unoccupied. The centre of the site previously had two raft foundation, however upon a site walkover these foundations have been crushed and form a slightly raised hardcore platform in the centre of the site. In the eastern sector of the site there is a stockpile of earth and rubble, from what appears to have been a surface scrape in this sector of the site. Several pockets of waste timber and plastic have been noted in the northwest of the site. A railway line runs along the southern boundary on a raised embankment.	
Site History	The site formed part of undeveloped farmland circa 1851 until it was subdivided into two smaller parcels of land pre-1890. A period of upfilling occurred onsite to form a railway terrace with steep sloping sides in the 1920s. Several buildings were constructed pre-1956 with a central paved yard being added circa 1965. The steep sloping sides are no longer markers on maps after 1971 with the land being as it is formed in the present day. The buildings were all demolished pre-1988 and no further changes to the site have been mapped.	
Environmental Setting	Drift Geology	Glacial Till – Diamicton
	Bedrock Geology	Pennine Lower Coal Measures Formation
	Faults	No faults have been recorded within the site.
	Hydrogeology	Unproductive strata (drift) overlying secondary A aquifer (solid). No groundwater abstractions have been identified within a 1 km radius.
	Hydrology	There are no surface water features within 500 m of the site boundary.
	Flood Risk	Unaffected by flooding from rivers.
Utility Locations	A formal Gutility survey has not been completed to date. A review of the service records for the site indicates that the following services are present onsite:  LV Electrical cable in the south-east of the site, and  UU Water along the eastern boundary.	
Landfill Sites and Ground Gases	The Groundsure report indicates that no landfills are present within 500 m of the site.	
Invasive Plant Species	E3P has been made aware that invasive species have been noted and treated by a third party onsite.	
Radon	Unaffected – No special precaution required.	



Coal Mining/Land Stability	The site is located in a development high risk area, as such E3P has completed a detailed coal mining risk assessment as part of this Geoenvironmental Site Assessment. The assessment indicates that there is a low risk to the site associated with underground coal workings. The Thin Coal Seam is located approximately 57 m to the east of the site and it is unclear whether this seam is located under the site. Rotary boreholes have been completed and the findings are summarised below.
Initial Conceptual Site Model	Contaminant Sources ☐ Made Ground – (upfill material on site and historic land use) Polycyclic aromatic hydrocarbon (PAHs), total petroleum hydrocarbons (TPH), heavy metals, asbestos containing material (ACM), volatile organic compounds(VOC), semi volatile organic compound (SVOC), ground gases. Pathways ☐ Direct contact and ingestion ☐ Volatilisation/indoor explosion ☐ Vapour/gas inhalation ☐ Dust inhalation Receptors ☐ Future site users (proposed residential end-users and construction workers) ☐ Buildings (proposed residential units) ☐ Underlying Secondary A aquifer

GROUND INVESTIGATION

Ground Investigation Works	E3P has completed an intrusive ground investigation comprising: ☐ 5x Window sample boreholes, ☐ 2x Rotary open holes and ☐ 5x Construction of environmental monitoring installations.
Ground Conditions	MADE GROUND – 0.00 m bgl to 6.60 m bgl Made Ground was encountered within all exploratory hole locations, with the greatest thickness within RB101 (6.60 m) located in the south-west of the site. The Made Ground on site is generally comprised of very loose (WS102 and WS104) to medium dense black slightly clayey slightly sandy gravel. Gravel is fine to medium subangular sandstone with frequent fragments of brick, clinker, concrete, glass and ash with pockets of sandy clay 0.15 m in size throughout. DRIFT – 3.70 m bgl to 8.60 m bgl Drift deposits were identified in the majority of locations on-site with the exception of RB101. Drift deposits generally comprised of a loose brown clayey fine to medium SAND overlying a stiff medium strength brown mottled grey CLAY to depths up to 5.45 m bgl. Within RB102, at deeper depths of 6.20–8.60 m a brown SAND was recorded.



Ground Conditions	SOLID – 6.20 m bgl to 40 m bgl Solid geology was encountered within two locations RB101 and RB102. A grey MUDSTONE with coal traces was identified within both locations at a depth of 6.60–7.30 m bgl and 8.60–12.00 m bgl respectively. SILTSTONE was identified within RB101 at a depth of 7.30–8.00 m bgl. The remaining geology comprised of MUDSTONE to 40.00 m bgl. No loss of flush or voids were noted within any of the rotatory boreholes across the site.
	GROUNDWATER Groundwater was encountered between 3.20 m bgl and 4.40 m bgl during the site investigation. Return monitoring visits have recorded groundwater levels at 4.00 m bgl within WS104.

CONTAMINATED LAND ASSESSMENT

Human Health	The Tier 1 human health risk assessment identified site-wide concentrations of non-volatile, insoluble heavy metals and hydrocarbon compounds that would present unacceptable degrees of theoretical risk to the identified receptors associated with direct exposure pathways. As such, it will be necessary to design and construct the proposed development in a manner that will ensure suitably validated cover systems for all areas of private garden, soft landscaping and public open space. Trace asbestos fibres have been identified within a number of samples collected from the Made Ground. Asbestos quantification has shown all locations containing asbestos to have < 0.001%. No visual signs of asbestos containing material (ACM) were encountered during the ground investigation; therefore, it is likely that only trace fibres are present. Elevated naphthalene has been identified in the Made Ground and this presents potential volatilisation to indoor air risk. Naphthalene has been identified within two samples on-site WS101 and WS103. Due to the small scale of the site, it can be considered there may be representative of wider Made Ground and as such a vapour resistant membrane should be utilised within the proposed dwellings. Mercury speciation has identified elemental mercury forms 0.667 mg/kg of the sample, meaning it is below the 1.20 mg/kg threshold. As such the mercury impact identified within WS105 is not seen to present an unacceptable risk to the site and its end users. Chemical analysis of the natural CLAY and SAND drift deposits has identified these soils to be acceptable for use as subsoil within the proposed garden areas; however, further chemical validation samples will be required to confirm this. There are no suitable sources of topsoil available on the site.
Controlled Waters	The chemical analysis for groundwater samples is pending; however, leachate analysis compared to DWS values (drinking water standards) has identified elevated lead concentrations within WS105 at 2.70m bgl.



Controlled Waters	Heavy metals are typically of low solubility and mobility and given the low sensitivity of the site with respect to controlled waters, it is considered there is unlikely to be any degree of unacceptable risk to the controlled water receptors.
Ground Gas	Ground gas monitoring thus far has indicated the site would be classed as Characteristic Situation 1 or Green, suggesting no gas protection measures will be required. However, consideration needs to be given to the requirement for vapour/chemically resistant membranes.
Potable Water Infrastructure	Based on the potable water assessment within section 9.3 it is likely that a barrier pipe will be required onsite.

COAL MINING ASSESSMENT

Coal Mining	In accordance with industry best practice as detailed within CIRIA 32, E3P has concluded that shallow mine workings are not present within the site boundary due to the lack of coal or voids encountered during the site investigation. Therefore, there is a low risk of ground instability caused by shallow mine workings.
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GEOTECHNICAL ASSESSMENT

Underground Obstructions	Significant concrete and brick obstructions have not been encountered within the Made Ground. If any obstructions are encountered these will require grubbing out to the base of the Made Ground to enable the construction of proposed plots.
Allowable Bearing Pressure	The underlying CLAY drift deposits, beneath the Made Ground deposits, have been assessed as being stiff, medium strength with a net allowable bearing pressure (ABP) in the order of 86.85–138.96 kN/m² at circa 4 m and 5 m bgl. Loose granular deposits were identified within WS102 at 4.00 m bgl and within WS104 at 5.00 m bgl, with a net bearing pressure (ABP) in the order of 59.14 kN/m² increasing to 82.96 kN/m² at circa 5.00 m bgl.
Foundation Options	Due to the site being underlain by deep Made Ground, varying from 3.70–6.60 m bgl it will be likely that an engineered founding solution will be required. This will likely be formed of a vibro stone column (VSC) or piled solution.
Building Floor Slabs	Ground-bearing floor slabs are unlikely to be viable given the anticipated depths or reworked Made Ground > 600 mm and shallow cohesive soils.
Heave Precautions	Given that the underlying clay is of low volume change potential, heave precautions will not be required to the internal face of a foundation less than 1.5 m in depth. Heave precautions will be required to the underside of floor slabs (where there is no 200 mm void) and pile ground beams are required within the modelled influencing distance of trees.
Soakaway Drainage	Due to presence of deep Made Ground that is impacted by low-level inorganic and hydrocarbon compounds this will likely preclude the use of infiltration drainage systems.
Sulphate Assessment	Concrete classification will be DS1 AC1s.
CBR Design %	Granular soils can be re-engineered to ensure 5% within the subgrade during favourable climatic conditions.



CBR Design %	Natural clay soils will provide a CBR in the order of 3–5% during drier climatic periods; however, if water is allowed to shed onto the formation, the CBR will reduce to < 2%, which will require specialist engineering of the subgrade.
Cut/Fill	Development levels are unknown at this time; however, it is anticipated that cut-and-fill works will be required to prepare the development platform.
Civil Engineering Excavations	The E3P Intrusive Ground Investigation has not identified the presence of weathered/competent bedrock at a shallow depth, which will not impede the excavation materials to form sewerage and drainage infrastructure and foundations.
Waste Characterisation	Any material that is to be disposed off-site should undergo assessment using Technical Guidance WM3: Waste Classification – <i>Guidance on the classification and assessment of waste</i> .

RECOMMENDATIONS

Based on the findings of the geoenvironmental site assessment, the following additional works are recommended to be completed in due course:

-  Plot-specific foundation schedule (upon receipt of the final development levels).
-  Arboricultural survey.
-  Settlement Analysis for earthworks design.
-  Slope stability assessment
-  Geotechnical earthworks strategy (infrastructure).
-  Remediation and enabling works strategy.



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DRAWING LIST

16-060-R1-001 - Site Location Plan
16-060-R1-002 - Proposed Development Plan
16-060-R1-003 - Site Features Plan
16-060-R1-004 - Historical Features Plan
16-060-R1-005 - Exploratory Hole Location Plan
16-060-R1-010 - Conceptual Site Model



1. INTRODUCTION

1.1. BACKGROUND

E3P has been commissioned by B&L Ingoe to undertake a detailed Phase I and II Geoenvironmental Site Assessment for a parcel of semi-derelict land at the southern extent of Buxton Street, Heywood.

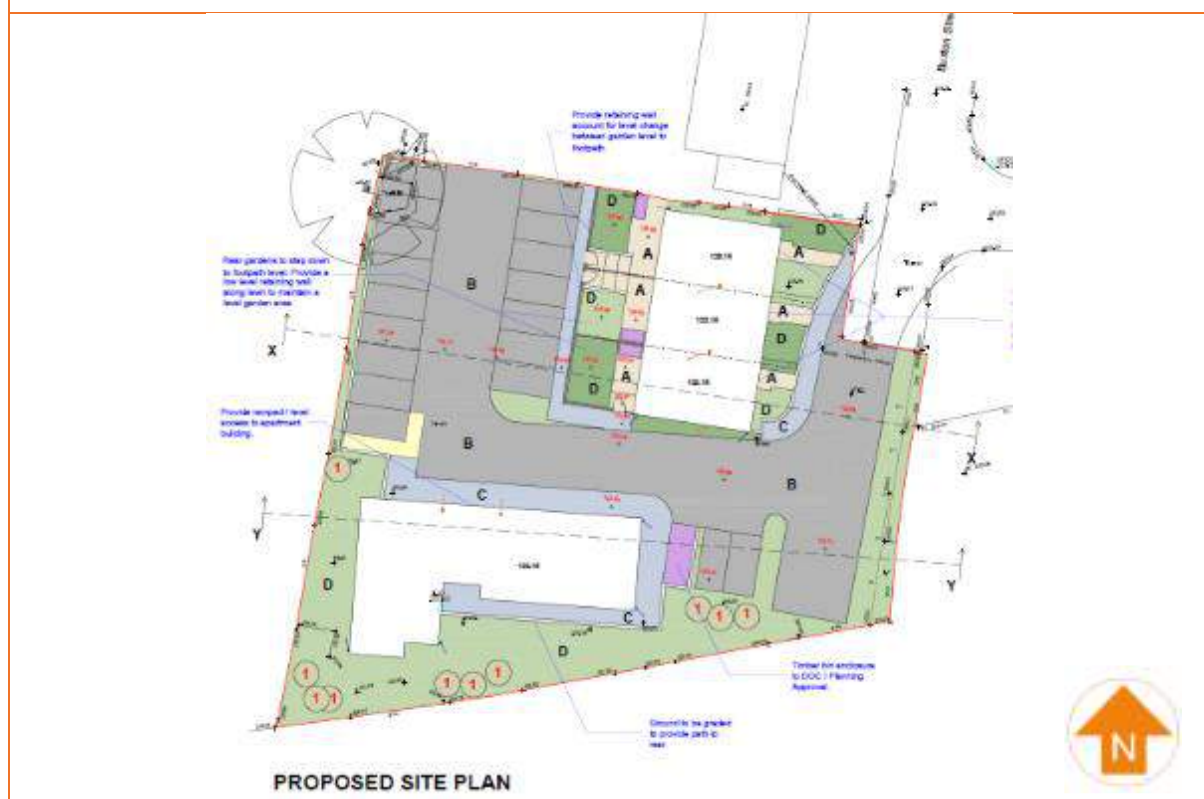
This report is required to determine potential contaminated land liabilities, remediation requirements and geotechnical engineering works that will be required as part of the proposed development for a proposed low-rise residential development.

1.2. PROPOSED DEVELOPMENT

B&L Ingoe intends to construct a low-rise residential development comprising low-rise residential housing and apartments with associated gardens, estate roads and infrastructure. Drawing 16-060-002 (Appendix III) identifies the proposed development layout.

A snapshot of the proposed development layout is indicated in Figure 1.1.

FIGURE 1.1 SNAPSHOT OF PROPOSED DEVELOPMENT



1.3. OBJECTIVES

The objectives of the geoenvironmental assessment are as follows:

- ❑ Undertake a preliminary stage of sampling and analysis to provide an overview of environmental issues identified.
- ❑ Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors.
- ❑ Assess the geotechnical information and provide preliminary recommendations in relation to foundations, pavement construction and floor slabs.
- ❑ Provide recommendations regarding future works required.

1.4. SCOPE OF WORKS

The scope of work includes the following elements:

- ❑ Design of suitable intrusive ground investigation;
- ❑ Window sample probeholes with, and construction of, environmental monitoring installations;
- ❑ Rotary boreholes;
- ❑ In-situ geotechnical testing;
- ❑ Chemical and geotechnical laboratory analysis;
- ❑ Groundwater monitoring and sampling;
- ❑ Ground gas monitoring;
- ❑ Contamination risk assessment and conceptual site model;
- ❑ Geotechnical assessment and interpretation; and
- ❑ Factual and interpretive reporting.

1.5. LIMITATIONS

The limitations of this report are presented in Appendix I.

1.6. CONFIDENTIALITY

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from E3P; a charge may be levied against such approval.



2. SITE SETTING

2.1. SITE DETAILS

Site Address	Land off Buxton Street, Heywood, Greater Manchester, OL10 1BS.
National Grid Reference	E 385733, N 410193.
Site Area	0.16 Ha.

All acronyms used within this report are defined in the Glossary presented in Appendix II.

A site location map is presented in Appendix III as Drawing 16-060-001.

2.2. CURRENT SITE USE

E3P has undertaken a site walkover and a description of the key findings is summarised in Table 2.1.

TABLE 2.1 SITE DESCRIPTION

Occupancy/Use	The subject site is a rectangular-shaped parcel of land located to the south of Buxton Street and is currently unoccupied. The centre of the site previously had two raft foundations, however, upon a site walkover, these foundations have been crushed and form a slightly raised hardcore platform in the centre of the site. In the eastern sector of the site, there is a stockpile of earth and rubble, from what appears to have been a surface scrape in this sector of the site. Several Stockpiles of waste timber and plastic have been noted in the northwest of the site. A railway line runs along the southern boundary on a raised embankment.	
Surface Cover (%)	Buildings	0%
	Hardstand	10%
	Soft Cover	90%
Structures	There are no structures present onsite.	
Access	Vehicular and pedestrian access to the site is via Heras fencing from Buxton Street in the northeast.	
Slope	The site slightly dips to the west, with a steep depression in the southwestern corner of the site, roughly 2 m lower than the surrounding land. The railway embankment along the southern boundary enters the site, circa 1 m.	
Retaining Structures	There are currently no retaining wall structures present onsite.	
Vegetation/Ecology	Scrub vegetation is present across the site with areas of overgrown grasses and windblown plants. A series of sporadic semi-mature trees are present along the southwestern and western boundaries. A survey for invasive species has been undertaken by a third party.	



Hazardous Material Storage	No above-ground storage tanks (ASTs) or underground storage tanks (USTs) were observed at the site during the preliminary site walkover. Due to the previously undeveloped nature of the site, it is unlikely that hazardous materials storage will have occurred on the site.
Asbestos-Containing Material (ACM)	No evidence of ACM was noted across the site.
Polychlorinated Biphenyls (PCBs)	No source has been identified.
Waste Storage	Potentially hazardous waste streams are unlikely to be generated at the site and none were observed during the preliminary site inspection.
Drainage	A formal drainage survey has not been completed under the scope of this report. However, drainage infrastructure is likely to be present on adjacent highways and there is potential for further drainage to cross under the site.

2.3. SURROUNDING AREA

The surrounding area land uses are summarised in Table 2.2.

TABLE 2.2 SURROUNDING LAND USES

DIRECTION	LAND USE
North	Residential units
East	Residential units
South	Railway line and recreational fields
West	Recreational fields

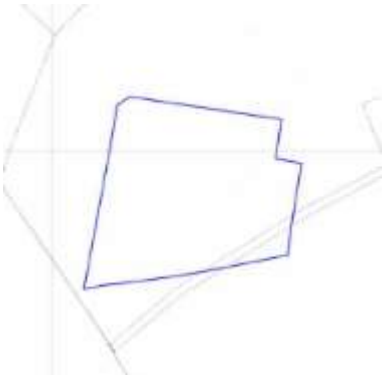
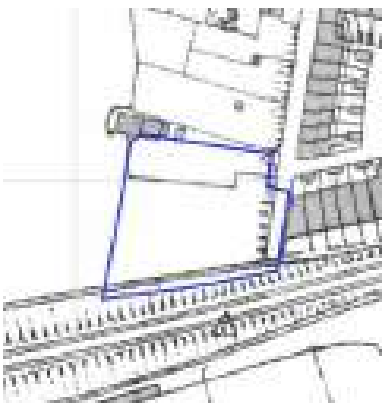


3. SITE HISTORY

3.1. ON-SITE HISTORICAL DEVELOPMENT

A review of historical mapping and historical aerial imagery pertinent to the site is summarised in Table 3.1. In addition, historical site features are presented in Drawing No 16-060-003 in Appendix III.

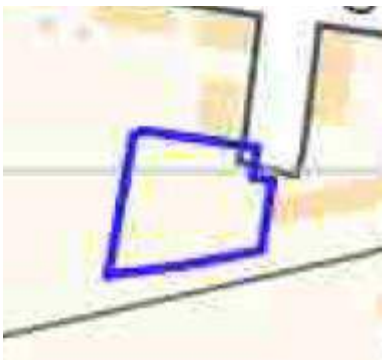
TABLE 3.1 HISTORICAL DEVELOPMENT

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1851 1:1,056	The site forms part of wider open farmland. There is a small road mapped bisecting the southeastern corner of the site.	
1890 1:2,500	The road has been removed and the site has been split into two small parcels of land, with a field boundary in the north of the site. There are two small slopes noted onsite; the first in the east of the site and the second forming the toe of the railway embankment in the south.	
1928 1:10,560	The field boundary in the north of the site has been removed and the site has been upfilled to form a railway terrace. Steep sloping sides are noted along the north, south and east of the terrace. There are no other significant changes recorded.	



MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1956 1:1,250	Three structures have been constructed onsite. There are no other significant changes recorded.	
1965 1:1,250	The easternmost structure has been removed with the central structure being extended. Between the structures, a hardstanding yard has been constructed. There are no other significant changes recorded.	
1971-1975 1:1,250	The sloped sides of the terrace are no longer indicated, however, given that the structures remain in place it is unlikely this feature has been removed. There are no other significant changes recorded.	
1988-1992 1:1,250	All of the structures onsite have been removed and are no longer mapped. There are no other significant changes recorded.	



MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
2022 1:10,000	The land remains undeveloped. There are no other significant changes recorded	
2022 Google Earth	Two raft foundations are visible in the centre of the site.	

3.2. OFF-SITE HISTORICAL DEVELOPMENT

A review of potentially contaminative uses identified on historical Ordnance Survey maps within a 250 m radius of the site is summarised in Table 3.2.

TABLE 3.2 SURROUNDING HISTORICAL DEVELOPMENT

SURROUNDING FEATURE	DISTANCE	DATES	DIRECTION
Railway Line Then: no longer marked	0 m	Pre 1851–Present	South
Reservoir Then: Infilled and housing built	190 m	Pre 1890–Pre 1937 Pre 1937–Present	North East
Brewery Then: Removed Then: Housing	200 m	Pre 1890–Pre 1929 Pre 1929–Pre 1956 Pre 1956–Present	North East
Warehouses Then: Removed and a care home built	200 m	Pre 1929–Pre 1969 Pre 1969–Present	North East
Cotton Mill Then: Removed Then: A care home built	210 m	Pre 1890–Pre 1969 Pre 1969–Pre 1971 Pre 1971–Present	East
Reservoir Then: Infilled Then: Housing	220 m	Pre 1890–Pre 1965 Pre 1965–Present	North
Engineering Works Then: Printing works Then: Works	230 m	Pre 1965–Pre 1971 Pre 1971–Pre 1980 Pre 1980–Present	South East



SURROUNDING FEATURE	DISTANCE	DATES	DIRECTION
Reservoir Then: Infilled Then: Housing	230 m	Pre 1890—Pre 1971 Pre 1971—Pre 1977 Pre 1977—Present	North East
Iron Foundry Then: Allotments	240 m	Pre 1937—Pre 1965 Pre 1965—Present	West
Sand Pit Then: Infilled Then: Housing	250 m	Pre 1857—Pre 1909 Pre 1909—Pre 1956 Pre 1956—Present	North East

3.3. PLANNING HISTORY

E3P has undertaken a detailed search of online planning records held by Rochdale Borough Council which has identified that there is only one planning application for the site in question, as summarised in Table 3.3.

TABLE 3.3 PREVIOUS ON-SITE PLANNING APPLICATIONS

PLANNING APPLICATION	DETAILS	DATE	OUTCOME
16/01023/FUL	Residential development - one 3-storey block of six apartments and a terrace of 3 dwellings	09-11-2016	Unknown
17/00497/FUL	Residential development - one 3-storey block of six apartments and a terrace of 3 dwellings - Resubmission of 16/01023/FUL	02-05-2017	Decided



4. ENVIRONMENTAL SETTING

4.1. GEOLOGY AND HYDROGEOLOGY

The British Geological Survey (BGS) map (Sheet 85) for the site, (1:50,000, Solid and Drift editions) and online records indicate the site is underlain by the geological sequence presented in Table 4.1.

TABLE 4.1 SUMMARY OF UNDERLYING GEOLOGY

GEOLOGICAL UNIT	CLASSIFICATION	DESCRIPTION	AQUIFER CLASSIFICATION
Drift	Glacial Till – Diamicton	SAND, CLAY and GRAVEL	Secondary undifferentiated
Solid	Pennine Lower Coal Measures Formation	MUDSTONE, SILTSTONE, SANDSTONE	Secondary A aquifer

There are no surface water features within 500 m of the site boundary.

TABLE 4.2 SUMMARY OF BGS BOREHOLE RECORDS

LOCATION	DEPTH	MADE GROUND	DRIFT	SOLID
69 m SW (SD81SE3127)	4.00 m	0.00–0.85 m bgl	Sandy GRAVEL 0.85–1.00 m bgl CLAY 1.00–2.30 m bgl	Completely weathered MUDSTONE 2.30–3.30 m bgl Weathered MUDSTONE 3.30–3.50 m bgl
71 m NW (SD81SE316)	12.50 m	0.00–1.50 m bgl	Gravelly SAND 1.50–11.50 m bgl CLAY 11.50–12.00 m bgl	Weathered MUDSTONE 12.00–12.50 m bgl
119 m NW (SD81SE315)	4.00 m	0.00–1.30 m bgl	CLAY 1.30–1.70 m bgl SAND 1.70–4.00 m bgl	N/A
119 m S (SD81SE318)	4.00 m	0.00–0.50 m bgl	CLAY 0.50–2.80 m bgl	Weathered MUDSTONE 2.80–3.50 m bgl

No faulting is indicated within influencing distance of the site, however, it is worth noting that there are two coal seams recorded both to the east of the site boundary at 67 m and 196 m respectively.

The Groundsure report indicates that the site is not located within a groundwater source protection zone. Furthermore, there are no groundwater/potable abstractions within 1 km of the site.

4.2. NATURAL LANDFORM AND GEOMORPHOLOGY

Based on the initial geological assessment, a review of available topographic data and pertinent mapping, E3P has undertaken a preliminary geomorphological assessment of the landform and its possible mechanism for formation.

The subject site is underlain by glacial till – these are deposits laid down by the deposition of melting ice shelf in the most recent glaciation. The underlying rock formations are associated with the Pennine Lower Coal Measures.



The Lidar image below indicates that the site is a raised platform. This matches the historical mapping data and it is possible that the historical upfilling has taken place onsite.

FIGURE 4.2 SURFACE LIDAR DATA OF THE SITE AND SURROUNDING AREA



4.3. GEOTECHNICAL DATA

Geotechnical data presented within a commercially available environmental database is summarised in Table 4.3.

TABLE 4.3 SUMMARY OF GEOTECHNICAL DATA

HAZARD	DESIGNATION
Shrink-Swell Clay	Very low risk
Landslides	Very low to low risk
Ground Dissolution	No hazard
Compressible Ground	No hazard
Collapseable Deposits	Very low risk
Running Sand	Very low risk



4.4. COAL MINING

The Groundsure report states the site is in an area that may be affected by coal mining.

A CA mining report was obtained (Ref: 51003165650001) dated 8th June 2022.

The CA operates a risk-based approach to the assessment of potential instability issues associated with future development of land located within the predefined CA consultation areas. This risk-based approach subdivides the potential risk into “low” and “high” risk categories.

The risk categories can be defined as:

Low-Risk Sites – Deemed to be land where coal mining has taken place, however, it was at such depth not to pose a risk to new development and it, therefore, contains no known recorded risks and as such no further assessment is required.

For low-risk sites, the CA categorically states:

If your proposed development is within the Development Low Risk Area there is no need for you to submit any coal mining information with your planning application and The Coal Authority will not be consulted by the LPA. The LPA will include our Standing Advice as an informative note within the decision notice.

High-Risk Sites – Deemed to be landholdings located within an area known to contain legacy risks that include:

- ☐ Mine entries (shaft or adit);
- ☐ Shallow coal workings (recorded and probable);
- ☐ Workable coal seam outcrops;
- ☐ Mine gas sites and areas;
- ☐ Recorded coal-mining-related hazards;
- ☐ Geological features (fissures and break lines); and
- ☐ Former surface mining sites (sometimes using historic opencast extraction methods).

4.5. COAL MINING INFORMATION

Prior to the enactment of the Coal Mines Regulation Act (1872), which came into force on the 1st January 1883, there was no statutory requirement to record the extent of abandoned mine workings and as such the CA has no knowledge of extensive workings throughout the UK Coal Fields where shallow workings are present at a depth that could result in a subsidence event in the future (through successive cavitation) associated with failure of support mechanism.

To determine if a site may have unrecorded or recorded coal mine workings requires the consideration of a wide range of information and E3P has completed a review of relevant information in relation to potential coal mining activities.



In the first instance, E3P has reviewed the Coal Authority Online Viewer and an excerpt of this is presented as Figure 4.3. This map shows that the site lies within a development high risk area. Furthermore, there are coal seams to the Thin Coal (Seam Code: ZZ004C) appears to dip below the site. The map also indicates that there is the potential for shallow workings beneath the site and there are no mine shafts on the site.

FIGURE 4.3 EXCERPT OF THE COAL AUTHORITY ONLINE VIEWER



as the site is within an area affected by coal mining E3P has consulted with the Coal Authority who has provided a Consultant Coal Mining Report for the site (Ref: 51003165650001).

Table 4.4 provides a summary of pertinent coal mining information with this report.

TABLE 4.4 COAL MINING INFORMATION

SOURCES OF INFORMATION	SUMMARY
Known Past Underground Mining	No past mining recorded
Probable Unrecorded workings	Yes
Spine Roadways at Shallow Depth	No spine roadways recorded at shallow depth
Mine Entries within 100m of the site	None recorded within 100 m of the site boundary
Mine Abandonment plans	Yes (16820)
Known outcrops	No outcrops recorded
Faults / Fissures	No faults or fissures recorded
Opencast mines	None recorded within 500m
Coal Authority Managed Tips	None recorded within 500m
Remediated Sites	None recorded within 50m



SOURCES OF INFORMATION	SUMMARY
Coal Mining Subsidence	None recorded within 50 m
Mine Gas	None recorded within 500 m
Mine Water	None recorded within 500 m
Future Underground Mining	None recorded
Coal Authority Development Advice	None recorded
British Geological Survey Mapping	The 1:50000 geological mapping for the area (Sheet 85, Manchester, Solid / Bedrock editions) indicates a coal seams trending NW/SE on the eastern boundary of the site.
Review of Coal Authority Archive	No CA archives/mine abandonment plans are made available.
Historical Ordnance Survey Mapping	A review of the 1:10,000 Ordnance Survey mapping from circa 1851, which has records of mine workings that predate the Mining & Regulation Act of 1872, identified the following features indicative of historical mine workings in proximity to the application site:  Coal Pit – 1000 m NE  Captain Fold Colliery – 1200 m NE
Historical Site Investigations	E3P has not been provided with any historic site investigation reports.

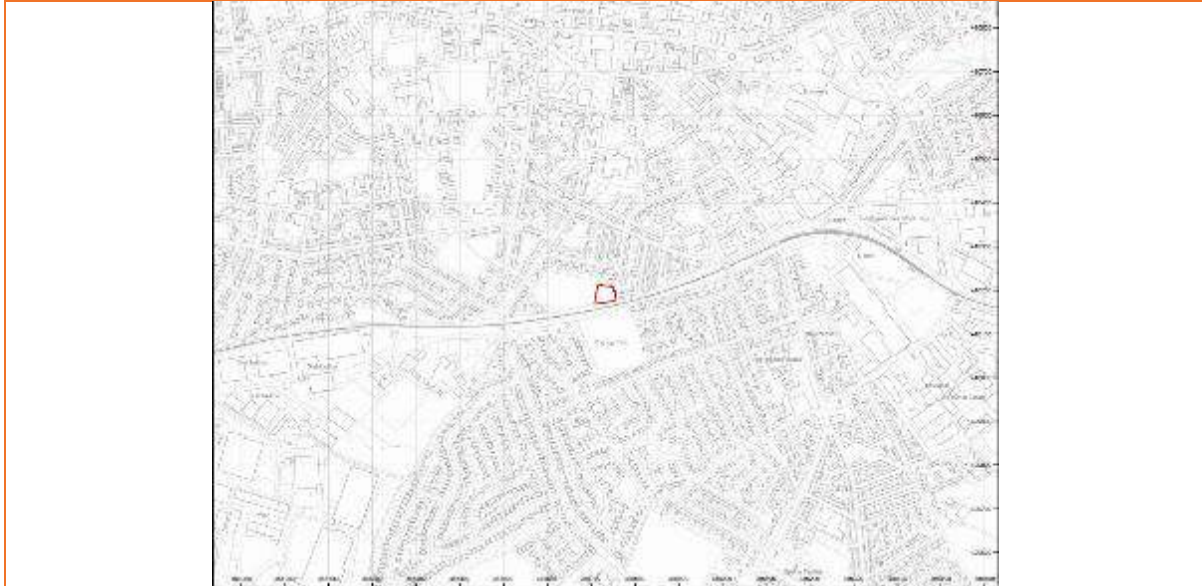


4.5.1. COAL AUTHORITY PLAN

The Coal Authority plan referenced: MR-LARGE-PLOT-51003165650001-1654698331825 shows that there are no recorded coal features within 50 m of the site boundary.

Correspondence from the Coal Authority has confirmed that the closest underground recorded workings are 1.1km to the north east of the site. There have been no records of workings beneath the site.

FIGURE 4.4 COAL AUTHORITY PLAN FOR THE SITE



4.5.2. COAL MINING GEOLOGY

Figure 4.5 is a photograph of the 1:1200 plan for the site which shows the Thin Coal outcrop, trending NW/SE, potentially can be found 57 m to the east, however, this is inferred and no outcrop has been marked.

FIGURE 4.5 PHOTOGRAPH OF THE 1:10,000 PLAN FOR THE SITE



4.6. COAL MINING RISK ASSESSMENT

This risk assessment comprises a desk-based review of all available information on coal mining issues that are relevant to the application site deemed to be located within a high-risk area. This includes:

- Interpretation of information to identify and assess the risks to the proposed development from coal mining legacy, including the cumulative impact of issues;
- Setting out appropriate mitigation measures to address the coal mining legacy issues affecting the site, including any necessary remedial works and/or demonstrate how coal mining issues have influenced the proposed development; and
- Demonstrating to the local planning authority that the application site is, or can be made, safe and stable to meet the requirements of national planning policy with regard to development on unstable land.

The coal mining risk assessment is summarised in Table 4.5.

TABLE 4.5 SUMMARY OF COAL MINING RISK ASSESSMENT

COAL MINING RISK ASSESSMENT	YES/NO	RISK ASSESSMENT
Recorded Underground Coal Mining at Shallow Depth (< 30 m)	No	Low
Recorded Underground Coal Mining at Shallow Depth (> 30 m)	No	Low
Evidence of Unrecorded Surface Extraction of Coal Outcrop	No	Low
Unrecorded Underground Coal Mining at Shallow Depth (< 30 m)	No	Low
Mine Entries (Shaft/Adits)	No	Low
Coal Mining Geology – Fractures/Fissures	No	Low
Recorded Gas Emissions	No	Low
Recorded Mining Surface Hazard	No	Low
Surface Mining (Opencast)	No	Low

Based on the above, a Low risk of unrecorded coal mining at shallow depth has been identified within the Thin Coal seam. The CA, as a statutory consultee, will require a series of rotary open holes across the site to determine the presence of any coal on site and to understand the nature of any coal workings. This is a requirement as the site sits within a development high risk, even upon reviewing the available information and assessing the site as low risk.



4.10. INDUSTRIAL LAND USES

The site is located within a predominantly agricultural and residential area, therefore there are no entries within the trade directory for industrial land uses.

The site is located within a predominantly residential area with limited industrial land usage. There are five active entries into the trade directory for industrial land use within 250 m of the site:

-  Electrical substation (159 m southeast);
-  Electrical substation (179 m north);
-  Unspecified works (229 m east);
-  Industrial printers (230 m east); and,
-  Clearance and salvage dealers – building merchants (246 m southwest).

4.11. SENSITIVE LAND USES

Residential properties border the site along the northern and eastern boundaries.

No other environmentally sensitive land uses have been identified within close proximity to the site.



4.12. SITE SENSITIVITY ASSESSMENT

The site is assessed to be located within a “Moderate” sensitivity setting as discussed in Table 4.6.

TABLE 4.6 SITE SENSITIVITY ASSESSMENT

SENSITIVITY PROFILE	DISCUSSION	RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not located in a Groundwater Source Protection Zone or Drinking Water Safeguard Zone	Low
Distance to the Closest Groundwater Abstraction Point	There are no groundwater abstraction points within 250 m of the site. There are no active groundwater abstraction points within 2000 m of the site.	Low
Aquifer Classification in Superficial Drift Deposits	Secondary Undifferentiated Aquifer.	Moderate
Aquifer Classification in Bedrock	Secondary A Aquifer.	Low
Is the Site Underlain by Low-Permeability Drift to Depths in Excess of 10 m?	BGS borehole records in the area paint a varied picture with shallow bedrock being identified to the southwest, however granular deposits to 11.50 m bgl have been identified to the north. The site is known to have been raised, however, the nature and composition of this upfill are unknown.	Moderate
Is the Site Located Within 50 m of a Surface Watercourse?	No surface watercourses have been identified within influencing distance of the site.	Low
Sensitive Land Uses	The site is located within a predominantly residential setting, surrounded by low rise, terrace housing.	Moderate
OVERALL SITE ENVIRONMENTAL SENSITIVITY		Low / Moderate



5. CONSULTATIONS

5.1. CONTAMINATED LAND OFFICER

E3P contacted the environmental health department at Rochdale Metropolitan Council who have been unable to respond within the reporting timescales. Upon receipt of the search information, E3P will issue any pertinent information and/or use the information to inform the development of any intrusive investigation proposals.

5.2. LANDFILL SITES AND WASTE TREATMENT SITES

There are no landfills recorded within 500 m of the site boundary.

5.3. REGULATORY DATABASE

The information summarised in Table 5.1 has been obtained from a commercially available environmental database. The summary table only includes records from within 250 m of the subject site and is not otherwise detailed in the report.

TABLE 5.1 SUMMARY OF ENVIRONMENTAL DATA

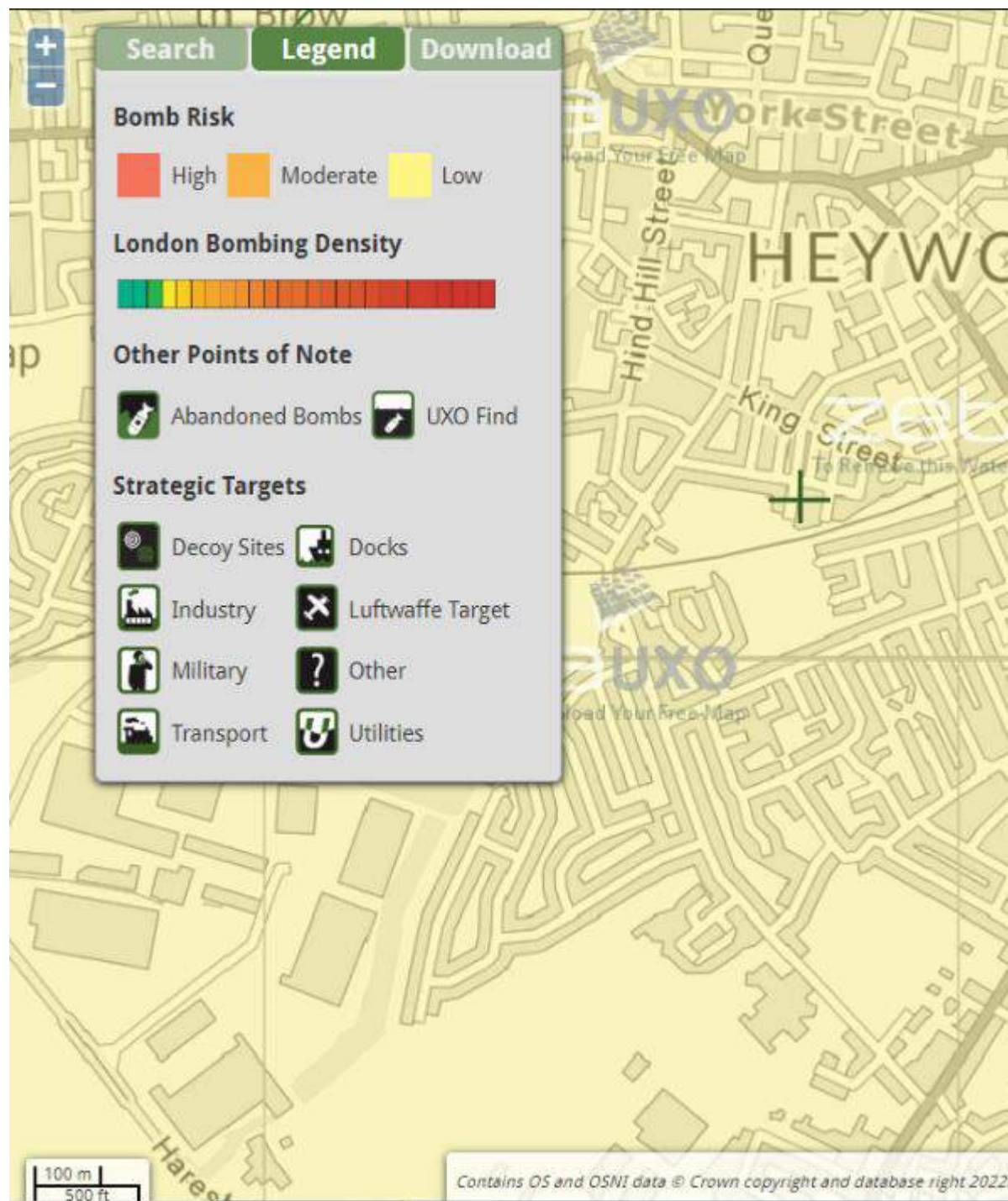
RECORD	ENTRIES WITHIN 250 m	DETAILS
Contaminated Land Register Entries and Notices	0	None Identified
Authorised Industrial Processes (IPC/IPPC/LAPPC)	0	None Identified
Fuel Stations Entries	0	None Identified
Licensed Radioactive Substances	0	None Identified
Enforcements, Prohibitions or Prosecutions	0	None Identified
Discharge Consents	0	None Identified
Pollution Incidents	0	None Identified
Consents Issued Under the Planning (Hazardous Substances) Act 1990	0	None Identified
Control of Major Accident Hazard (COMAH) Sites	0	None Identified

5.1. UNEXPLODED ORDNANCE

The regional unexploded bomb risk map from Zetica (2014) indicates that the site is in an area at low risk from possible unexploded ordnance (UXO) resulting from the Second World War. The Zetia UXO Risk Map is presented in Figure 5.1.



FIGURE 5.1 ZETICA UXO RISK MAP



Source - <https://zeticauxo.com/downloads-and-resources/risk-maps/>



6. INITIAL CONCEPTUAL SITE MODEL

In accordance with EA LCRM (2019) and BSI 10175 (Code of Practice for Investigation of Potentially Contaminated Land), E3P has developed an initial conceptual site model (CSM) to identify potential contamination sources, migration pathways and receptors within the study area. This is summarised within Table 6.1.

ON-SITE SOURCES OF CONTAMINATION

The following potential on-site sources of contamination have been identified:

- Historical upfilling (Made Ground) of the land.
- Historical activity associated with the railway that runs along the southern boundary

OFF-SITE SOURCES OF CONTAMINATION

The following potential off-site source of contamination have been identified:

- Industrial activity associated with the railway to the south

TABLE 6.1 INITIAL CONCEPTUAL SITE MODEL

SOURCE	PATHWAY	RECEPTOR
Human Health		
Heavy Metals, PAHs Associated Within Made Ground	Dermal Contact and Ingestion. Consumption of Homegrown Produce.	Construction Workers. Residential End Users.
Discussion: Given the development history and the upfilled platform that is present onsite, Made ground is likely to be present across the site, which may contain contaminants such as heavy metals (lead, arsenic, mercury etc) , non-volatile Polycyclic Aromatic Hydrocarbons (benzo[a]pyrene, dibenz[a,h]anthracene etc) and Total Petroleum Hydrocarbon contamination (aromatic and aliphatic fractions).		
Volatile Hydrocarbon Compounds Associated Within Made Ground	Volatilisation/Accumulation. Vapour Inhalation.	Construction Workers. Residential End Users.
Discussion: There is potential for fuel leaks/spills given the historical past of the site, albeit highly localised and the absence of hard standing may have resulted in leaching into soils onsite. . No other significant sources of volatile contaminants have been identified at the site. Future residential end users may be exposed to volatile contaminants via inhalation and accumulation of vapours in indoor space, representing a long-term risk. An intrusive ground investigation with chemical analysis of soil and groundwater samples is recommended to investigate the presence of volatile compounds and facilitate further risk assessment. There is considered to be a low overall risk to human health in this initial assessment.		



SOURCE	PATHWAY	RECEPTOR
Asbestos-Containing Materials (ACMs) within Made Ground	Fibre/Dust Inhalation.	Construction Workers. Residential End Users. Third-Party Property.
Discussion: The presence of ACM within the Made Ground is a possibility due to the historic developments on the site. ACM products were commonly used within building material in historical developments (pre-2000). Disturbance of ACM in subsoils during the construction phase may give rise to dust generation, posing a moderate risk to adjacent site users and construction workers. These risks can be mitigated through the development of a detailed enabling works strategy following guidance and protocol specified within the Control of Asbestos Regulations (2012) and industry best practice as detailed in CIRIA733 (Asbestos in Soil and Made Ground: A guide to understanding risk).		
Hazardous Ground Gases		
Methane and Carbon Dioxide Associated with Possible On-Site Fill Material	Inhalation. Accumulation.	Construction Workers. Residential End Users.
Discussion: Low likelihood due to the absence of any infilled areas or organic deposits on the site, however, the presence of deep Made Ground may give rise to the generation of ground gasses. The potential presence of underground working further gives rise to the potential for ground gas generation. A full gas monitoring regime is recommended due to the sensitive nature of the proposed development.		
Controlled Waters		
Hydrocarbon Compounds	Vertical/Lateral Migration.	Secondary A Aquifer.
Discussion: Given the development history and the upfilled platform that is present onsite, Made ground is likely to be present across the site, which may contain contaminants such as Polycyclic Aromatic Hydrocarbons (benzo[a]pyrene, dibenz[a,h]anthracene etc) and Total Petroleum Hydrocarbon contamination (aromatic and aliphatic fractions).		
Buildings and Infrastructure		
pH and Sulphate	Corrosion of Concrete.	Foundations/Concrete.
Discussion: Low pH and high sulphates may be present within Made Ground, which may result in corrosion of buried concrete within the proposed development. Intrusive investigation with chemical analysis of soil samples is recommended to confirm the levels of pH and sulphate within Made Ground deposits and thus determine the concrete classification.		
Ecology		
None Identified	None identified	None identified
Discussion: No sensitive ecological receptors have been identified at the site.		



7. GROUND INVESTIGATION

7.1. GENERAL OVERVIEW

A ground investigation has been designed based on the findings of the desk study, with exploratory holes advanced to target specific potential contaminant sources. The investigation has also been used to collect geotechnical information to assist in the design and construction of the proposed development.

Exploratory fieldwork was completed between 7th July 2022 and 8th July 2022. The works are summarised in Table 7.1.

7.2. LIMITATIONS OF THE INVESTIGATION

The presence of Japanese knotweed, particularly in the west of the site limited the reach of the investigation in this area.

7.3. SCOPE OF INVESTIGATION

TABLE 7.1 SUMMARY OF FIELDWORK

POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAXIMUM DEPTH (m bgl)	MONITORING WELLS RESPONSE ZONE (m bgl)
General ground conditions including the presence/nature of obstructions	WS101	Window Sample Probehole	5.45	4.50-5.00
	WS102		5.45	0.50-3.50
	WS103		5.45	1.00-4.00
	WS104		5.45	3.50-4.50
	WS105		5.45	0.60-3.00
Investigate the presence of coal workings	RB101	Rotary Boreholes	40.00	N/A
	RB102		40.00	N/A

Window sample probeholes were advanced to undertake in-situ detailed geotechnical testing, obtain environmental samples and install groundwater and ground gas monitoring wells.

The rotary boreholes were advanced to investigate the potential presence of shallow mine workings. These boreholes were drilled in accordance with the CA permissions process and industry best practice.

The sampling locations are illustrated in Drawing 16-060-005 (Appendix III). The ground conditions encountered are indicated on the logs, which are provided in Appendix V.

Return visits were made to monitor installations for groundwater level and gas concentrations.

7.4. IN-SITU STANDARD PENETRATION TESTING (SPT)

In-situ geotechnical testing was conducted using the standard penetration test (SPT) and, where the ground is granular, a 60° cone (SPT(C)) was used instead of the sampling tube. The results are shown in the probehole logs in Appendix V and presented in Table 8.4 and discussed in Section 11.



7.5. LABORATORY ANALYSIS

Selected soil samples were submitted for a range of chemical analyses comprising:

- ☐ Metals.
- ☐ pH, total sulphate, water-soluble sulphate (2:1 extract).
- ☐ Sulphide.
- ☐ Cyanide.
- ☐ Phenols.
- ☐ Total and speciated polycyclic aromatic hydrocarbons (PAHs).
- ☐ Semi Volatile Organic Compounds (SVOC).
- ☐ Volatile Organic Compounds (VOC).
- ☐ Asbestos identification and quantification.
- ☐ Speciated and banded total petroleum hydrocarbon (TPH).

I2 Analytical undertook the analytical work and the testing results are included in Appendix VI and discussed in Section 9.

Selected samples were submitted to PSL Laboratory where the following geotechnical tests were undertaken:

- ☐ Atterberg limits determinations; and
- ☐ Single-stage triaxial tests.

Laboratory analysis sheets are included in Appendix VIII and are summarised in Section 11.



8. GROUND AND GROUNDWATER CONDITIONS

8.1. SUMMARY OF GROUND CONDITIONS

The ground investigation generally confirms the published geology and identifies the strata set out in Table 8.1.

TABLE 8.1 SUMMARY OF STRATA

HOLE	DEPTH TO STRATUM (m bgl)					
	MADE GROUND	SAND	CLAY	STIFF CLAY	GRAVEL	BED ROCK
WS101	0.00-4.50	–	–	4.50-5.45	–	–
WS102	0.00-3.70	3.70-5.45	–	4.30-5.45	–	–
WS103	0.00-3.85	–	3.85-4.20	4.20-5.45	–	–
WS104	0.00-3.80	4.70-5.45	–	3.80-4.70	–	–
WS105	0.00-4.30	4.30-4.90	–	4.90-5.45	–	–
RB101	0.00-6.60	–	–	–	–	6.60-40.00
RB102	0.00-6.20	6.20-8.60	–	–	–	8.60-40.00

8.2. MADE GROUND

Made Ground deposits were encountered within all exploratory hole locations to depths of between 0.37 m and in excess of 6.60 m bgl although, in general, Made Ground was encountered to a depth of less than 3.80 m bgl.

The Made Ground on site is generally comprised of very loose (WS102 and WS104) to medium dense black slightly clayey slightly sandy gravel. Gravel is fine to medium subangular of sandstone with frequent fragments of brick, clinker, concrete, glass and ash with clay clods of sandy clay 0.15 m in size throughout.

A Depth of Made Ground Plan is presented as Drawing 16-060-005 in Appendix III.

8.3. DRIFT DEPOSITS

Drift deposits were identified in the majority of locations on-site with the exception of RB101. Drift deposits generally comprised of a loose brown clayey fine to medium SAND overlying a stiff medium strength brown mottled grey CLAY to depths up to 5.45 m bgl.

Within RB102 at deeper depths of 6.20–8.60 m a brown SAND was recorded.

8.4. SOLID GEOLOGY

Solid geology was encountered within two locations RB101 and RB102.

A grey mudstone with coal traces was identified within both locations at a depth of 6.60–7.30 m bgl and 8.60–12.00 m bgl respectively.

SILTSTONE was identified within RB101 at a depth of 7.30–8.00 m bgl.



The remaining geology comprised MUDSTONE to 40.00 m bgl.

No loss of flush or voids were noted within any of the rotatory boreholes across the site.

8.5. GROUNDWATER

Groundwater strikes were encountered as seepages. The depth of the seepages are shown on the exploratory hole records in Appendix V and are summarised in Table 8.2.

TABLE 8.2 SUMMARY OF GROUNDWATER STRIKES

LOCATION	DEPTH TO STRIKE (m)	NOTES
WS102	4.00	Perched water
WS103	4.50	Perched water
WS104	3.20	Perched water within Made Ground
WS105	4.00	Perched water within Made Ground

8.6. VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

Visual and olfactory evidence of potential contamination has been identified during the site investigation and these are summarised in Table 8.3.

TABLE 8.3 SUMMARY OF VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

LOCATION	DEPTH (m)	STRATUM	NOTES
WS101	1.10–4.50	Made Ground	Ash and clinker
WS102	GL–3.70	Made Ground	Ash and clinker
WS103	GL–3.85	Made Ground	Ash and clinker
WS104	GL–3.10	Made Ground	Ash and clinker
WS105	GL–1.30 & 2.50–4.30	Made Ground	Ash and clinker
	2.50–3.00 & 4.00–4.30		Slight hydrocarbon odour

8.7. SOIL CONSISTENCY

SPT borehole data is presented in Table 8.4, which indicates the natural clay to vary between stiff and very stiff. Strength test data is generally consistent with the field descriptions of the aforementioned soils.



TABLE 8.4 STANDARD/CONE PENETRATION TEST RESULTS

BOREHOLES	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
WS101	1	MADE GROUND: Yellowish brown very gravelly fine to medium sand.	26	26.21	Medium Dense	N/A	N/A	N/A	262.12
WS101	2	MADE GROUND: Black slightly clayey slightly sandy gravel.	7	6.39	Loose	N/A	N/A	N/A	63.95
WS101	3	MADE GROUND: Black slightly clayey slightly sandy gravel.	5	4.35	Loose	N/A	N/A	N/A	43.48
WS101	4	MADE GROUND: Black very gravelly clay.	12	10.14	N/A	Stiff	Medium strength	50.69	104.22
WS101	5	Brown mottled grey CLAY.	15	12.44	N/A	Stiff	Medium strength	62.22	127.93
WS102	1	MADE GROUND: Black slightly clayey slightly sandy gravel.	3	3.02	Very Loose	N/A	N/A	N/A	30.24
WS102	2	MADE GROUND: Black slightly clayey slightly sandy gravel.	3	2.74	Very Loose	N/A	N/A	N/A	27.41
WS102	3	MADE GROUND: Dark grey sandy slightly gravelly clay.	7	6.09	Loose	N/A	N/A	N/A	60.88



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BOREHOLES	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
WS102	4	Brown clayey fine to medium SAND.	7	5.91	Loose	N/A	N/A	N/A	59.14
WS102	5	Brown mottled grey sandy CLAY.	15	12.44	N/A	Stiff	Medium strength	62.22	127.93
WS103	1	MADE GROUND: Dark brown slightly clayey gravelly sand.	20	20.16	Medium Dense	N/A	N/A	N/A	201.63
WS103	2	MADE GROUND: Black slightly clayey slightly sandy gravel.	6	5.48	Loose	N/A	N/A	N/A	54.81
WS103	3	MADE GROUND: Black slightly clayey slightly sandy gravel.	3	2.61	Very Loose	N/A	N/A	N/A	26.09
WS103	4	Dark grey very sandy CLAY.	16	13.52	N/A	Stiff	Medium strength	67.59	138.96
WS103	5	Brown slightly gravelly sandy CLAY.	11	9.13	N/A	Stiff	Medium strength	45.63	93.81
WS104	1.2	MADE GROUND: Dark brownish grey slightly clayey gravelly fine to medium sand.	1	0.98	Very Loose	N/A	N/A	N/A	9.81



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BOREHOLES	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
WS104	2	MADE GROUND: Dark brownish grey slightly clayey gravelly fine to medium sand.	4	3.65	Very Loose	N/A	N/A	N/A	36.54
WS104	3	MADE GROUND: Dark brownish grey slightly clayey gravelly fine to medium sand.	2	1.74	Very Loose	N/A	N/A	N/A	17.39
WS104	4	Brown very sandy CLAY.	10	8.45	N/A	Stiff	Medium strength	42.24	86.85
WS104	5	Brown very clayey fine to medium SAND.	10	8.30	Loose	N/A	N/A	N/A	82.96
WS105	1	MADE GROUND: Dark brown slightly clayey gravelly fine to medium sand.	8	8.07	Loose	N/A	N/A	N/A	80.65
WS105	2	MADE GROUND: Dark grey slightly sandy gravelly clay.	3	2.74	N/A	Soft	Very low strength	13.70	28.17
WS105	3	MADE GROUND: Dark grey slightly sandy gravelly clay.	6	5.22	Loose	N/A	N/A	N/A	52.18
WS105	4	MADE GROUND: Dark grey slightly sandy gravelly clay.	34	28.72	N/A	Very Stiff	High strength	143.62	295.29



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BOREHOLES	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
WS105	5	Brown mottled grey sandy CLAY.	15	12.44	N/A	Stiff	Medium strength	62.22	127.93

NOTES

* The Allowable Bearing Pressure (ABP) should be considered indicative.

The interpretation of in situ mass undrained shear strength (cu) data from SPT Blow Count (N) results and the influence of the Plasticity Index (PI) was reported in Standard Penetration Test in Insensitive Clays and Soft Rocks. Stroud (1974). The standard penetration test and the engineering properties of glacial materials subsequently. Stroud and Butler (1975) and (1989).

Allowable bearing pressure on sands. Soil Mechanics in Engineering Practice Terzaghi, K. & Peck, R.B. 1996.



8.8. PARTICLE SIZE DISTRIBUTION

Particle Size Distribution Tests have been undertaken on selected samples of granular material via wet sieve to obtain information on the soil fractions. The results are included in Table 8.5. The full results can be found in Appendix VIII.

TABLE 8.5 SUMMARY OF PARTICLE SIZE DISTRIBUTION TEST RESULTS

LOCATION	DEPTH (m)	SOIL FRACTION (%)			
		COBBLES	GRAVEL	SAND	SILT/CLAY
WS101	0.50-1.20 (Made Ground)	27	32	30	11
WS103	0.50-2.00 (Made Ground)	0	29	26	45

8.9. SOIL PLASTICITY

The Atterberg limits determinations, summarised in Table 8.6, show the clay to be of predominantly low plasticity with discrete areas of moderate plasticity clay.

TABLE 8.6 SUMMARY OF PLASTICITY INDEX TEST RESULTS

LOCATION	DEPTH (m)	NATURAL MOISTURE CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	PASSING 425 µm SIEVE (%)	MODIFIED PLASTICITY INDEX	NHBC VOLUME CHANGE POTENTIAL
WS102	4.00-4.45	17	15	28	13	100	13	Low
WS103	3.00-3.45	26	17	36	19	77	14.63	Low
WS104	2.00-2.45	16	25	42	17	84	14.28	Low

The results of the Atterberg limits testing confirmed that the soils would be deemed to be "Low Volume Change Potential" in accordance with the classification system utilised by the LABC/NHBC industry guidance.



8.10. pH AND SULPHATE

Chemical analyses for pH and soluble sulphate content contained in Appendix VI (summarised in Table 8.7), shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE *Special Digest 1* (2005).

TABLE 8.7 SUMMARY OF pH AND SULPHATE DATA

LOCATION	DEPTH (m)	SO ₄ IN 2:1 WATER/SOIL (g/l)	pH VALUE	CLASSIFICATION
WS101	0.80	0.045	9.6	DS-1, AC-1s
WS101	2.60	0.091	8	DS-1, AC-1s
WS102	0.50	0.026	8.3	DS-1, AC-1s
WS103	0.20	0.022	8.6	DS-1, AC-1s
WS103	1.60	0.05	7.9	DS-1, AC-1s
WS104	0.30	0.044	8.7	DS-1, AC-1s
WS104	1.50	0.028	8.2	DS-1, AC-1s
WS105	0.60	0.024	8.3	DS-1, AC-1s
WS105	2.70	0.13	8.5	DS-1, AC-1s
WS105	4.50	0.018	8.4	DS-1, AC-1s



9. TIER I QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

E3P has undertaken a Tier 1 qualitative risk assessment to determine if any potential contaminants within the underlying soils and groundwater pose an unacceptable level of risk to the identified receptors.

9.1. DEVIATING SAMPLES

Deviating samples were to be avoided during the ground investigation by using best practice sampling procedures including use of appropriate sampling containers and adhering to the laboratory holding times for each contaminant analysis undertaken.

As such no samples have been noted to have deviating.

9.2. HUMAN HEALTH RISK ASSESSMENT

At Tier 1 stage, the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published in LQM/CIEH S4UL (S4UL3267).

Where Tier 1 screening values are not provided by LQM, other screening values have been used and these are referenced in Table 9.1.

The results of this comparison have been summarised within Table 9.1.



TABLE 9.1 SUMMARY OF INORGANIC AND HYDROCARBON TOXICITY ASSESSMENT FOR A RESIDENTIAL END USE

DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PATH-WAY	ASSESSMENT
Arsenic	mg/kg	37	14	210 140	WS103 – 1.60 m WS105 – 2.70 m	1	Further Action
Cadmium	mg/kg	17	14	0.5	N/A	1	No Further Action
Chromium (VI)	mg/kg	6.0	14	<1.8	N/A	1	No Further Action
Lead	mg/kg	200	14	1200 720 440 270 210	WS103 – 1.60 m WS105 – 2.70 m WS104 – 1.50 m WS104 – 0.30 m WS102 – 0.50 m	1	Further Action
Mercury	mg/kg	1.2	14	5	WS105 – 2.70 m	4	Further Action
Nickel	mg/kg	130	14	110	N/A	1	No Further Action
Selenium	mg/kg	250	14	<1.0	N/A	1	No Further Action
Copper	mg/kg	2400	14	1900	N/A	1	No Further Action
Zinc	mg/kg	3700	14	380	N/A	1	No Further Action
Cyanide – Total	mg/kg	791	14	6.3	N/A	1	No Further Action
Phenols – Total	mg/kg	120	14	<1.0	N/A	1	No Further Action
Asbestos	Fibres	NFD	9	<0.001	WS102 – 0.50 m WS104 – 0.30 m WS104 – 1.50 m WS105 – 2.70 m	3	Chrysotile Further Action
Naphthalene	mg/kg	2.3	14	9.7 2.7	WS103 – 1.60 m WS101 – 2.60 m	4	Further Action
Acenaphthylene	mg/kg	170	14	1.8	N/A	2	No Further Action
Acenaphthene	mg/kg	210	14	18	N/A	1	No Further Action
Fluorene	mg/kg	170	14	11	N/A	1	No Further Action
Phenanthrene	mg/kg	95	14	130	WS101 – 2.60 m	2	Further Action
Anthracene	mg/kg	2400	14	32	N/A	2	No Further Action
Fluoranthene	mg/kg	280	14	160	N/A	2	No Further Action
Pyrene	mg/kg	620	14	150	N/A	2	No Further Action
Benzo(a)Anthracene	mg/kg	7.2	14	99 23	WS101 – 2.60 m WS103 – 1.60 m	2	Further Action
Chrysene	mg/kg	15	14	69 18	WS101 – 2.60 m WS103 – 1.60 m	2	Further Action
Benzo(b)Fluoranthene	mg/kg	2.6	14	68 16 5.3 4.4 4	WS101 – 2.60 m WS103 – 1.60 m WS104 – 1.50 m WS104 – 0.30 m WS105 – 2.70 m	2	Further Action
Benzo(k)Fluoranthene	mg/kg	77	14	38	N/A	2	No Further Action
Benzo(a)Pyrene	mg/kg	2.2	14	69 20 4.8 4.6 4.3	WS101 – 2.60 m WS103 – 1.60 m WS104 – 1.50 m WS105 – 2.70 m WS104 – 0.30 m	2	Further Action



DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PATH-WAY	ASSESSMENT
Indeno(123-cd)Pyrene	mg/kg	27	14	29	WS101 – 2.60 m	2	Further Action
Dibenzo(a,h)Anthracene	mg/kg	0.24	14	9.8 2.7 0.65 0.52	WS101 – 2.60 m WS103 – 1.60 m WS104 – 1.50 m WS104 – 0.30 m	2	Further Action
Benzo(ghi)Perylene	mg/kg	320	14	32	N/A	2	No Further Action
TPH C5-C6 (aliphatic)*	mg/kg	42	12	<1.0	N/A	4	No Further Action
TPH C6-C8 (aliphatic)*	mg/kg	100	12	<0.1	N/A	4	No Further Action
TPH C8-C10 (aliphatic)*	mg/kg	27	12	<0.1	N/A	4	No Further Action
TPH C10-C12 (aromatic)*	mg/kg	74	12	11	N/A	4	No Further Action
TPH C12-C16 (aromatic)*	mg/kg	140	12	84	N/A	4	No Further Action
TPH C16-C21 (aromatic)*	mg/kg	260	12	500	WS101 – 2.60 m	1	Further Action
TPH C21-C35 (aromatic)*	mg/kg	1100	12	1600	WS103 – 1.60 m	1	Further Action

Notes

PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = dust inhalation; PL4 = Vapour/Gas Inhalation; PL5 = Vertical / Lateral Migration; PL6 = Corrosion of concrete; PL7=Tainting of water supply; PL8 = Uptake by plants

Abbreviations: GAC = general assessment criteria, n = number of samples, MC = maximum concentration; Loc of Ex = location of exceedance; NFD = no fibres detected.

* The Tier 1 GAC for the hydrocarbon fraction is derived from the CIEH assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. E3P has utilised the Tier 1 values for aliphatic compounds for the volatile and semi volatile fractions (C5-C12) and the Tier 1 values for aromatic compound for the non-volatile fractions (C12-C35). The comparison of a total (aliphatic/aromatic) compounds to an individual fraction is considered to be a conservative approach and satisfactory for the protection of human health.

Referring to Table 9.1, the results of this direct comparison indicate that the data exceeds the screening criteria for a residential end use for the following contaminants:

-  Arsenic.
-  Lead.
-  Mercury.
-  Naphthalene.
-  Phenanthrene.
-  Benzo(a)Anthracene.
-  Chrysene.
-  Benzo(b)Fluoranthene.
-  Benzo(a)Pyrene.
-  Indeno(123-cd)Pyrene.



-  Dibenzo(a,h)Anthracene.
-  Hydrocarbon Fractions C16-C35 (aromatic).
-  Chrysotile.

Asbestos in the form of loose chrysotile fibres has been identified in the Made Ground in WS102, WS104 and in WS105.

The laboratory analysis confirms the assessment within the initial conceptual site model that the main constituents of concern were likely to be asbestos, PAHs, hydrocarbon compounds and heavy metals.

In relation to these exceedances, the following can be determined:

-  The main exposure pathways based on the Tier I exceedances are:
 - Soil ingestion;
 - Vapour inhalation (indoor);
 - Dermal contact and ingestion;
 - Consumption of homegrown vegetables; and
 - Fibre/dust inhalation.

HUMAN HEALTH RISK ASSESSMENT AND MITIGATION

A Tier I human health risk assessment has been undertaken using the chemical analysis results of the soils and comparing to the relevant Tier I screening criteria for a residential end use. This assessment has identified the presence of elevated lead, arsenic, mercury, naphthalene, phenanthrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, asbestos and total and speciated petroleum hydrocarbon (TPH) bands C21-C35.

The majority of the identified elevated concentrations have primary exposure pathways related to dermal contact and ingestion, soil ingestion and consumption of homegrown produce. These exceedances can be mitigated by the installation of a chemically suitable cover system within all proposed garden areas. With regards to the elevated naphthalene, mercury, these present a potential volatilisation to indoor air risk. Naphthalene has been identified within two locations on site WS101 and WS103. Due to the small nature of the site, it can be considered there is nowhere deemed suitable to place the soils on site to mitigate the risk caused to human health. Therefore, a vapour resistant membrane should be utilised under plots to reduce the risk.

The initial chemical testing identified a total mercury of 5.0 mg/kg within WS105 at 2.70 m bgl. The sample was submitted for further analysis to identify the elemental mercury present. It is the elemental mercury that forms the vapour risk. The chemical result indicates that the elemental mercury forms 0.667 mg/kg of the sample, meaning it is below the 1.20 mg/kg threshold. As such the mercury impact identified within WS105 is not seen to present an unacceptable risk to the site and its end users.

Asbestos, in the form of chrysotile, has also been identified within areas of Made Ground deposits. Asbestos quantification has shown all locations containing asbestos to have < 0.001%. No visual signs of asbestos containing material (ACM) were encountered during the ground investigation; therefore, it is likely that only trace fibres are present within these soils. Impacted soils should be managed according to the asbestos risk mitigation conceptual site model shown in Figure 9.1.



Chemical analysis of the natural CLAY and SAND drift deposits have identified these soils to be acceptable for use as subsoil within the proposed garden areas; however, further chemical validation samples will be required to confirm this. There are no suitable sources of topsoil available on the site.

FIGURE 9.1 ASBESTOS RISK MITIGATION CONCEPTUAL SITE MODEL



Notes

ND None Detect

0.001% Soils may contain $\leq 0.001\%$ asbestos using composite testing to ensure there is no potential risk to human health. This value is present within areas where there may be a short term low level exposure of soils containing trace asbestos fibres by construction workers where an appropriate level of asbestos management is employed (dust suppression)

0.1% Soils at a depth of $>1.00\text{m}$ bgl may contain $<0.1\%$ asbestos using composite testing where they will not be likely to be disturbed in the future and will therefore be in an area of low sensitivity. Risk assessment completed in accordance with Asbestos JIWG risk assessment tools.

Undefined- this will be dependent upon soils encountered during earthworks, which may be placed at these depths to ensure no potential risk to human health.



9.3. CONTROLLED WATERS RISK ASSESSMENT

E3P has undertaken a controlled waters risk assessment for the site based on the consideration of the conceptual site model and the sensitive receptors which are summarised in Table 9.2.

TABLE 9.2 CONTROLLED WATERS CONCEPTUAL MODEL AND SENSITIVITY PROFILE

DISCUSSION		SENSITIVITY RATING
Contaminant Source		
Made Ground Heavy metal and PAH contamination is present as a result of the historical filling across the site to form the railway terrace.		High
Pathway		
Vertical Migration Due to the majority of the site being underlain by granular deposits, vertical migration of contaminants is likely to occur as a result of the high permeability of the drift deposits. However, clay deposits underlay granular drift up to a depth of 5.45 m bgl. The presence of this low permeability drift will offer some protection to the underlying aquifer.		Medium
Lateral migration Lateral migration of contaminants is considered possible due to the presence of granular alluvium deposits across the site. However, this will be reduced due to the presence of low permeability clay deposits on site.		Medium
Receptor		
Aquifer Classification in Superficial Drift Deposits	Secondary undifferentiated	Medium
Aquifer Classification in Bedrock	Secondary A aquifer	Medium
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not affected	Low
Distance to the Closest Groundwater Abstraction Point	None identified within a 1 km radius.	Low
Is the Site Located Within 50 m of a Surface Watercourse?	No surface watercourses have been identified within influencing distance of the site.	Low
The ICSM developed within the context of the site setting has viable pollutant pathway, which would be the downward migration of potentially mobile phase-soluble contaminants towards the underlying secondary A aquifer.		

To ensure a robust appraisal of the identified risk to controlled waters, E3P has identified the sources of potential contamination that represent a risk to controlled waters from the initial CSM, we have then assessed the availability of ground investigation data in the form of analysis of the solid phase (soil) and dissolved phase within the perched groundwater or aquifer. The results of this assessment are presented in Table 9.3.



TABLE 9.3 QUALITATIVE RISK TO CONTROLLED WATERS FROM SOIL ANALYTICAL RESULTS

CONTAMINANT	ASSESSMENT RATING	DISCUSSION
BTEX > 1 mg/kg	The soil data analysis has not identified any detectable concentrations of VOCs above 1mg/kg or TPH C5 to C6 that might otherwise be indicative of VOC impact.	None
Total VOC > 1 mg/kg		
Total SVOC > 1 mg/kg	SVOC analysis recorded concentrations below the laboratory LOD, however, PAH analysis has identified levels above the laboratory LOD throughout the site.	Further discussion
C5-C10 > 5 mg/kg	All concentrations are below the laboratory LOD.	None
C10-C12 > 10 mg/kg	Concentration of C10-C12 has been recorded at 11 mg/kg within WS103 at 1.60 m bgl. No further concentrations above 10 mg/kg have been identified onsite.	Further discussion
C12-C16 > 50 mg/kg	Concentration of C12-C16 has been recorded at 84 mg/kg within WS101 at 2.60 m bgl. No further concentrations above 50 mg/kg have been identified onsite.	Further discussion
Phenols > 2 mg/kg	All concentrations are below the laboratory LOD.	None
Naphthalene > 2 mg/kg	Concentrations of naphthalene above 2 mg/kg have been recorded in WS101 (2.7 mg/kg) at 2.60 m bgl and within WS103 (9.7 mg/kg) at 1.60 m bgl.	Further discussion
Total PAH > 10 mg/kg	Total concentrations of low-solubility PAH compounds greater than 10 mg/kg have been detected throughout the site, with a maximum concentration recorded in WS101 at 918 mg/kg.	Further discussion
PCB > 1 mg/kg	No potential sources of PCB have been identified	None
Heavy metals > 500 mg/kg	Concentrations of heavy metals above 500 mg/kg have been recorded in WS103 at 1.60 m bgl and within WS105 at 2.70 m bgl.	Further discussion

The Tier I assessment has included a comparison of leachate analysis from samples of the Made Ground drinking water standards due to the lack of any surface water features within 50 m of the site.

These are presented in Table 9.4.

E3P visited the site on 13/07/22, 26/07/22 and 8/08/22 to collect water samples, however insufficient water has been monitored in the wells across the site to collect a representative sample. As such Table 9.4 solely contains leachate analysis.



TABLE 9.4 COMPARISON OF GROUNDWATER AND LEACHATE ANALYSIS WITH TIER 1 SCREENING LEVELS

DETERMINAND	UNIT	EQS ^{1,2,3}	DWS _{3,4,5}	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA					
Arsenic	µg/l	50	10	3	7	N/A	No Further Action
Cadmium	µg/l	0.08-0.25	5	3	<0.08	N/A	No Further Action
Chromium (VI)	µg/l	3.4	–	3	<5.0	N/A	No Further Action
Chromium (III)	µg/l	4.7	50	3		N/A	No Further Action
Copper	µg/l	1	2000	3	19	N/A	No Further Action
Total Cyanide	µg/l	1	50	3	10	N/A	No Further Action
Lead	µg/l	1.2	10	3	11	WS105 at 2.70 m	Further Action
Mercury	µg/l	–	1.0	3	<0.5	N/A	No Further Action
Nickel	µg/l	4	20	3	5.8	N/A	No Further Action
Selenium	µg/l	–	10	3	<4.0	N/A	No Further Action
Zinc	µg/l	10.9	–	3	14	N/A	No Further Action
pH	6–9			3	8	N/A	No Further Action
Naphthalene	µg/l	2	10*	3	1.7	N/A	No Further Action
Anthracene	µg/l	0.1	10*	3	<0.01	N/A	No Further Action
Benzo[b]fluoranthene	µg/l	0.00017*	10*	3	<0.01	N/A	No Further Action
Benzo[k]fluoranthene	µg/l	0.00017*	10*	3	<0.01	N/A	No Further Action
Benzo(a)pyrene	µg/l	0.00017*	10*	3	<0.01	N/A	No Further Action
Indeno(123-cd)pyrene	µg/l	0.00017*	10*	3	<0.01	N/A	No Further Action
Fluoranthene	µg/l	0.0063	10*	3	<0.01	N/A	No Further Action
Benzo(ghi)perylene	µg/l	1.7–4	10*	3	<0.01	N/A	No Further Action
TPH C5-C6 (benzene)	µg/l	10	1	3	<1.0	N/A	No Further Action
TPH C6-C8 (toluene)	µg/l	74	700	3	<1.0	N/A	No Further Action
TPH C8-C10 (ethyl benzene)	µg/l	20	300	3	<1.0	N/A	No Further Action
TPH C10-C12 (xylene)	µg/l	30	500	3	<10	N/A	No Further Action
TPH C12-C16	µg/l	2	90 ⁵	3	<10	N/A	No Further Action
TPH C16-C35	µg/l	50#	90 ⁵	3	<10	N/A	No Further Action
TPH C5-C6	µg/l	–	15000	3	<1.0	N/A	No Further Action
TPH C6-C8	µg/l	–	15000	3	<1.0	N/A	No Further Action



DETERMINAND	UNIT	EQS 1,2,3	DWS 3,4,5	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA					
TPH C8-C10	µg/l	–	300	3	<1.0	N/A	No Further Action
TPH C10-C12	µg/l	–	300	3	<10	N/A	No Further Action
TPH C12-C16	µg/l	–	300	3	<10	N/A	No Further Action
TPH C16-C21	µg/l	–	300**	3	<10	N/A	No Further Action
TPH C21-C35	µg/l	–	300**	3	<10	N/A	No Further Action

Notes

Solubility <0.01µg/l
AA – Annual Average
MAC- Maximum Admissible Concentration
* Polyaromatic hydrocarbons (PAH) - Benzo(a)pyrene (BaP), Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water
** There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300µg/l) has been applied.

1. The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations (2015)
2. Directive establishing a framework for Community action in the field of water policy (Water Framework Directive)
3. Council Directive on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (Dangerous Substances Directive) - List II substances
4. Council Directive on the quality of water intended for human consumption (Drinking Water Directive)
5. WHO Guidelines for Drinking Water Quality. Third edition (2004)

9.3.1. CONTROLLED WATER RISK ASSESSMENT AND MITIGATION

This comparison indicates that the data exceeds the DWS values for the following inorganic compounds:

 Lead

Leachate analysis identifies a marginal exceedance of the DWS for lead. Where leachate analysis has been undertaken, this can overstate the risk as is not wholly representative of the site conditions. On the basis that this is a marginal exceedance and given the presence of deeper low permeability drift deposits, the risk to controlled waters is considered to be low.



9.4. GROUND GAS

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in CIRIA Report 665 – *Assessing risks posed by hazardous ground gases to buildings* (2007). However, it is recommended that the full ground gas assessment and recommended protection measures are agreed with the local authority prior to their adoption on site. Furthermore, all protection measures adopted should be validated by a suitably qualified engineer.

9.1. INVESTIGATION RATIONALE

The ICSM has identified that the underlying Made Ground may represent a potential source of ground gas generation. Based on the identification of these sources, E3P has determined that the site represents a low ground gas source generation potential.

Within the context of the proposed residential end use and ground gas generation potential, the gas assessment requires that six visits are required over three months, with at least two sets of readings at low or falling atmospheric pressure as set out within CIRIA 665 Tables 5.5a and 5.5b.

The spacing requirements for monitoring wells are detailed within CIRIA 665 Table 4.2, which indicates that for low gas hazard sites (Made Ground with limited degradable material, organic clay of limited thickness) and a high sensitivity development, nominal well spacing should be between 25 m and 50 m.

TABLE 9.5 GROUND GAS MONITORING LOCATION RATIONALE

LOCATION	GROUND GAS SOURCE	DEPTH OF MONITORING WELL (m)
WS101	Natural Deposits	4.50–5.00
WS102	Made Ground	0.50–3.50
WS103	Made Ground	1.00–4.00
WS104	Natural Deposits	3.50–4.50
WS105	Made Ground	0.50–2.50

9.2. MONITORING METHODOLOGY

Concentrations of methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂) were measured using a calibrated infra-red gas analyser (GFM435) with gas flow rates were measured using an integrated flow meter.

Gas measurements were recorded for a minimum of 300 seconds at each location, at which point the maximum concentration of CH₄ and CO₂, together with the lowest concentration of O₂ were recorded. The results of the ground gas monitoring are presented in Table 9.7.

CIRIA C665 and NHBC Report No 10627-R01 provide assessments for carbon dioxide and methane based upon gas screening values (GSVs) utilising flow rates and concentrations. The site-based GSVs for steady state methane and carbon dioxide are based upon the following equation:

$$GSV = \frac{\text{concentration (by vol)}}{100} \times \text{flowrate (1 / hr)}$$



The GSVs within CIRIA C665 are based upon all buildings other than standard residential houses. The NHBC GSVs are based upon standard residential houses with precast concrete floors (block and beam). The CIRIA 665 report author (Steve Wilson) since provided further clarification regarding which guidance should be adopted for residential houses that have suspended cast in-situ concrete floor slab: for the avoidance of doubt, it was confirmed that the GSVs within the CIRIA 665 guidance should be adopted. The thresholds for GSVs based upon NHBC and CIRIA guidance are provided within Table 9.6.

TABLE 9.6 RESIDENTIAL THRESHOLDS FOR GAS SCREENING VALUES (GSV) IN ACCORDANCE WITH CIRIA C665 AND NHBC REPORT NO 10627-R01 – RESIDENTIAL END USE

CIRIA – NO SUBFLOOR VOID		NHBC – SUBFLOOR VOID		
CLASSIFICATION	GSV (METHANE AND CARBON DIOXIDE)	CLASSIFICATION	GSV (METHANE)	GSV (CARBON DIOXIDE)
CS1	< 0.07	Green	< 0.13	< 0.76
CS2	< 0.70	Amber 1	< 0.63	< 1.60
CS3	< 3.5	Amber 2	< 1.60	< 3.10
CS4	< 15	Red	> 1.60	> 3.10
CS5	< 70	N/A	N/A	N/A
CS6	> 70	N/A	N/A	N/A

9.2.1. SUMMARY OF MONITORING RESULTS

Table 9.7 presents the ground gas and groundwater monitoring results to date.



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TABLE 9.7 SUMMARY OF GROUND GAS MONITORING RESULTS

WELL	DATE	CH ₄ INITIAL (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ GSV (l/hr)	CO ₂ INITIAL (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ GSV (l/hr)	O ₂ (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS101	13/07/22	0.1	0.1	0.0001	0.1	0.1	0.0001	20.6	1010	Rising	0.1	4.50–5.00	4.35	Dry
	26/07/22	0.1	0.1	0.0001	0.1	0.1	0.0001	18.6	1010	Rising	0.1		4.40	Dry
	09/08/22	0.1	0.1	0.0001	0.1	0.1	0.0001	20.5	1017	Steady	0.1		3.90	Dry
	31/08/22	0.1	0.1	0.0001	0.1	0.1	0.0001	20.2	1016	Falling	0.1		3.90	Dry
WS102	13/07/22	0.1	0.1	0.0001	0.1	0.1	0.0001	20.6	1010	Rising	0.1	0.50–3.50	3.10	Dry
	26/07/22	0.1	0.1	0.0001	0.1	0.1	0.0001	18.6	1004	Rising	0.1		3.16	Dry
	09/08/22	0.1	0.1	0.0001	0.1	0.1	0.0001	20.5	1016	Steady	0.1		3.10	Dry
	31/08/22	0.1	0.1	0.0001	0.1	0.1	0.0001	20.2	1015	Falling	0.1		3.10	Dry
WS103	13/07/22	0.1	0.1	0.0001	0.1	0.1	0.0001	20.7	1009	Rising	0.1	1.00–4.00	3.40	Dry
	26/07/22	0.1	0.1	0.0001	0.1	0.1	0.0001	18.6	1004	Rising	0.1		3.46	Dry
	09/08/22	0.1	0.1	0.0001	0.1	0.1	0.0001	20.4	1016	Steady	0.1		3.45	Dry
	31/08/22	0.1	0.1	0.0001	0.1	0.1	0.0001	20.2	1015	Falling	0.1		3.45	Dry
WS104	13/07/22	0.1	0.1	0.0001	0.1	0.1	0.0001	20.6	1010	Rising	0.1	3.50-4.50	4.10	4.00
	26/07/22	0.1	0.1	0.0001	0.1	0.1	0.0001	18.6	1004	Rising	0.1		4.22	4.02
	09/08/22	0.1	0.1	0.0001	0.1	0.1	0.0001	20.5	1016	Steady	0.1		4.20	Dry
	31/08/22	0.1	0.1	0.0001	0.1	0.1	0.0001	20.2	1015	Falling	0.1		4.20	Dry
WS105	13/07/22	0.1	0.1	0.0001	0.1	0.1	0.0001	20.7	1010	Rising	0.1	0.50–2.50	3.00	Dry
	26/07/22	0.1	0.1	0.0001	0.1	0.1	0.0001	18.6	1005	Rising	0.1		3.06	Dry
	09/08/22	0.1	0.1	0.0001	0.1	0.1	0.0001	20.5	1016	Steady	0.1		2.85	Dry
	31/08/22	0.1	0.1	0.0001	0.1	0.1	0.0001	20.2	1015	Falling	0.1		2.45	Dry



Buxton Street, Heywood

Phase I & II Geoenvironmental Site Assessment

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NOTES

NHBC Traffic Light System		Typical Max CH4 Concentration	GSV CH4	Typical Max CO2 Concentration	GSV CO2
	Amber 1	1	0.16-0.63	5	0.78-1.56
	Amber 2	5	0.63-1.56	10	1.56-3.13
	Red	20	1.56+	30	3.13+

Values in **BOLD** exceed Amber 1 Thresholds

Values in **BLUE** denote water above monitoring well



9.2.2. SOURCES OF GROUND GAS

The Phase I report and subsequent ground investigation has identified the following potential sources of ground gas:

-  Made Ground deposits

9.2.3. GROUNDWATER

Monitoring wells WS101, WS102, WS103 and WS105 have been recorded as being dry, with no water being recorded during the initial rounds of gas monitoring.

Within WS104 water levels have been recorded at 4.00 m bgl. Water levels have dropped over the initial phase of the gas monitoring and the latest results show that the well is dry, with no water being recorded.

9.2.4. GAS FLOW

Flow rates of 0.1 l/hr have been recorded across the site, indicating flow rates above the LOD have not been detected.

9.2.5. GAS CONCENTRATIONS

The maximum methane value recorded within the monitoring wells was 0.1% v/v (limit of detection of the analyser).

Carbon dioxide concentrations were recorded at concentrations ranging from 0.1% v/v v (limit of detection of the analyser).



9.2.6. GAS ASSESSMENT

In accordance with the methodology outlined in the CIRIA publication C665, E3P has utilised the results of the ground gas monitoring surveys to calculate a tentative gas screening value (GSV). The GSVs for the monitoring positions are summarised in Table 9.8.

TABLE 9.8 GAS RISK PROFILE AND LOCATION

LOCATION	MAX CH ₄ (% v/v)	GSV (l/hr)	MAX CO ₂ (% v/v)	GSV (l/hr)	CLASSIFICATION
WS101	0.1	0.0001	0.1	0.0001	Green/CS1
WS102	0.1	0.0001	0.1	0.0001	Green/CS1
WS103	0.1	0.0001	0.1	0.0001	Green/CS1
WS104	0.1	0.0001	0.1	0.0001	Green/CS1
WS105	0.1	0.0001	0.1	0.0001	Green/CS1

The GSV has been compared to the criteria outlined with CIRIA C665 to determine the level of risk to the proposed development and to ensure the appropriate remedial options are incorporated into any future building design in this area.

Preliminary ground gas monitoring suggests that the site can be predominantly classified as CS1, and in these areas it is considered that gas protection measures will not be required.

Naphthalene has been identified within two locations on site WS101 and WS103. Due to the small nature of the site, it can be considered there is nowhere deemed suitable to place the soils on site to mitigate the risk caused to human health. Therefore, a vapour resistant membrane should be utilised under plots to reduce the risk.



9.3. POTABLE WATER SUPPLY

This section provides a summary of the site investigation data with reference to the selection of potable water supply pipework. The assessment is made with reference to the UK Water Industry Research (UKWIR) publication "Guidance on the selection of Water Supply Pipes to be used in Brownfield Sites"

TABLE 9.9 PIPELINE SELECTION PE THRESHOLD CONCENTRATIONS

Contaminant Group	PE-threshold (mg/kg)	Concentrations at <u>Current</u> pipeline depth (mg/kg)
Total VOC	0.5	<1.0
Total BTEX And MTBE	0.1	N/A
Total SVOCs (Excluding PAH and those substances marked with an *)	2	N/A
EC5-EC10 Aliphatic and Aromatic Hydrocarbons	2	<1.0
EC10-EC16- Aliphatic and Aromatic Hydrocarbons	10	6.1
EC16-EC40 Aliphatic and Aromatic Hydrocarbons	500	67
Phenols (From SVOC Analysis)*	2	N/A
Cresols and Chlorinated Phenols (From SVOC Analysis)	2	NA
Ethers*	0.5	NA
Nitrobenzene*	0.5	NA
Ketones*	0.5	NA
Aldehydes*	0.5	NA
Amines	Fail	NA
Other Consideration		
Are there any exceedances of the PE threshold outside of the pipeline depth?	EC10-EC16 within WS101 at 2.60 m bgl and WS103 at 1.60 m bgl EC16-EC40 within WS101 at 2.60 m bgl and WS103 at 1.60 m bgl	
Is free product present in soil and groundwater?	Hydrocarbon odour noted within WS105 at 2.50-3.00 m and 4.00-4.30 m bgl.	
Could hydrocarbon impact at greater depth than current pipeline depth be mobilised by rising groundwater levels?	N/A	
Will soils impacted with above determinands likely be utilised elsewhere on site?	No	
Will soils be imported to site as part of any future earth works	Site levels will likely need to be cut as part of a phase of enabling works. As such the contaminants may be at the future pipe line depth. A WIR assessment may be required.	

Notes - Pipe line depth normally between 0.75m–1.35m

Based on the assessment of current site conditions it is likely that barrier pipe will be required at the proposed development.



9.4. CONCEPTUAL SITE MODEL

Following the completion of the intrusive site investigation, chemical analysis and risk assessment, the conceptual model shown in Table 9.10 has been prepared for the site.

TABLE 9.10 CONCEPTUAL MODEL

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL1 PL2	Heavy Metals, non-volatile PAH (Made Ground)	Dermal contact. Dermal contact and ingestion.	Future site users. Off-site receptors.	Likely	High	LOW
Discussion: Heavy metals and PAHs have been identified throughout Made Ground across the site including lead, arsenic, mercury, naphthalene, phenanthrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene, Indeno(1,2,3-cd)pyrene and dibenzo(a,h)anthracene. Recommendation: Cover system to garden and landscaped areas will prevent exposure to future site users. Construction works completed with PPE and provision of welfare.						
PL3	ACM in Made Ground	Inhalation of dust.	Future site users. Buildings. Off-site land users.	Likely	High	LOW
Assessment: Asbestos in the form of loose chrysotile fibres has been identified in the Made Ground within WS102, WS104 and WS105. Asbestos quantification has shown all locations containing asbestos to have < 0.001%. No visual signs of asbestos containing material (ACM) were encountered during the ground investigation; therefore, it is likely that only trace fibres are present within these soils and should be placed in an area of low sensitivity. Recommendation: The soils will require placement in accordance with the asbestos CSM. Construction works completed with PPE and provision of welfare.						



POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL4	Volatile Contaminants	Inhalation of vapours. Migration through permeable strata and preferential pathways.	Future site users. Off-site receptors.	Likely	Moderate	LOW
Assessment: Elevated concentrations of TPH C21-C35 and naphthalene have been identified within Made Ground across the site these present a potential volatilisation to indoor air risk. Recommendation: Due to the small nature of the site, it can be considered there is nowhere deemed suitable to place the soils on site to mitigate the risk caused to human health. Therefore, a vapour resistant membrane should be utilised under plots to reduce the risk.						
PL4	Methane, carbon dioxide (coal measures and Made Ground)	Inhalation of gas. Migration through permeable strata and preferential pathways. Explosion in confined spaces.	Future site users. Buildings. Off-site land users.	Low likelihood	Moderate	LOW
Assessment: Deep Made Ground and coal measures on site have been identified as potential sources of hazardous ground gas. Glacial till will likely restrict migration of any coal measures gas into shallow foundations. Recommendation: Initial monitoring suggests that the site can be classified as CS1/Green, however this will be confirmed on completion of the monitoring. Precautionary CS2/Amber 1 measures required with the use a chemically resistant membrane.						



POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL5	Lead	Surface runoff. Migration through permeable strata and preferential pathways. Perched waters migration.	Groundwater (secondary A aquifer).	Low	Low	LOW
Assessment: Leachate analysis has identified a marginally elevated concentration of lead within WS105. Glacial cohesive till across the site may reduce downward migration into the underlying bedrock aquifer. Recommendation: Based on ground conditions, site sensitivity with respect to controlled waters and absence of significantly mobile contamination, the risk is considered to be low.						
PL6	Sulphate (potential ash within Made Ground)	Sulphate attack on concrete.	Building structure.	Likely	Moderate/Low	LOW
Assessment: The soils at the site meet class DS-1, AC-1s. Recommendation: Concrete should be designed in accordance with the chemical testing results.						



POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL7	Organic contaminants such as hydrocarbons, solvents (Made Ground)	Ingestion of tainted water supply.	Future site users. Water pipes.	Likely	Moderate	LOW
Assessment: No elevations have been identified at the proposed pipeline depth (0.75 m – 1.35 m). Elevated EC10-EC16 within WS101 at 2.60 m bgl and WS103 at 1.60 m bgl EC16-EC40 within WS101 at 2.60 m bgl and WS103 at 1.60 m bgl. However, groundwater has not been identified on-site. Currently due to the ground conditions on site it is likely PE barrier pipe will be required. Recommendation: Based on the assessment of current site conditions, it is likely that barrier pipe will be required. This will need to be confirmed with a UKWIR risk assessment post remediation.						

Main exposure pathways:

PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = dust inhalation; PL4 = Vapour/Gas Inhalation; PL5 = Vertical / Lateral Migration; PL6 = Corrosion of concrete; PL7=Tainting of water supply;



10. COAL MINING

10.1. COAL MINING GEOLOGY

A review of the mining geology indicates the potential presence of a coal seam trending NW/SE on the eastern boundary of the site to the east of the site. A full review of the pertinent coal mining data and geology is present within Section 4.4.

10.2. SCOPE OF INTRUSIVE GROUND INVESTIGATION

In due consideration of the potential presence of an outcrop within the Thin Coal Seam and an area of potential shallow mine workings across the site, a series of rotary boreholes have been advanced in accordance with Coal Authority Permission ref: 25187 to assess the potential presence of shallow workings within this seam and the potential for ground instability to induce a future subsidence event within the proposed development.

10.3. SUMMARY OF GROUND INVESTIGATION WORKS

10.3.1. ROTARY BOREHOLES TO INVESTIGATE WORKINGS IN COAL

Two rotary boreholes have been advanced at the locations detailed within the E3P exploratory borehole location plan at positions to intersect the potential coal seams and assess the potential for any workings.

TABLE 10.1 ROTARY BOREHOLES

ROTARY BOREHOLE	DEPTH TO ROCKHEAD (m bgl)	DEPTH TO COAL (m bgl)	EVIDENCE OF MINING ACTIVITY/SEAM	REMARKS
RB101	6.60	N/A	N/A	Traces of coal noted within MUDSTONE between 6.60-7.30 m bgl – No evidence of workings or seams
RB102	8.60	N/A	N/A	Traces of coal noted within MUDSTONE between 8.60-12.00 m bgl – No evidence of workings or seams



10.4. SUMMARY OF COAL MINING ISSUES

E3P completed two 40 m rotary boreholes to investigate shallow mine workings. The findings are summarised below:

-  The intrusive ground investigations comprising two, deep, rotary boreholes did not identify any shallow coal seams or evidence of historic mine workings to the base of the boreholes.
-  The coal seam is inferred on the BGS mapping records as no historical evidence of workings have been recorded.
-  The Coal Authority plan referenced: MR-LARGE-PLOT-51003165650001-1654698331825 shows that there are no recorded coal features within 50 m of the site boundary.
-  Correspondence from the Coal Authority has confirmed that the closest underground recorded workings are 1.1 km to the northeast of the site. There have been no records of workings beneath the site.



11. GEOTECHNICAL ASSESSMENT

11.1. PROPOSED DEVELOPMENT

B&L Ingoe intends to construct a low-rise residential development comprising of low-rise residential housing and apartments with associated gardens, estate roads and infrastructure. Drawing 16-060-002 (Appendix III) identifies the proposed development layout.

11.2. SUMMARY OF GROUND CONDITIONS

MADE GROUND

Made Ground deposits were encountered within all exploratory hole locations to depths of between 0.37 m and in excess of 6.60 m bgl although, in general, Made Ground was encountered to a depth of less than 3.80 m bgl.

The Made Ground on site generally comprised of a very loose (WS102 and WS104) to medium dense black slightly clayey slightly sandy gravel. Gravel is fine to medium subangular of sandstone with frequent fragments of brick, clinker, concrete, glass and ash with clay clods of sandy clay 0.15m in size throughout.

A Depth of Made Ground Plan is presented as Drawing 16-060-005 in Appendix III.

DRIFT DEPOSITS

Drift deposits were identified in the majority of locations on-site with the exception of RB101. Drift deposits generally comprised of a loose brown clayey fine to medium SAND overlying a stiff medium strength brown mottled grey CLAY to depths up to 5.45 m bgl.

Within RB102 at deeper depths of 6.20–8.60 m a brown SAND was recorded.

SOLID GEOLOGY

Solid geology was encountered within two locations RB101 and RB102.

A grey MUDSTONE with coal traces was identified within both locations at a depth of 6.60–7.30 m bgl and 8.60–12.00 m bgl respectively.

SILTSTONE was identified within RB101 at a depth of 7.30–8.00 m bgl.

The remaining geology comprised of MUDSTONE to 40.00 m bgl.

No loss of flush or voids were noted within any of the rotatory boreholes.

GROUNDWATER

Groundwater was encountered between 3.20 m bgl and 4.40 m bgl during the site investigation. Return monitoring visits have recorded groundwater levels at 4.00m bgl within WS104.



11.3. SITE PREPARATION

The site should be cleared and any vegetation below areas of proposed development stripped in accordance with Series 200 of the *Manual of Contract Documents for Highway Works (MCHW)*. This should include the following:

- ☐ Roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting void infilled with suitable compacted engineered fill.
- ☐ Demolition of all building footings and removal of all concrete hardstanding.
- ☐ Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill.
- ☐ Buried structures and old foundations have been encountered on site. These should be excavated from below the proposed development footprint with the resulting void backfilled.

11.4. FOUNDATION CONDITIONS AND ASSESSMENT OF POTENTIAL BEARING CAPACITIES

In due consideration of the identified ground conditions, in-situ and laboratory geotechnical testing, E3P has undertaken an assessment of the net safe allowable bearing pressure (ABP) within the underlying natural stratum to assist in the detailed design of foundations and infrastructure and determine the target founding stratum. The results of this assessment are summarised in Table 11.1.

TABLE 11.1 SUMMARY OF ABP

GRANULAR SOILS			
Description	Depth (Range m bgl)	Relative Density	Allowable Bearing Pressure (kN/m ²)
Clayey SAND (WS102 and WS104)	4.00–5.00	Loose	59.14–82.96
COHESIVE SOILS			
Description	Depth (range m bgl)	Undrained Shear Strength (Cu) (kN/m ²)	Allowable Bearing Pressure (kN/m ²)
Stiff CLAY	4.00–5.00	42.24–67.59	93.81–138.96

Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the underlying stiff glacial clays.

However, given the topographical variances on the site and the depth of the made ground deposits across the site, a programme of remediation and enabling works will be required to remove the potential buried obstructions and cut/fill the site to provide suitable development platform levels.



Therefore, following completion of the cut/fill enabling works, it is considered for a residential development that the most appropriate foundation options at this stage would be a combination of vibro Stone Columns (VSC) in Made Ground and potentially driven pile foundations (where Made Ground exceeds 3.00 m) in the area of deeper Made Ground. This will ensure a uniform ABP in the order of 100 kN/m² for the construction of a doubly reinforced strip footing at ~600 mm below remediated ground level.

To determine if VSC is viable at the subject site, E3P has completed a Ground Improvement Design Risk Matrix that is summarised in Table 11.2.

TABLE 11.2 GROUND IMPROVEMENT DESIGN RISK MATRIX

RISK ITEM	COMMENT	PASS/FAIL
Soft clays with an undrained shear strength less than 30 kN/m ²	CLAY soils are generally firm to stiff with Cu > 80 kN.	PASS
Ground with peat layers close to foundation level or the base of the stone column, or where intermediate layers of peat are thicker than 200 mm, either as a single layer or the sum of the thicknesses of individual layers throughout the length of the stone column	No organic deposits have been encountered during site investigations.	PASS
Voided filled ground, e.g. old water tanks, pottery, glass bottles, concrete rubble or brick fill of unsuitable grading	Made Ground beneath the north-eastern sector will require removal and processing to render the site suitable for VSC.	PASS – on completion of enabling works
Loose or non-engineered fill not previously subject to rising or fluctuating water levels saturation	None identified.	PASS
Filled ground still settling or expected to settle under its own weight or due to the effects of surcharging/upfilling where there is a high organic content or where decay is continuing	None identified – the site was historically filled circa 50 years ago with granular fill. It is considered that the material has consolidated under self-weight settlement.	PASS
Fill, containing degradable material where organic material forms more than 15% of fill by volume	None identified.	PASS
Clays with a plasticity index greater than 40%	None identified.	PASS
Highly sensitive soils liable to collapse or remoulding	None identified.	PASS
Cohesive soils with trees in influencing distance	Plots where tree influence has been modelled and will either be subject to a piled or mass trench-fill solution.	PASS
Overall Risk Rating and Suitability for Vibratory Ground Improvement		PASS



Foundation depths should take account of the presence of existing and proposed trees, with foundations deepened locally to mitigate the potential for volumetric instability attributed to fluctuations in moisture content, in accordance with the requirements of NHBC standards.

It is recommended that at working drawing stage a foundation schedule is prepared for the development, taking account of the physical change of natural clay soils and the current/proposed locations of trees.

At this time it is not possible to accurately define the foundation types due to the absence of a detailed tree survey and final development levels; however, based on our extensive experience of similar sites, we would anticipate that the final foundation solution would be a combination of the following:

-  Vibro Stone Columns (VSC) where Made Ground is less than 3.00 m)
-  Driven pile foundations (where Made Ground exceeds 3.00m)

A summary of anticipated foundations is presented in Table 11.3.

TABLE 11.3 ANTICIPATED FOUNDATIONS

LOCATION	ANTICIPATED FOUNDING STRATA DEPTH (m bgl)	GROUND WATER (m bgl)	TARGET STRATUM	TREES	COAL	FOUNDATION TYPE	TYPE OF CONCRETE
WS101	>2.50	N/A	TBC	N	N	VSC or Driven Pile	DS-1, AC-1s
WS102	>2.50	4.00	TBC	N	N	VSC or Driven Pile	DS-1, AC-1s
WS103	>2.50	4.50	TBC	N	N	VSC or Driven Pile	DS-1, AC-1s
WS104	>2.50	3.20	TBC	N	N	VSC or Driven Pile	DS-1, AC-1s
WS105	>2.50	4.00	TBC	N	N	VSC or Driven Pile	DS-1, AC-1s
RB101	>2.50	N/A	TBC	N	N	VSC or Driven Pile	DS-1, AC-1s
RB102	>2.50	N/A	TBC	N	N	VSC or Driven Pile	DS-1, AC-1s

It is recommended that, at working drawing stage, a foundation schedule is prepared for the development taking account of the physical change of natural clay soils and the current/proposed locations of trees.

11.5. GROUND FLOOR SLABS

Current building control regulations require that where infilled ground is present to depths in excess of 600 mm, or where the substratum is variable in terms of the structure and settlement potential, or where clay soils are present within the influence of existing or proposed trees, a suspended floor slab is required.

In this instance, it is considered that for the majority of substructures, the underlying stratum would have in excess of 600 mm of infill and, as such, a suspended floor slab will be required.

Where a cast in-situ suspended slab is utilised with no subfloor void, appropriate compressible material (heave precautions) will be required in the construction of the substructure.



11.6. HEAVE PRECAUTIONS

The site has been proven to be underlain by clay soils, which are susceptible to volumetric instability due to fluctuations in moisture content, particularly within influencing distance of trees as per the NHBC/LABC conjectured zones of influence.

As the clay is deemed to be low plasticity, heave precautions are not required to the internal face of the external load-bearing walls (outside or within tree influence).

If a ground beam is to be constructed within the zone of tree influence, heave precautions are required to the underside of this and edge beams.

If the ground floor slab is to be constructed with a beam and block floor, a minimum subfloor void of 200 mm is required within any structures located in the zone of conjectured tree influence.

If the ground floor slab is constructed with a cast in-situ suspended floor slab, then heave precautions that can tolerate 50 mm of clay swelling are required within any part of the floor slab to be located within the zone of influence of a tree.

A summary of heave precautions is presented in Table 11.4.

TABLE 11.4 SUMMARY OF HEAVE PRECAUTIONS

		MINIMUM VOID DIMENSION FOR FOUNDATIONS, GROUND BEAMS AND SUSPENDED IN-SITU CONCRETE GROUND FLOORS		MINIMUM VOID DIMENSIONS UNDER PRECAST CONCRETE AND SUSPENDED TIMBER FLOORS
Plasticity Index of Soil	Required Foundation Depth (m)	Thickness of Void Former Against Side of Foundation or Ground Beam (mm)	Thickness of Void Former on Underside of Edge Beam and Floor Slab (mm)	Void Dimension (mm)
High Plasticity (> 40)	> 2.5	Engineer Design		Engineer Design
	2.0–2.5	35	150	300
	1.5–2.0	25	75	
Moderate Plasticity (20–40)	> 2.5	Engineer Design		Engineer Design
	2.0–2.5	25	100	250
	1.5–2.0	25	50	
Low Plasticity (< 20)	2.0–2.5	N/A	50	200
	> 2.0	No Special Precautions		



11.7. HIGHWAYS CONSTRUCTION

A programme of remediation and enabling works will be required to remediate the proposed road subgrade in accordance with the requirements of the Manual of Contract Documents for Highway Works Volume 1 Specification For Highway Works (Series 600-Earthworks) for a method compaction.

It is considered that the material can be re-engineered using method compaction to achieve a CBR in excess of 5% if works are completed in favourable climatic conditions.

11.8. DRAINAGE

The presence of substantial depths of Made Ground across the site may result in settlement. It is therefore recommended that drain runs are designed using steeper gradients and flexible joints to allow for some differential settlement. The underlying soils are also impacted by low-level inorganic and hydrocarbon compounds which would preclude the use of infiltration drainage systems.

If soakaway drainage is to be considered, full BRE 365 testing must be completed to inform the detailed design.

11.9. CONCRETE DURABILITY

Based upon the results of the chemical analyses it is considered that subsurface concrete can be designed in accordance with Design Sulphate Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with the recommendations provided in BRE *Special Digest 1* (2005).

11.10. SLOPE STABILITY

A significant embankment is present at the western boundary leading to playing fields at a lower elevation of this slope.

It is recommended that any structures at the site are designed by a structural engineer to ensure that slope stability is not induced within the slope.



11.11. CONSTRUCTION ACTIVITY AND INSPECTION

The following activities and inspections should be incorporated in to the site works:

-  Due to the variability of the soils at the site, it is recommended that sufficient allowance is made for the inspection of formations and subformations to foundations and pavement construction.
-  Excavations, where access is required, should be subject to a risk assessment from a competent person and, where appropriate, mitigation measures such as benching back the sides or use of support systems in accordance with CIRIA R97 should be utilised.
-  It is considered that dewatering may be required, especially following periods of heavy rainfall. Removal of surface water and water within trenches should be possible with conventional sump pumping. Discharge of any water should be agreed with the relevant regulatory body and be undertaken under a trade effluent discharge, where required. Measures to remove silt and suspended solids may be required and consideration should be given to provision of space for settling tanks or an attenuation pond.
-  Where access to confined spaces is required, appropriate mitigation measures should be addressed within the construction stage health and safety plan. A particular account should be taken of the gas results.
-  The presence of potential contamination and mitigation measures should be addressed as part of the construction stage health and safety plan and should include measures to design out the risks, reduce their impact and, finally, to include the use of personnel protective equipment (PPE).



11.12. GEOTECHNICAL RISK REGISTER

POTENTIAL CONSTRAINT	ABNORMAL	LOCATION ON SITE	ESTIMATED AREA OF SITE AT RISK (%)	ASSESSMENT AND MITIGATION
Remediation of contaminated soils		On site	100	Elevated heavy metal and PAHs have been identified within soils throughout the site. These elevations have primary exposure pathways related to dermal contact and ingestion, soil ingestion and consumption of homegrown produce. These exceedances can be mitigated by the installation of a chemically suitable cover system within all proposed garden areas. With regards to the elevated naphthalene, and mercury, these present a potential volatilisation to indoor air risk. Due to the small nature of the site, it can be considered there is nowhere deemed suitable to place the soils on site to mitigate the risk caused to human health. Therefore, a vapour-resistant membrane should be utilised under plots to reduce the risk. Asbestos has been identified within samples across the site asbestos quantification has shown all locations containing asbestos to have < 0.001%. These soils will need to be placed in accordance with the asbestos CSM.
Bedrock		On site	N/A	Bedrock is identified from 6.60 m in the north and 8.60 m in the south.
Obstructions		All	50	Significant obstructions have not been identified on site, however, due to the historic infilling and depths of Made Ground there is a potential for obstructions to be present on site.
Artificially levelled and filled platforms		On site	100	The site appears to have been artificially levelled due to historic infilling on site and being used as a railway terrace.
Trench collapse		All	100	Made Ground present beneath the site is loosely compacted and possibly prone to collapse.



POTENTIAL CONSTRAINT	ABNORMAL	LOCATION ON SITE	ESTIMATED AREA OF SITE AT RISK (%)	ASSESSMENT AND MITIGATION
Mature trees		Southwestern and western boundaries	15	Sporadic semi-mature trees are present along the southwestern and western boundaries. An arboricultural survey may be required.
Volume change potential clay		N/A	N/A	The site is likely to be underlain by cohesive soils, which have been assessed as a low volume potential change. Therefore no precautions are not required.
Running sands		N/A	N/A	Data searches indicate very low risk.
Ground dissolution		N/A	N/A	Data searches indicate no hazard.
Concrete design		On site	-	The soils on site generally meet class DS-1, AC-1s.
Low-permeability ground		On site	100	Soakaways unlikely to be effective due to extensive depths of Made Ground up to 6.60 m on site. Where underlying drift deposits were encountered are comprised of low permeability clay deposits which will impede the use of soakaways.
Services/sensitive structures		Eastern boundary and centre	10	A review of online services has identified services within the site boundary. A low voltage cable enters the site in the southeast running to the centre of the site and water pipes run along the eastern boundary of the site.
Abnormal foundation solutions		On site	100	Significant depths of Made Ground have been identified on site therefore, a VSC or pile engineered design will be required.
Areas not investigated		On site	5	Due to the presence of Japanese knotweed and horsetail on site located along the western and southern boundary, these areas could not be investigated.
Mining		N/A	N/A	The intrusive ground investigations comprising two, deep, rotary boreholes did not identify any shallow coal seams or evidence of historic mine workings to the base of the boreholes. Therefore the site can be classified as at a low risk from historic coal mining.
Slope		Western boundary	15	A significant embankment is present at the western boundary leading to playing fields at a lower elevation of this slope. Structures within proximity to the slope should be designed by a structural engineer to ensure that slope stability is not affected.



12. CONCLUSIONS AND RECOMMENDATIONS

12.1. CONTAMINATED LAND ASSESSMENT

Human Health	The Tier 1 human health risk assessment identified site-wide concentrations of non-volatile, insoluble heavy metals and hydrocarbon compounds that would present unacceptable degrees of theoretical risk to the identified receptors associated with direct exposure pathways. As such, it will be necessary to design and construct the proposed development in a manner that will ensure suitably validated cover systems to all areas of private garden, soft landscaping and public open space. Trace asbestos fibres have been identified within a number of samples collected from the Made Ground. Asbestos quantification has shown all locations containing asbestos to have < 0.001%. No visual signs of asbestos containing material (ACM) were encountered during the ground investigation; therefore, it is likely that only trace fibres are present within these soils and should be placed in an area of low sensitivity. With regards to the elevated naphthalene, this presents a potential volatilisation to indoor risk. Naphthalene has been identified within two samples on site WS101 and WS103. Due to the small nature of the site, it can be considered there is nowhere deemed suitable to place the soils on site to mitigate the risk to human health. Therefore, a vapour resistant membrane should be utilised under the plots. Mercury speciation has identified elemental mercury forms 0.667 mg/kg of the sample, meaning it is below the 1.20 mg/kg threshold. As such the mercury impact identified within WS105 is not seen to present an unacceptable risk to the site and its end users. Chemical analysis of the natural CLAY and SAND drift deposits have identified these soils to be acceptable for use as subsoil within the proposed garden areas; however, further chemical validation samples will be required to confirm this. There are no suitable sources of topsoil available on the site.
Controlled Waters	The chemical analysis for groundwater samples is pending; however, leachate analysis compared to DWS values (drinking water standards) has identified elevated lead concentrations within WS105 at 2.70m bgl. Heavy metals are typical of low solubility and mobility: and given the low sensitivity of the site with respect to controlled waters, it is considered there is unlikely to be any degree of unacceptable risk to the controlled water receptors and the wider environ.
Ground Gas	Ground gas monitoring thus far has indicated the site would be classed as Characteristic Situation 1 or Green, suggesting no gas protection measures will be required. However, the final ground gas regime will be confirmed following the completion of the ground gas monitoring programme and consideration needs to be given to the requirement for vapour membranes.
Potable Water	Based on the potable water assessment within section 9.3 it is likely that a barrier pipe will be required onsite.



12.2. COAL MINING

Coal Mining	In accordance with industry best practice as detailed within CIRIA 32, E3P has concluded that shallow mine workings are not present within the site boundary due to the lack of coal or voids encountered during the site investigation. Therefore, there is a low risk of ground instability caused by shallow mine workings.
-------------	--

12.3. GEOTECHNICAL ASSESSMENT

Significant concrete and brick obstructions have not been encountered within the Made Ground, however due to extensive infilling on site it is likely that obstructions are still present on site. If any obstructions are encountered these will require grubbing out to the base of the Made Ground to enable the construction of proposed plots.

The underlying CLAY drift deposits, beneath the Made Ground deposits, have been assessed as being stiff, medium strength with a net allowable bearing pressure (ABP) in the order of 86.85–138.96 kN/m² at circa 4 m and 5 m bgl.

Loose granular deposits were identified within WS102 at 4.00 m bgl and within WS104 at 5.00 m bgl, with a net bearing pressure (ABP) in the order of 59.14 kN/m² increasing to 82.96 kN/m² at circa 5.00 m bgl.

Given the topographical variances on the site and the depth of the made ground deposits across the site, a programme of remediation and enabling works will be required to remove the potential buried obstructions and cut/fill the site to provide suitable development platform levels.

Due to the site being underlain by deep Made Ground, varying from 3.70–6.60 m bgl it will be likely that an engineered founding solution will be required. This will likely be formed of a vibro stone column (VSC) or piled solution.

END OF REPORT



APPENDIX I

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.3.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. 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.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, 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 report in full.
9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.



APPENDIX II

GLOSSARY

TERMS

ACM	Asbestos-containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Above-ground storage tank	NDP	Nuclear density probe
BGS	British Geological Survey	NMP	Noise management plan
BSI	British Standards Institute	NPSE	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	NR	Not recorded
CA	Coal Authority	PAH	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	PCB	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	PI	Plasticity index
CIRIA	Construction Industry Research Association	PID	Photo ionisation detector
CLEA	Contaminated land exposure assessment	POS	Public open space
CML	Council of Mortgage Lenders	PPE	Personnel protective equipment
CoC	Contaminants of concern	ProPG	Professional practice guidance
CSM	Conceptual site model	QA	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	SGV	Soil guideline value
DWS	Drinking water standard	SPH	Separate-phase hydrocarbon
EA	Environment Agency	SPT	Standard penetration test
EQS	Environmental quality standard	SVOC	Semi-volatile organic compound
FFL	Finished floor level	TPH	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	UKWIR	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	UST	Underground storage tank
HCV	Health criteria value	VCC	Vibro-concrete column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibro-replacement stone columns
LMRL	Lower method reporting limit	VSC	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	WHO	World Health Organisation
MCV	Moisture condition value	WRAP	Waste and Resources Action Programme



Buxton Street, Heywood

Phase I & II Geoenvironmental Site Assessment

September 2022

MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	kN/m²	Kilonewtons per metre squared
ppb	Parts per billion	µm	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	SSRT	Site Specific Remediation Target
PSD	Particle Size Distribution	DD	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	Mc	Moisture Content
ρ	Bulk Density	GPR	Ground Penetrating Radar
NDP	Nuclear Density Probe	FFL	Finished Floor Level
LEL	Lower Explosive Limit	UKWIR	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	LOD	Limit of Detection



APPENDIX III

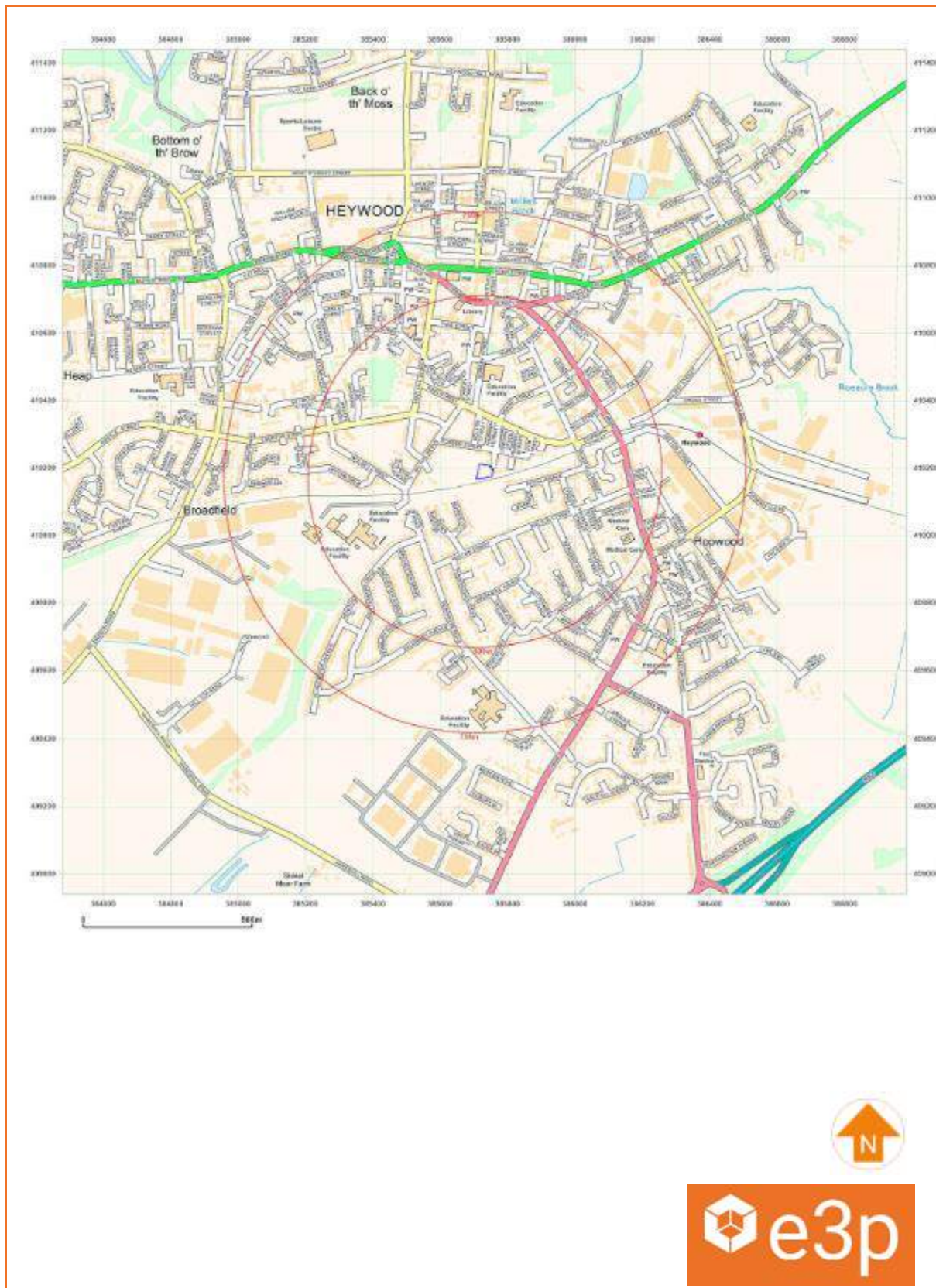
DRAWINGS

Buxton Street, Heywood

Phase I & II Geoenvironmental Site Assessment

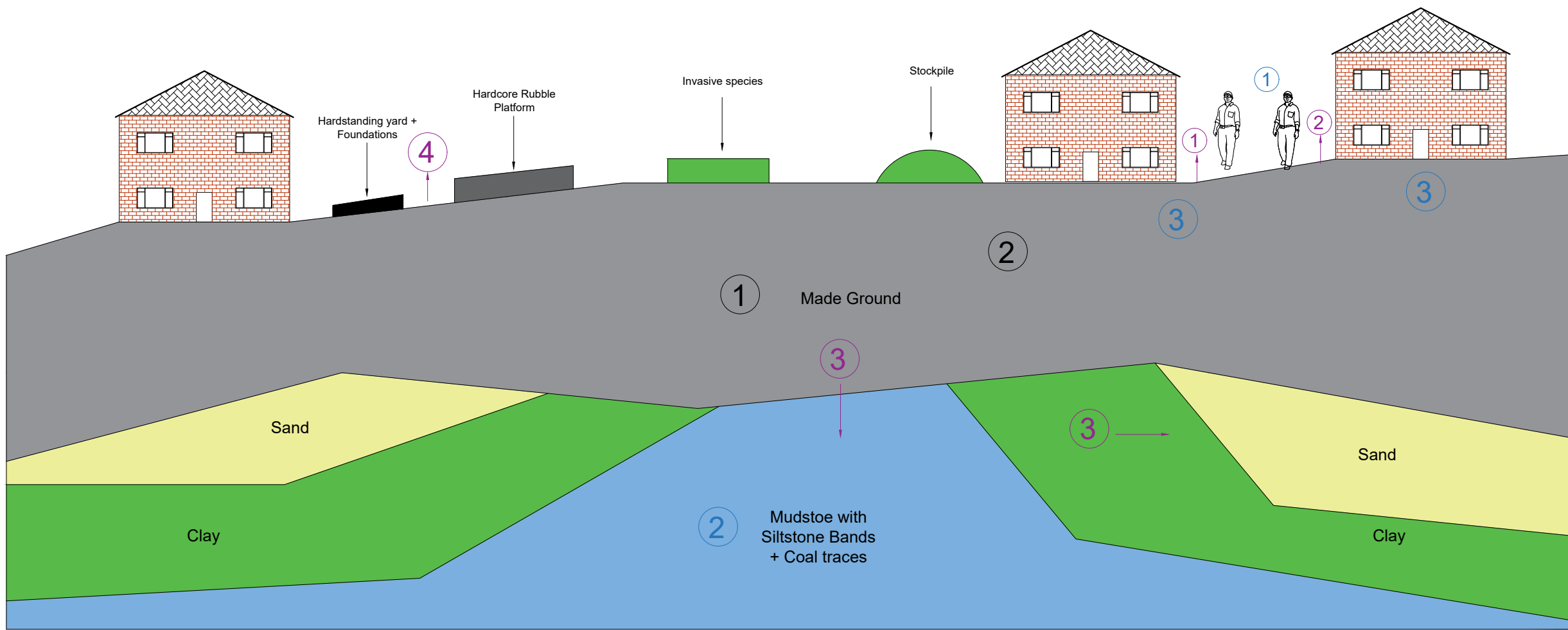
August 2022

DRAWING 16-060-001 – SITE LOCATION PLAN





Historical Features Former Buildings Former Buildings Former Railway Embankment Former Field Boundaries Former Footpath Former Emabnkment	Notes:					Client: B and L Ingoe	Job No: 16-060	Date: 21.06.2022	 Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk
							Drawing No: 003	Scale: NTS	
							Drawing Title: Historical Features Plan		
P1	REVA	21.06.2022	LM	MJ	Job Title: Buxton Street Heywood				
Phase	Issue	Date	Drawn	Checked					



Geology Key

	Made Ground
	Clay
	Sand
	Mudstone With Siltstone Bands + Coal Traces

Sources

- ① Made Ground- heavy metals, PAHs, TPH, asbestos
- ② Made Ground - ground gas, co2, CH4

Receptors

- ① Dermal Contact + ingestion
- ② Dust inhalation (asbestos)
- ③ Lateral/Downward migration
- ④ Vapour/Gas inhalation

Pathways

- ① Future endusers
- ② Secondary a aquifer
- ③ buried concrete

Notes:

P1	REVA	22.08.2022	OW	MJ
Phase	Issue	Date	Drawn	Checked

Client:

B & L Ingoe

Job Title:

Buxton Street

Job No:

16-060

Drawing No:

010

Date:

22.08.2022

Scale:

NTS @ A3



Environmental Engineering
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Conceptual Site
Model



Notes:				
P1	REVA	16.06.2022	HM	MJ
Phase	Issue	Date	Drawn	Checked

Client:	B and L Ingoe
Job Title:	Buxton Street Heywood

Job No:	16-060	Date:	16.06.2022
Drawing No:	002	Scale:	NTS
Drawing Title:	Proposed Development Plan		



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Site Features	
	Mature Trees
	Potential Invasive Species - Surveyed by third party
	Crush
	Stockpile of earth & rubble
	Waste Material

Notes:

P1	REVA	16.06.2022	HM	MJ
Phase	Issue	Date	Drawn	Checked

Client:

B and L Ingoe

Job Title:

Buxton Street
Heywood

Job No:

16-060

Drawing No:

003

Date:

16.06.2022

Scale:

NTS



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APPENDIX IV

PHOTOGRAPHS

PLATE 1 VIEW OF SITE FACING NORTH



PLATE 2 VIEW OF SITE FACING EAST



PLATE 3 SLOPE IN THE WESTERN SECTOR OF THE SITE



PLATE 4 RAILWAY ALONG THE SOUTHERN BOUNDARY



PLATE 5 GROUND CONDITIONS WS102



PLATE 6 GROUND CONDITIONS WS105



PLATE 7 MONITORING WELL INSTALL



PLATE 8 STOCKPILE IN THE SOUTH OF THE SITE



PLATE 9 SPROUTING INVASIVE SPECIES ON SITE



APPENDIX V

E3P EXPLORATORY HOLE LOGS



Borehole Log

Borehole No.

RB101

Sheet 1 of 4

Project Name: Buxton Street

Project No.
16060

Co-ords: 385720.00 - 410180.00

Hole Type
BH

Location: Heywood

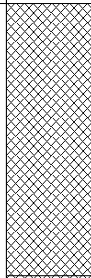
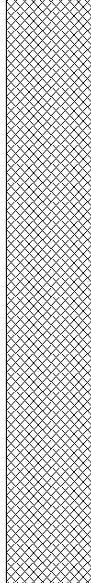
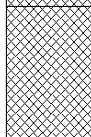
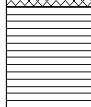
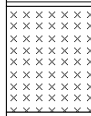
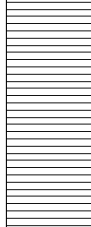
Level: 122.51

Scale
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Client: B and L Ingoe

Dates: 07/07/2022 -

Logged By
G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
					1.80	120.71		MADE GROUND: Black slightly clayey slightly sandy gravel. Gravel is fine to medium subangular of sandstone with frequent fragments of brick, clinker and ash.	1	
								MADE GROUND: Brown sand.	2	
						3				
						4				
						5				
					5.70	116.81			MADE GROUND: Brown sandy gravel. Gravel fine to coarse angular to subrounded of brick.	6
					6.60	115.91				Light grey MUDSTONE with traces of coal.
					7.30	115.21				Light grey SILTSTONE.
					8.00	114.51				Light grey MUDSTONE.
										9
9.60	112.91		Dark grey MUDSTONE.	10						
Continued on next sheet									10	

Remarks





Borehole Log

Borehole No.

RB101

Sheet 2 of 4

Project Name: Buxton Street

Project No.
16060

Co-ords: 385720.00 - 410180.00

Hole Type
BH

Location: Heywood

Level: 122.51

Scale
1:50

Client: B and L Ingoe

Dates: 07/07/2022 -

Logged By
G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					10.20	112.31		Light grey MUDSTONE.	
									11
									12
									13
									14
									15
									16
									17
									18
									19
									20

Continued on next sheet

Remarks





Borehole Log

Borehole No.

RB101

Sheet 3 of 4

Project Name: Buxton Street

Project No.
16060

Co-ords: 385720.00 - 410180.00

Hole Type
BH

Location: Heywood

Level: 122.51

Scale
1:50

Client: B and L Ingoe

Dates: 07/07/2022 -

Logged By
G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
									21
									22
									23
									24
									25
									26
									27
					28.20	94.31		Dark grey MUDSTONE.	28
					29.50	93.01		Light grey MUDSTONE.	29
									30

Continued on next sheet

Remarks





Borehole Log

Borehole No.

RB102

Sheet 1 of 4

Project Name: Buxton Street

Project No.
16060

Co-ords: 385738.00 - 410209.00

Hole Type
BH

Location: Heywood

Level: 122.75

Scale
1:50

Client: B and L Ingoe

Dates: 08/07/2022 -

Logged By
G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					2.20	120.55		MADE GROUND: Black slightly clayey slightly sandy gravel. Gravel is fine to medium subangular of sandstone with frequent fragments of brick, clinker and ash.	1
								MADE GROUND: Brown sandy gravel. Gravel fine to coarse angular to subrounded of brick.	2
									3
									4
									5
					6.20	116.55		Brown SAND.	6
									7
									8
					8.60	114.15		Light grey MUDSTONE with traces of coal.	9
									10

Continued on next sheet

Remarks





Borehole Log

Borehole No.

RB102

Sheet 3 of 4

Project Name: Buxton Street

Project No.
16060

Co-ords: 385738.00 - 410209.00

Hole Type
BH

Location: Heywood

Level: 122.75

Scale
1:50

Client: B and L Ingoe

Dates: 08/07/2022 -

Logged By
G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
									21
									22
									23
									24
									25
									26
									27
									28
									29
									30

Continued on next sheet

Remarks





Borehole Log

Borehole No.

WS101

Sheet 1 of 1

Project Name: Buxton Street

Project No.
16060

Co-ords: 385733.00 - 410210.00

Hole Type
WS

Location: Heywood

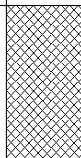
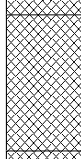
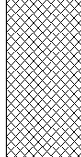
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Scale
1:50

Client: B and L Ingoe

Dates: 07/07/2022 -

Logged By
G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.80	ES	N=26 (4,11/10,8,4,4)	1.10	121.43		MADE GROUND: Yellowish brown very gravelly fine to medium sand. Gravel is fine to coarse angular to subrounded of sandstone with frequent fragments of brick and concrete.	1
		1.00							
		2.00	ES	N=7 (3,2/3,2,1,1)	2.00	120.53		MADE GROUND: Medium dense dark brown slightly clayey gravelly sand. Gravel is fine subangular of sandstone and mudstone with frequent fragmnets of brick and clinker.	2
		2.60							
		3.00						MADE GROUND: Loose black slightly clayey slightly sandy gravel. Gravel is fine to medium subangular of sandstone with frequent fragments of brick, clinker and ash.	
		3.50							
		4.00	ES	N=12 (2,1/3,4,2,3)	4.50	118.03		MADE GROUND: Stiff medium strength black very gravelly clay. Gravel is fine to medium angular to subangular of mudstone and sandstone with frequent fragments of brick, clinker, ash and glass.	4
		4.80							
		5.00						Stiff medium strength brown mottled grey CLAY.	
					5.45	117.08		End of borehole at 5.45 m	5
									6
									7
									8
									9
									10

Remarks

1. Complete. 2. Monitoring well installed. 3. Response zone 4.50-5.00m bgl.

Borehole Log

Borehole No.

WS102

Sheet 1 of 1

Project Name: Buxton Street

Project No.
16060

Co-ords: 385742.00 - 410195.00

Hole Type
WS

Location: Heywood

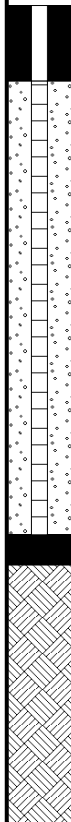
Level: 123.02

Scale
1:50

Client: B and L Ingoe

Dates: 07/07/2022 -

Logged By
G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	ES					MADE GROUND: Very loose black slightly clayey slightly sandy gravel. Gravel is fine to medium subangular of sandstone with frequent fragments of brick, clinker, timber and ash and rare clods of brown sandy clay 15cm in size.	1
		1.00		N=3 (3,2/1,1,1,0)					
		2.00		N=3 (1,0/1,0,1,1)					2
		3.00		N=7 (1,1/1,1,1,4)	2.80	120.22		MADE GROUND: Loose dark grey sandy slightly gravelly clay. Gravel is fine angular to subangular of sandstone and mudstone with frequent fragments of brick, clinker and glass.	3
		3.90	ES		3.70	119.32			
		4.00		N=7 (1,1/2,1,1,3)				Loose brown clayey fine to medium SAND.	4
		4.50	U100		4.30	118.72			
		5.00		N=15 (2,3/5,4,4,2)				Stiff medium strength brown mottled grey sandy CLAY.	5
					5.45	117.57		End of borehole at 5.45 m	6

Remarks

1. Complete. 2. Water strike encountered 4.00m bgl. 3. Monitoring well installed. 4. Response zone 0.50-3.50m bgl.

Borehole Log

Borehole No.

WS103

Sheet 1 of 1

Project Name: Buxton Street

Project No.
16060

Co-ords: 385736.00 - 410193.00

Hole Type
WS

Location: Heywood

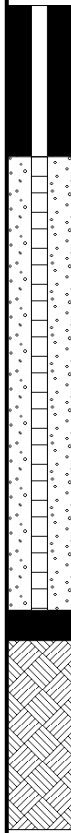
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Scale
1:50

Client: B and L Ingoe

Dates: 07/07/2022 -

Logged By
G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES					MADE GROUND: Dark brown slightly clayey gravelly sand. Gravel is fine to coarse subangular to subrounded of mudstone and sandstone with frequent fragments of brick, concrete and ash.	
		0.50	B						
		1.00		N=20 (7,9/7,6,4,3)	1.10	121.78			1
		1.60	ES					MADE GROUND: Medium dense black slightly clayey slightly sandy gravel. Gravel is fine to medium subangular of sandstone with frequent fragments of brick, clinker and ash. (Becoming loose circa 2.00m bgl and then becoming very loose circa 3.00m bgl)	2
		2.00		N=6 (1,1/1,2,1,2)					
		3.00		N=3 (2,2/1,1,0,1)					3
		4.00		N=16 (3,4/5,3,4,4)	3.85	119.03		Dark grey very sandy CLAY.	4
		4.60	ES		4.20	118.68		Stiff medium strength brown slightly gravelly sandy CLAY. Gravel is fine subangular to subrounded of sandstone and mudstone.	5
		5.00		N=11 (2,3/3,3,2,3)					
					5.45	117.43		End of borehole at 5.45 m	6

Remarks

1. Complete. 2. Water strike encountered at 4.40m bgl. 3. Monitoring well installed. 4. Response zone 1.00-4.00m bgl.

Borehole Log

Borehole No.

WS104

Sheet 1 of 1

Project Name: Buxton Street

Project No.
16060

Co-ords: 385746.00 - 410189.00

Hole Type
WS

Location: Heywood

Level: 122.87

Scale
1:50

Client: B and L Ingoe

Dates: 07/07/2022 -

Logged By
G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES					MADE GROUND: Very loose dark brownish grey slightly clayey gravelly fine to medium sand with rare rootlets 0.00-0.15m bgl and a sandy clay clod 1.40-1.60m bgl. Gravel is fine to medium angular to subangular of sandstone and mudstone with frequent fragments of brick, clinker, glass, concrete and ash.	1
		0.50	B						
		1.20		N=1 (1,1/0,0,1,0)					
		1.50	ES						
		2.00		N=4 (1,0/1,0,2,1)					2
		3.00		N=2 (1,1/0,1,0,1)	3.10	119.77			3
		4.00		N=10 (1,2/2,2,3,3)	3.80	119.07			4
		4.40	ES		4.70	118.17			
		5.00		N=10 (4,2/2,3,2,3)	5.45	117.42			5
								End of borehole at 5.45 m	6

Remarks

1. Complete. 2. Water strike encountered at 3.20m bgl. 3. Monitoring well installed. 4. Response zone 3.50-4.50mbgl.

Borehole Log

Borehole No.

WS105

Sheet 1 of 1

Project Name: Buxton Street

Project No.
16060

Co-ords: 385723.00 - 410191.00

Hole Type
WS

Location: Heywood

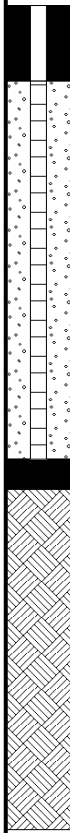
Level: 122.50

Scale
1:50

Client: B and L Ingoe

Dates: 07/07/2022 -

Logged By
G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.60	ES					MADE GROUND: Loose dark brown slightly clayey gravelly fine to medium sand. Gravel is fine to coarse subangular of sandstone and mudstone with frequent fragments of brick, ceramic, glass, clinker and ash.	1
		1.00		N=8 (2,1/1,3,1,3)	1.30	121.20		MADE GROUND: Loose dark grey slightly sandy gravelly clay. Gravel is fine to medium angular to subangular of clinker brick sandstone, mudstone and ceramic.	2
		1.80	ES					MADE GROUND: Soft low strength grey mottled brown sandy clay (reworked clay)	3
		2.00		N=3 (1,1/1,1,0,1)	2.10	120.40		MADE GROUND: Loose dark grey slightly sandy gravelly clay. Gravel is fine to medium subangular of mudstone and sandstone with frequent fragments of brick and clinker. (Slight hydrocarbon odour 2.50-3.00mbgl)	4
		2.70	ES					MADE GROUND: Loose dark grey slightly sandy gravelly clay. Gravel is fine to medium subangular of mudstone and sandstone with frequent fragments of brick and clinker. (Slight hydrocarbon odour)	5
		3.00		N=6 (1,1/1,1,2,2)				Brown clayey fine to medium SAND. Stiff medium strength brown mottled grey sandy CLAY.	6
		4.00		N=34 (6,7/10,8,8,8)	3.80	118.70		Grey mottled brown sandy clay. (Reworked clay)	7
		4.50	ES		4.30	118.20		MADE GROUND: Very stiff high strength dark grey slightly sandy gravelly clay. Gravel is fine to medium subangular of mudstone and sandstone with frequent fragments of brick and clinker. (Slight hydrocarbon odour)	8
		5.00		N=15 (3,4/4,4,3,4)	4.90	117.60		MADE GROUND: Very stiff high strength dark grey slightly sandy gravelly clay. Gravel is fine to medium subangular of mudstone and sandstone with frequent fragments of brick and clinker. (Slight hydrocarbon odour)	9
					5.45	117.05		End of borehole at 5.45 m	10

Remarks

1. Complete. 2. Slight hydrocarbon odour 2.50-3.00m and 4.00-4.30m bgl. 3. Water strike encountered 4.00m bgl. 4. Monitoring well installed. 5. Response zone 0.50-3.00m bgl.

APPENDIX VI

CHEMICAL TESTING

RESULTS



Matt Jackson

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Analytical Report Number : 22-70304

Replaces Analytical Report Number: 22-70304, issue no. 1
Additional analysis undertaken.

Project / Site name:	Buxton Street	Samples received on:	08/07/2022
Your job number:	16-060	Samples instructed on/ Analysis started on:	08/07/2022
Your order number:	0021155	Analysis completed by:	02/08/2022
Report Issue Number:	2	Report issued on:	02/08/2022
Samples Analysed:	3 leachate samples - 14 soil samples		


Signed:

Martyna Langer
Junior Reporting Specialist
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

Excel copies of reports are only valid when accompanied by this PDF certificate.

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.

Analytical Report Number: 22-70304
Project / Site name: Buxton Street
Your Order No: 0021155

Lab Sample Number				2343855	2343856	2343857	2343858	2343859
Sample Reference				WS101	WS101	WS101	WS102	WS102
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	2.60	4.80	0.50	3.90
Date Sampled				08/07/2022	08/07/2022	08/07/2022	08/07/2022	08/07/2022
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	56	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	4.8	14	20	9.2	14
Total mass of sample received	kg	0.001	NONE	0.7	0.7	0.3	0.3	0.3

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	Chrysotile	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	-	Detected	-
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	< 0.001	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	< 0.001	-
Asbestos Analyst ID	N/A	N/A	N/A	DSA	DSA	N/A	DSA	N/A

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.6	8	-	8.3	-
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	160	730	-	500	-
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.045	0.091	-	0.026	-
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	91	180	-	53	-
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	45.3	90.5	-	26.3	-
Sulphide	mg/kg	1	MCERTS	2.8	18	-	24	-
Total Sulphur	mg/kg	50	MCERTS	59	650	-	320	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	< 0.1	5.1	-	0.6	-
Total Organic Carbon (TOC) - Manual	%	0.1	MCERTS	-	-	-	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	2.7	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	1.4	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	18	< 0.05	0.29	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	11	< 0.05	0.21	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	130	1.1	2.3	0.27
Anthracene	mg/kg	0.05	MCERTS	< 0.05	32	0.31	0.59	0.3
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	160	2.3	3.4	0.24
Pyrene	mg/kg	0.05	MCERTS	< 0.05	150	2.3	3.5	0.34
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	99	1.1	1.6	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	69	0.94	1.6	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	68	0.83	1.3	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	38	0.57	0.75	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	69	0.88	1.2	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	29	0.35	0.59	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	9.8	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	32	0.49	0.67	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	918	11.1	18.1	1.15
-----------------------------	-------	-----	--------	--------	-----	------	------	------

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	1.2	22	8.9	8.7	5.2
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	110	-	79
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	-	0.97	-	0.73
Boron (water soluble)	mg/kg	0.2	MCERTS	-	-	0.3	-	< 0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	0.3
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	9.1	26	-	20	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	8.9	86	30	31	25

Analytical Report Number: 22-70304
Project / Site name: Buxton Street
Your Order No: 0021155

Lab Sample Number				2343855	2343856	2343857	2343858	2343859
Sample Reference				WS101	WS101	WS101	WS102	WS102
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	2.60	4.80	0.50	3.90
Date Sampled				08/07/2022	08/07/2022	08/07/2022	08/07/2022	08/07/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Lead (aqua regia extractable)	mg/kg	1	MCERTS	8	180	16	210	18
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	13	29	36	18	16
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	-	-	27	-	16
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	29	110	71	86	51

Speciated Mercury (Dry Weight)

Inorganic Mercury	mg/kg	0.005	NONE	-	-	-	-	-
Organo-Mercury Species (including Methyl Hg)	mg/kg	0.005	NONE	-	-	-	-	-
Elemental Mercury	mg/kg	0.005	NONE	-	-	-	-	-

Speciated Mercury (Dry Weight)

F1 - Water soluble	mg/kg	0.005	NONE	-	-	-	-	-
F2 - Weak acid	mg/kg	0.005	NONE	-	-	-	-	-
F3 - Organo- complexed	mg/kg	0.005	NONE	-	-	-	-	-
F4 - Strongly complexed	mg/kg	0.005	NONE	-	-	-	-	-
F5 - Mineral bound	mg/kg	0.005	NONE	-	-	-	-	-

Petroleum Hydrocarbons

TPH (C5 - C6) HS_ID_TOTAL	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8) HS_ID_TOTAL	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10) HS_ID_TOTAL	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12) EH_CU_ID_TOTAL	mg/kg	2	MCERTS	< 2.0	4.9	< 2.0	< 2.0	< 2.0
TPH (C12 - C16) EH_CU_ID_TOTAL	mg/kg	4	MCERTS	< 4.0	84	< 4.0	6.1	< 4.0
TPH (C16 - C21) EH_CU_ID_TOTAL	mg/kg	1	MCERTS	< 1.0	500	7.9	16	< 1.0
TPH (C21 - C35) EH_CU_ID_TOTAL	mg/kg	1	MCERTS	< 1.0	830	20	29	< 1.0
TPH (C35 - C40) EH_CU_ID_TOTAL	mg/kg	10	MCERTS	< 10	55	< 10	11	< 10
TPH Total C5 - C40 EH_CU+HS_ID_TOTAL	mg/kg	10	MCERTS	< 10	1500	27	61	< 10

Analytical Report Number: 22-70304
Project / Site name: Buxton Street
Your Order No: 0021155

Lab Sample Number	2343855	2343856	2343857	2343858	2343859
Sample Reference	WS101	WS101	WS101	WS102	WS102
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.80	2.60	4.80	0.50	3.90
Date Sampled	08/07/2022	08/07/2022	08/07/2022	08/07/2022	08/07/2022
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

VOCs

Chloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chloroethane	µg/kg	1	NONE	-	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	-	-
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
Styrene	µg/kg	1	MCERTS	-	-	-	-	-
Tribromomethane	µg/kg	1	NONE	-	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	-	-

Analytical Report Number: 22-70304
Project / Site name: Buxton Street
Your Order No: 0021155

Lab Sample Number				2343855	2343856	2343857	2343858	2343859
Sample Reference				WS101	WS101	WS101	WS102	WS102
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	2.60	4.80	0.50	3.90
Date Sampled				08/07/2022	08/07/2022	08/07/2022	08/07/2022	08/07/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-

SVOCs

Aniline	mg/kg	0.1	NONE	-	-	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	-	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	-	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	-	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	-	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	-	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	-	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	-	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-

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Lab Sample Number				2343855	2343856	2343857	2343858	2343859
Sample Reference				WS101	WS101	WS101	WS102	WS102
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	2.60	4.80	0.50	3.90
Date Sampled				08/07/2022	08/07/2022	08/07/2022	08/07/2022	08/07/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		
Dibenz(a,h)anthracene				mg/kg	0.05	MCERTS	-	-
Benzo(ghi)perylene				mg/kg	0.05	MCERTS	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

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Lab Sample Number				2343860	2343861	2343862	2343863	2343864
Sample Reference				WS103	WS103	WS103	WS104	WS104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	1.60	4.60	0.30	1.50
Date Sampled				08/07/2022	08/07/2022	08/07/2022	08/07/2022	08/07/2022
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	57	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	5.5	14	13	9.4	10
Total mass of sample received	kg	0.001	NONE	0.3	0.3	0.3	0.3	0.3

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	Chrysotile	Chrysotile
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	-	Detected	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	< 0.001	< 0.001
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	< 0.001	< 0.001
Asbestos Analyst ID	N/A	N/A	N/A	DSA	DSA	N/A	DSA	DSA

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.6	7.9	-	8.7	8.2
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	75	2200	-	490	740
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.022	0.05	-	0.044	0.028
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	44	99	-	88	56
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	21.9	49.6	-	43.9	28.2
Sulphide	mg/kg	1	MCERTS	11	17	-	9.4	6.2
Total Sulphur	mg/kg	50	MCERTS	< 50	1300	-	480	470
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.3	5.1	-	2.1	2.3
Total Organic Carbon (TOC) - Manual	%	0.1	MCERTS	-	-	-	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	9.7	< 0.05	0.4	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	1.8	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	4.6	< 0.05	1.3	0.28
Fluorene	mg/kg	0.05	MCERTS	< 0.05	4.1	< 0.05	0.91	0.37
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	32	0.6	7	4.1
Anthracene	mg/kg	0.05	MCERTS	< 0.05	8.2	< 0.05	1.6	1.3
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	41	0.83	10	9.5
Pyrene	mg/kg	0.05	MCERTS	< 0.05	38	0.71	9	8.6
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	23	0.54	5.8	6.1
Chrysene	mg/kg	0.05	MCERTS	< 0.05	18	0.49	4.2	4.2
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	16	0.29	4.4	5.3
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	16	0.34	2.3	2.5
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	20	0.38	4.3	4.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	8.7	< 0.05	2.2	2.3
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	2.7	< 0.05	0.52	0.65
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	10	< 0.05	2.3	2.8

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	254	4.18	56.6	52.8
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	1.8	210	8.6	18	36
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	150	-	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	-	0.89	-	-
Boron (water soluble)	mg/kg	0.2	MCERTS	-	-	< 0.2	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	7.5	65	-	21	24
Copper (aqua regia extractable)	mg/kg	1	MCERTS	12	300	23	82	66

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Lab Sample Number				2343860	2343861	2343862	2343863	2343864
Sample Reference				WS103	WS103	WS103	WS104	WS104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	1.60	4.60	0.30	1.50
Date Sampled				08/07/2022	08/07/2022	08/07/2022	08/07/2022	08/07/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Lead (aqua regia extractable)	mg/kg	1	MCERTS	8.2	1200	17	270	440
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	1.1	< 0.3	0.3	0.5
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	10	110	28	26	31
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	-	-	22	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	28	250	59	150	99

Speciated Mercury (Dry Weight)

Inorganic Mercury	mg/kg	0.005	NONE	-	-	-	-	-
Organo-Mercury Species (including Methyl Hg)	mg/kg	0.005	NONE	-	-	-	-	-
Elemental Mercury	mg/kg	0.005	NONE	-	-	-	-	-

Speciated Mercury (Dry Weight)

F1 - Water soluble	mg/kg	0.005	NONE	-	-	-	-	-
F2 - Weak acid	mg/kg	0.005	NONE	-	-	-	-	-
F3 - Organo- complexed	mg/kg	0.005	NONE	-	-	-	-	-
F4 - Strongly complexed	mg/kg	0.005	NONE	-	-	-	-	-
F5 - Mineral bound	mg/kg	0.005	NONE	-	-	-	-	-

Petroleum Hydrocarbons

TPH (C5 - C6) HS_ID_TOTAL	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8) HS_ID_TOTAL	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10) HS_ID_TOTAL	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12) EH_CU_ID_TOTAL	mg/kg	2	MCERTS	< 2.0	11	< 2.0	2.6	< 2.0
TPH (C12 - C16) EH_CU_ID_TOTAL	mg/kg	4	MCERTS	< 4.0	19	< 4.0	6.4	< 4.0
TPH (C16 - C21) EH_CU_ID_TOTAL	mg/kg	1	MCERTS	< 1.0	210	< 1.0	36	16
TPH (C21 - C35) EH_CU_ID_TOTAL	mg/kg	1	MCERTS	< 1.0	1600	< 1.0	91	39
TPH (C35 - C40) EH_CU_ID_TOTAL	mg/kg	10	MCERTS	< 10	160	< 10	44	< 10
TPH Total C5 - C40 EH_CU+HS_ID_TOTAL	mg/kg	10	MCERTS	< 10	2000	< 10	180	55

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Lab Sample Number				2343860	2343861	2343862	2343863	2343864
Sample Reference				WS103	WS103	WS103	WS104	WS104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	1.60	4.60	0.30	1.50
Date Sampled				08/07/2022	08/07/2022	08/07/2022	08/07/2022	08/07/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chloroethane	µg/kg	1	NONE	-	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	-	-
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
Styrene	µg/kg	1	MCERTS	-	-	-	-	-
Tribromomethane	µg/kg	1	NONE	-	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	-	-

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Lab Sample Number				2343860	2343861	2343862	2343863	2343864
Sample Reference				WS103	WS103	WS103	WS104	WS104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	1.60	4.60	0.30	1.50
Date Sampled				08/07/2022	08/07/2022	08/07/2022	08/07/2022	08/07/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-

SVOCs

Aniline	mg/kg	0.1	NONE	-	-	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	-	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	-	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	-	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	-	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	-	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	-	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	-	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-

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Lab Sample Number				2343860	2343861	2343862	2343863	2343864
Sample Reference				WS103	WS103	WS103	WS104	WS104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	1.60	4.60	0.30	1.50
Date Sampled				08/07/2022	08/07/2022	08/07/2022	08/07/2022	08/07/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		
Dibenz(a,h)anthracene				mg/kg	0.05	MCERTS	-	-
Benzo(ghi)perylene				mg/kg	0.05	MCERTS	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 22-70304
Project / Site name: Buxton Street
Your Order No: 0021155

Lab Sample Number				2343865	2343866	2343867	2343868
Sample Reference				WS104	WS105	WS105	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				4.40	0.60	2.70	4.50
Date Sampled				08/07/2022	08/07/2022	08/07/2022	08/07/2022
Time Taken				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	73	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	10	7	19	16
Total mass of sample received	kg	0.001	NONE	0.3	0.3	0.3	0.3

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	Chrysotile	-
Asbestos in Soil	Type	N/A	ISO 17025	-	Not-detected	Detected	-
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	< 0.001	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	< 0.001	-
Asbestos Analyst ID	N/A	N/A	N/A	N/A	DSA	DSA	N/A

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	-	8.3	8.5	8.4
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	6.3	< 1.0
Total Sulphate as SO ₄	mg/kg	50	MCERTS	-	260	2100	50
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	-	0.024	0.13	0.018
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	-	47	260	36
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	-	23.5	130	18
Sulphide	mg/kg	1	MCERTS	-	13	34	5.4
Total Sulphur	mg/kg	50	MCERTS	-	160	2100	< 50
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	-	0.7	-	0.5
Total Organic Carbon (TOC) - Manual	%	0.1	MCERTS	-	-	8.3	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0
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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	< 0.05	< 0.05	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	1.3	-	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.24	-	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	2	-	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	1.7	-	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	1.4	-	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	1	-	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.81	-	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	1.2	-	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	1.1	-	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.43	-	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	0.63	-	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	11.9	-	< 0.80
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5.5	9.1	140	3.9
Barium (aqua regia extractable)	mg/kg	1	MCERTS	100	-	1200	11
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.68	-	4.1	0.3
Boron (water soluble)	mg/kg	0.2	MCERTS	< 0.2	-	0.5	< 0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.5	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	15	42	4.7
Copper (aqua regia extractable)	mg/kg	1	MCERTS	20	24	1900	20

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Lab Sample Number				2343865	2343866	2343867	2343868
Sample Reference				WS104	WS105	WS105	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				4.40	0.60	2.70	4.50
Date Sampled				08/07/2022	08/07/2022	08/07/2022	08/07/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	12	75	720	4.4
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	5	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	20	16	64	5.1
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	18	-	97	6
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	44	87	380	19

Speciated Mercury (Dry Weight)

Inorganic Mercury	mg/kg	0.005	NONE	-	-	3.742	-
Organo-Mercury Species (including Methyl Hg)	mg/kg	0.005	NONE	-	-	0.271	-
Elemental Mercury	mg/kg	0.005	NONE	-	-	0.667	-

Speciated Mercury (Dry Weight)

F1 - Water soluble	mg/kg	0.005	NONE	-	-	0.107	-
F2 - Weak acid	mg/kg	0.005	NONE	-	-	0.314	-
F3 - Organo- complexed	mg/kg	0.005	NONE	-	-	0.271	-
F4 - Strongly complexed	mg/kg	0.005	NONE	-	-	0.667	-
F5 - Mineral bound	mg/kg	0.005	NONE	-	-	3.321	-

Petroleum Hydrocarbons

TPH (C5 - C6) HS_ID_TOTAL	mg/kg	1	NONE	< 1.0	< 1.0	-	-
TPH (C6 - C8) HS_ID_TOTAL	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	-
TPH (C8 - C10) HS_ID_TOTAL	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	-
TPH (C10 - C12) EH_CU_ID_TOTAL	mg/kg	2	MCERTS	< 2.0	3.4	-	-
TPH (C12 - C16) EH_CU_ID_TOTAL	mg/kg	4	MCERTS	< 4.0	6.1	-	-
TPH (C16 - C21) EH_CU_ID_TOTAL	mg/kg	1	MCERTS	< 1.0	33	-	-
TPH (C21 - C35) EH_CU_ID_TOTAL	mg/kg	1	MCERTS	< 1.0	67	-	-
TPH (C35 - C40) EH_CU_ID_TOTAL	mg/kg	10	MCERTS	< 10	10	-	-
TPH Total C5 - C40 EH_CU+HS_ID_TOTAL	mg/kg	10	MCERTS	< 10	120	-	-

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Lab Sample Number				2343865	2343866	2343867	2343868
Sample Reference				WS104	WS105	WS105	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				4.40	0.60	2.70	4.50
Date Sampled				08/07/2022	08/07/2022	08/07/2022	08/07/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
VOCs							
Chloromethane	µg/kg	1	ISO 17025	-	-	< 1.0	-
Chloroethane	µg/kg	1	NONE	-	-	< 1.0	-
Bromomethane	µg/kg	1	ISO 17025	-	-	< 1.0	-
Vinyl Chloride	µg/kg	1	NONE	-	-	< 1.0	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	< 1.0	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	< 1.0	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	< 1.0	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	< 1.0	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	< 1.0	-
Trichloromethane	µg/kg	1	MCERTS	-	-	< 1.0	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	< 1.0	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	< 1.0	-
Benzene	µg/kg	1	MCERTS	-	-	< 1.0	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	< 1.0	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	< 1.0	-
Trichloroethene	µg/kg	1	MCERTS	-	-	< 1.0	-
Dibromomethane	µg/kg	1	MCERTS	-	-	< 1.0	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	< 1.0	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	< 1.0	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	< 1.0	-
Toluene	µg/kg	1	MCERTS	-	-	< 1.0	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	< 1.0	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	< 1.0	-
Tetrachloroethene	µg/kg	1	NONE	-	-	< 1.0	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	< 1.0	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	< 1.0	-
Styrene	µg/kg	1	MCERTS	-	-	< 1.0	-
Tri bromomethane	µg/kg	1	NONE	-	-	< 1.0	-
o-Xylene	µg/kg	1	MCERTS	-	-	< 1.0	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-
Bromobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	< 1.0	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	< 1.0	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	< 1.0	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-
Butylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	< 1.0	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	< 1.0	-

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Lab Sample Number				2343865	2343866	2343867	2343868
Sample Reference				WS104	WS105	WS105	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				4.40	0.60	2.70	4.50
Date Sampled				08/07/2022	08/07/2022	08/07/2022	08/07/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-

SVOCs

Aniline	mg/kg	0.1	NONE	-	-	< 0.1	-
Phenol	mg/kg	0.2	ISO 17025	-	-	< 0.2	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-	< 0.1	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-	< 0.2	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	< 0.2	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-	< 0.1	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	< 0.2	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-	< 0.1	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	-	< 0.3	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	-	< 0.05	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	-	< 0.3	-
4-Methylphenol	mg/kg	0.2	NONE	-	-	< 0.2	-
Isophorone	mg/kg	0.2	MCERTS	-	-	< 0.2	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-	< 0.3	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-	< 0.3	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-	< 0.3	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-	< 0.3	-
Naphthalene	mg/kg	0.05	MCERTS	-	-	< 0.05	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-	< 0.3	-
4-Chloroaniline	mg/kg	0.1	NONE	-	-	< 0.1	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-	< 0.1	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	< 0.1	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-	< 0.1	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-	< 0.2	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	0.5	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-	< 0.1	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-	< 0.1	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-	< 0.1	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	< 0.05	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	1.6	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-	< 0.2	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	-	0.5	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-	< 0.3	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-	< 0.2	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-	< 0.2	-
Fluorene	mg/kg	0.05	MCERTS	-	-	1.3	-
Azobenzene	mg/kg	0.3	MCERTS	-	-	< 0.3	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-	< 0.2	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-	< 0.3	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	11	-
Anthracene	mg/kg	0.05	MCERTS	-	-	3.1	-
Carbazole	mg/kg	0.3	MCERTS	-	-	0.9	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-	< 0.2	-
Anthraquinone	mg/kg	0.3	MCERTS	-	-	1	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	14	-
Pyrene	mg/kg	0.05	MCERTS	-	-	13	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-	< 0.3	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	6.9	-
Chrysene	mg/kg	0.05	MCERTS	-	-	5.4	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	4	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	3.1	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	4.6	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	2.4	-

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Lab Sample Number				2343865	2343866	2343867	2343868
Sample Reference				WS104	WS105	WS105	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				4.40	0.60	2.70	4.50
Date Sampled				08/07/2022	08/07/2022	08/07/2022	08/07/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	< 0.05	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	2.7	-

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: **22-70304**
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Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
2343858	WS102	0.50	133	Loose Fibres	Chrysotile	< 0.001	< 0.001
2343863	WS104	0.30	170	Loose Fibres	Chrysotile	< 0.001	< 0.001
2343864	WS104	1.50	148	Loose Fibres	Chrysotile	< 0.001	< 0.001
2343867	WS105	2.70	75	Loose Fibres	Chrysotile	< 0.001	< 0.001

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.



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Project / Site name: Buxton Street

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Lab Sample Number				2343869	2343870	2343871
Sample Reference				WS101	WS105	WS105
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				2.60	0.60	2.70
Date Sampled				08/07/2022	08/07/2022	08/07/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status			

General Inorganics

pH (automated)	pH Units	N/A	ISO 17025	7.8	8	7.8
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	< 1.0	10

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	2.4	2.1	2.7
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	1.7	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	0.91	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.2	NONE	2.6	< 0.2	< 0.2
-------------------	------	-----	------	-----	-------	-------

Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	1	ISO 17025	7	4.8	4.3
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08	< 0.08
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	1	3	< 0.4
Copper (dissolved)	µg/l	0.7	ISO 17025	15	19	5.7
Lead (dissolved)	µg/l	1	ISO 17025	3.4	10	11
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	3.1	3.5	5.8
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	12	12	14



Analytical Report Number: 22-70304
Project / Site name: Buxton Street

Your Order No: 0021155

Lab Sample Number				2343869	2343870	2343871
Sample Reference				WS101	WS105	WS105
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				2.60	0.60	2.70
Date Sampled				08/07/2022	08/07/2022	08/07/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status			

Monoaromatics & Oxygenates

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	< 10	< 10

Petroleum Hydrocarbons

TPH1 (C10 - C40) EH_ID_TOTAL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
--	------	----	------	------	------	------

TPH-CWG - Aliphatic >C5 - C6 HS_ID_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_ID_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_ID_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_ID_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_ID_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_ID_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_ID_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_ID_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10

TPH-CWG - Aromatic >C5 - C7 HS_ID_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_ID_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_ID_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_ID_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_ID_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_ID_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_ID_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_ID_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-70304
Project / Site name: Buxton Street

* 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 *
2343855	WS101	None Supplied	0.8	Brown sand with gravel and stones.
2343856	WS101	None Supplied	2.6	Brown sandy clay with gravel and rubble.
2343857	WS101	None Supplied	4.8	Brown sandy clay.
2343858	WS102	None Supplied	0.5	Brown sand with brick and rubble.
2343859	WS102	None Supplied	3.9	Brown sandy clay with gravel.
2343860	WS103	None Supplied	0.2	Brown sand with gravel and stones.
2343861	WS103	None Supplied	1.6	Brown loam and sand with gravel.
2343862	WS103	None Supplied	4.6	Brown clay.
2343863	WS104	None Supplied	0.3	Brown loam and sand with gravel.
2343864	WS104	None Supplied	1.5	Brown clay and sand with gravel.
2343865	WS104	None Supplied	4.4	Brown sandy clay.
2343866	WS105	None Supplied	0.6	Brown loam and sand with gravel and stones.
2343867	WS105	None Supplied	2.7	Brown clay and sand with gravel.
2343868	WS105	None Supplied	4.5	Brown sand.

Analytical Report Number : 22-70304

Project / Site name: Buxton Street

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

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
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	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 leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in leachate - LOW LEVEL 1 ug/l	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed 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
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
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
pH at 20oC in leachate (automated)	Determination of pH in leachate by electrometric measurement.	In house method.	L099B	W	ISO 17025
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	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

Analytical Report Number : 22-70304

Project / Site name: Buxton Street

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total Sulphur in soil	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
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
TPH1 (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	ISO 17025
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
Total organic carbon (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
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
BTEX and MTBE in leachates (Monoaromatics)	Determination of BTEX and MTBE in leachates by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Speciated Mercury in soil by Millennium Merlin Ana	Determination of Speciated Mercury in soil by Millennium Merlin Analyzer	In-house method	L085-PL	Dry	NONE
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L023-PL	D	MCERTS
Total cyanide in leachate - 1µg/l	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	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
Sulphate, water soluble, in soil (1hr extraction)	Sulphate, water soluble, in soil (1hr extraction)	In-house method	L038-PL	D	MCERTS

Analytical Report Number : 22-70304
Project / Site name: Buxton Street

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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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 30°C.

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.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
-	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

APPENDIX VII

ORIGIN OF TIER I GENERIC ASSESSMENT CRITERIA

CONSTITUENT	ORIGIN OF RISK ASSESSMENT VALUE
Arsenic	2014 LQM/CIEH S4ULs
Cadmium	2014 LQM/CIEH S4ULs
Chromium	2014 LQM/CIEH S4ULs
Lead	2014 LQM/CIEH S4ULs
Mercury	2014 LQM/CIEH S4ULs – methylmercury
Nickel	2014 LQM/CIEH S4ULs
Selenium	2014 LQM/CIEH S4ULs
Copper	2014 LQM/CIEH S4ULs
Zinc	2014 LQM/CIEH S4ULs
Cyanide – Total	2014 LQM/CIEH S4ULs
Phenols – Total	2014 LQM/CIEH S4ULs
Naphthalene	General assessment criteria (GAC) developed by CIEH/LQM Suitable 4 Use Levels with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM.
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)Anthracene	
Chrysene	
Benzo(b/k)Fluoranthene ⁽ⁱⁱⁱ⁾	
Benzo(a)Pyrene	
Indeno(123-cd)Pyrene	
Dibenzo(a,h)Anthracene	
Benzo(ghi)Perylene	
TPH C ₅ -C ₆ (aliphatic)	
TPH C ₆ -C ₈ (aliphatic)	
TPH C ₈ -C ₁₀ (aliphatic)	
TPH C ₁₀ -C ₁₂ (aliphatic)	
TPH C ₁₂ -C ₁₆ (aromatic)	
TPH C ₁₆ -C ₂₁ (aromatic)	
TPH C ₂₁ -C ₃₅ (aromatic)	



APPENDIX VIII

GEOTECHNICAL RESULTS



LABORATORY REPORT



4043

Contract Number: PSL22/4599

Report Date: 28 July 2022

Client's Reference: 002156

Client Name: E3P
Taylor Road
Urmston
Manchester
M41 7JQ

For the attention of: Matt Jackson/Georgia Calvert

Contract Title: Buxton Street

Date Received: 11/7/2022

Date Commenced: 11/7/2022

Date Completed: 26/07/2022

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)

M Fennell
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

4043

PSL
Professional Soils Laboratory

Buxton Street

Contract No:

PSL22/4599

Client Ref:

002156

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic

*** : Liquid Limit and Plastic Limit Wet Sieved.**



4043

PSL
Professional Soils Laboratory

Buxton Street

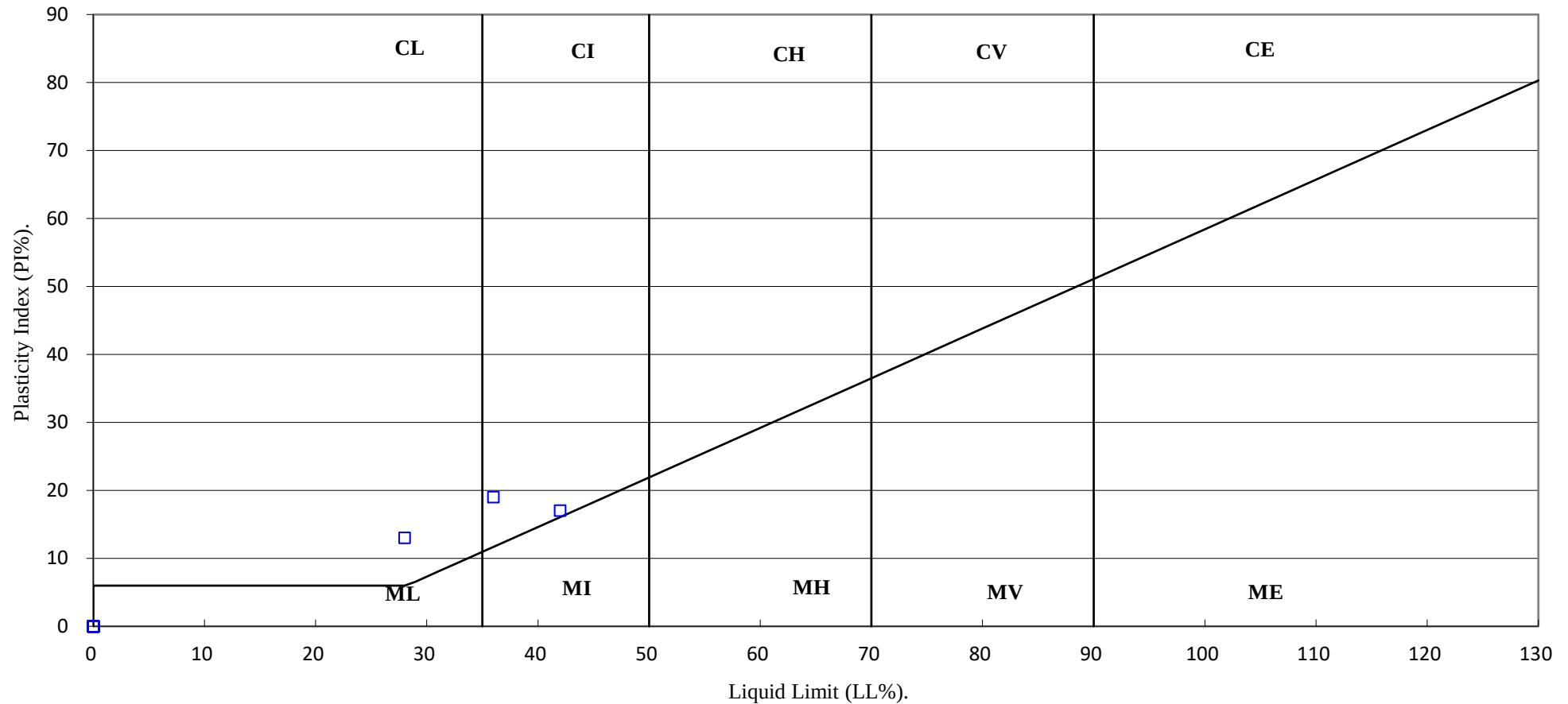
Contract No:

PSL22/4599

Client Ref:

002156

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL
Professional Soils Laboratory

Buxton Street

Contract No:

PSL22/4599

Client Ref:

002156

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

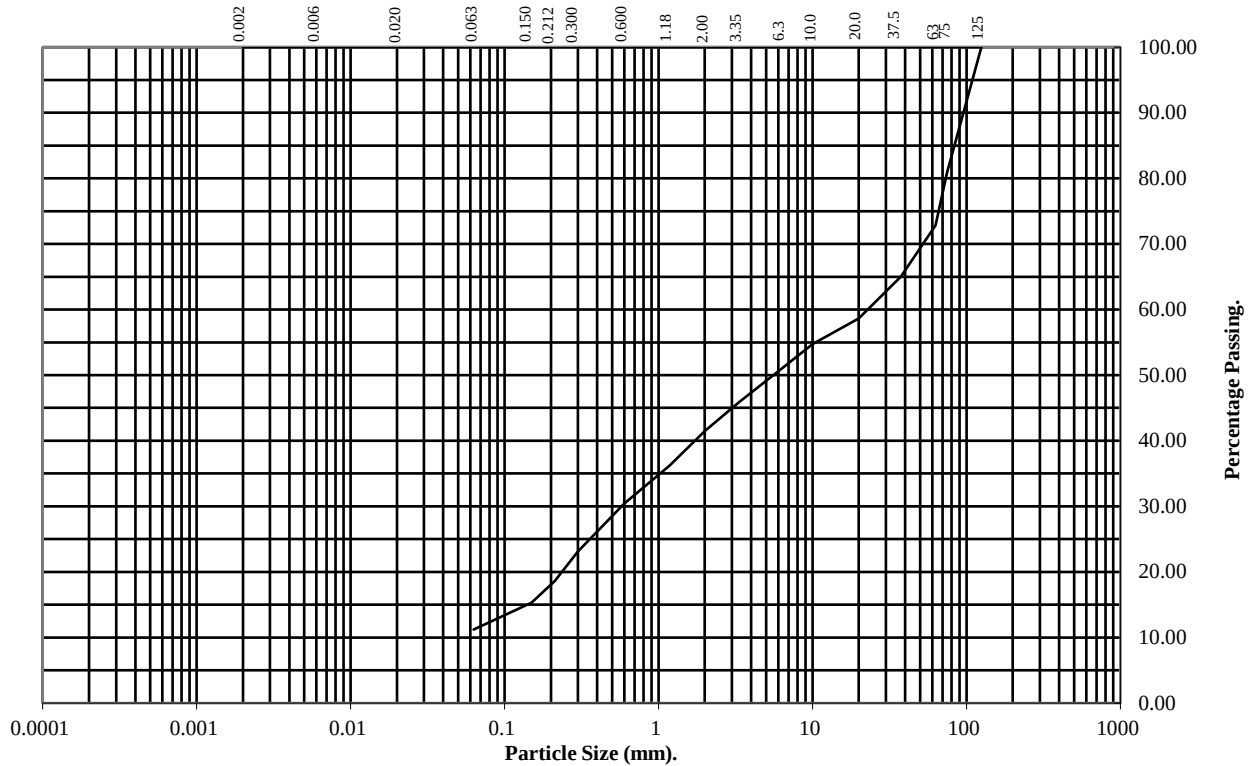
Hole Number: WS101

Top Depth (m): 0.50

Sample Number:

Base Depth(m): 1.20

Sample Type: BULK



BS Test Sieve (mm)	Percentage Passing
125	100
75	81
63	73
37.5	65
20	59
10	55
6.3	51
3.35	46
2	41
1.18	36
0.6	30
0.3	23
0.212	19
0.15	15
0.063	11

Soil Fraction	Total Percentage
Cobbles	27
Gravel	32
Sand	30
Silt/Clay	11

Remarks:

See Summary of Soil Descriptions



Buxton Street

Contract No:
PSL22/4599
Client Ref:
002156

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

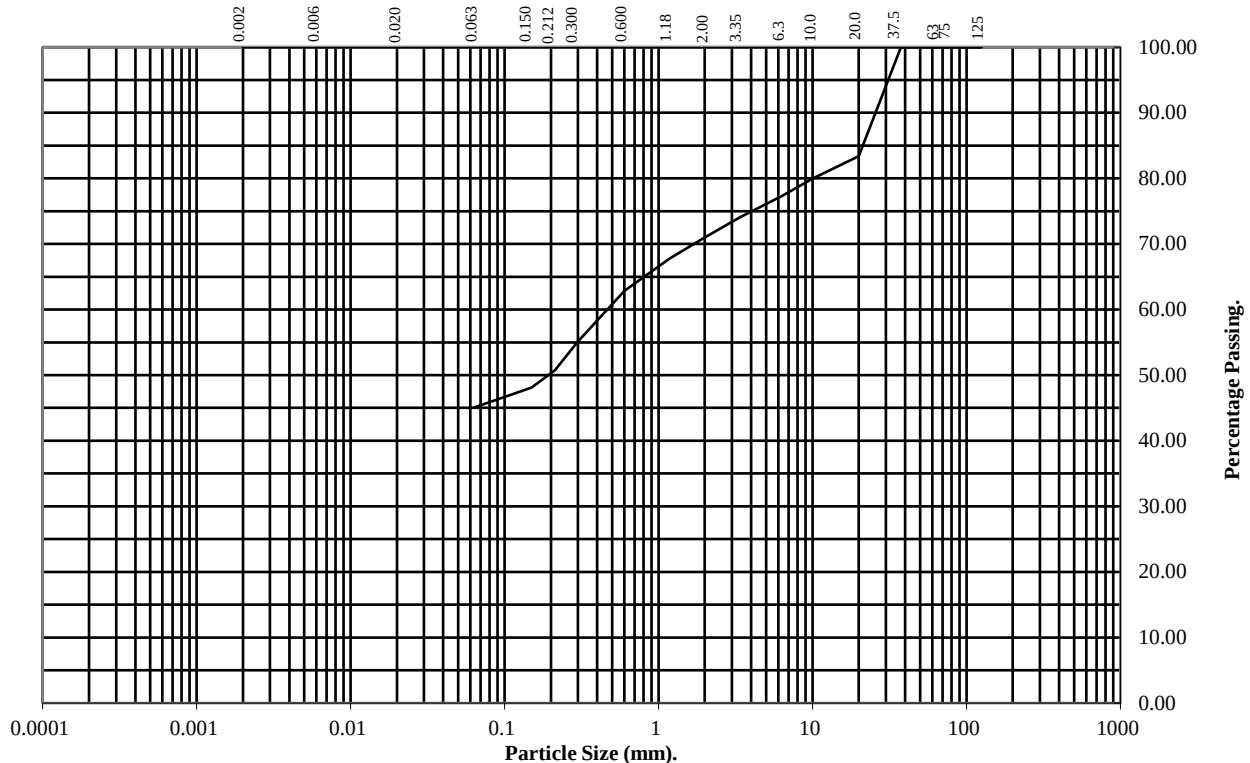
Hole Number: WS103

Top Depth (m): 0.50

Sample Number:

Base Depth(m): 2.00

Sample Type: BULK



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	83
10	80
6.3	77
3.35	74
2	71
1.18	68
0.6	63
0.3	55
0.212	51
0.15	48
0.063	45

Soil Fraction	Total Percentage
Cobbles	0
Gravel	29
Sand	26
Silt/Clay	45

Remarks:

See Summary of Soil Descriptions



Buxton Street

Contract No:
PSL22/4599
Client Ref:
002156

APPENDIX IX

HISTORICAL MAPS

Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: 1056 Scale Town Plan

Map date: 1851

Scale: 1:1,056

Printed at: 1:1,056



Surveyed 1848
Revised N/A
Edition 1851
Copyright N/A
Levelled N/A

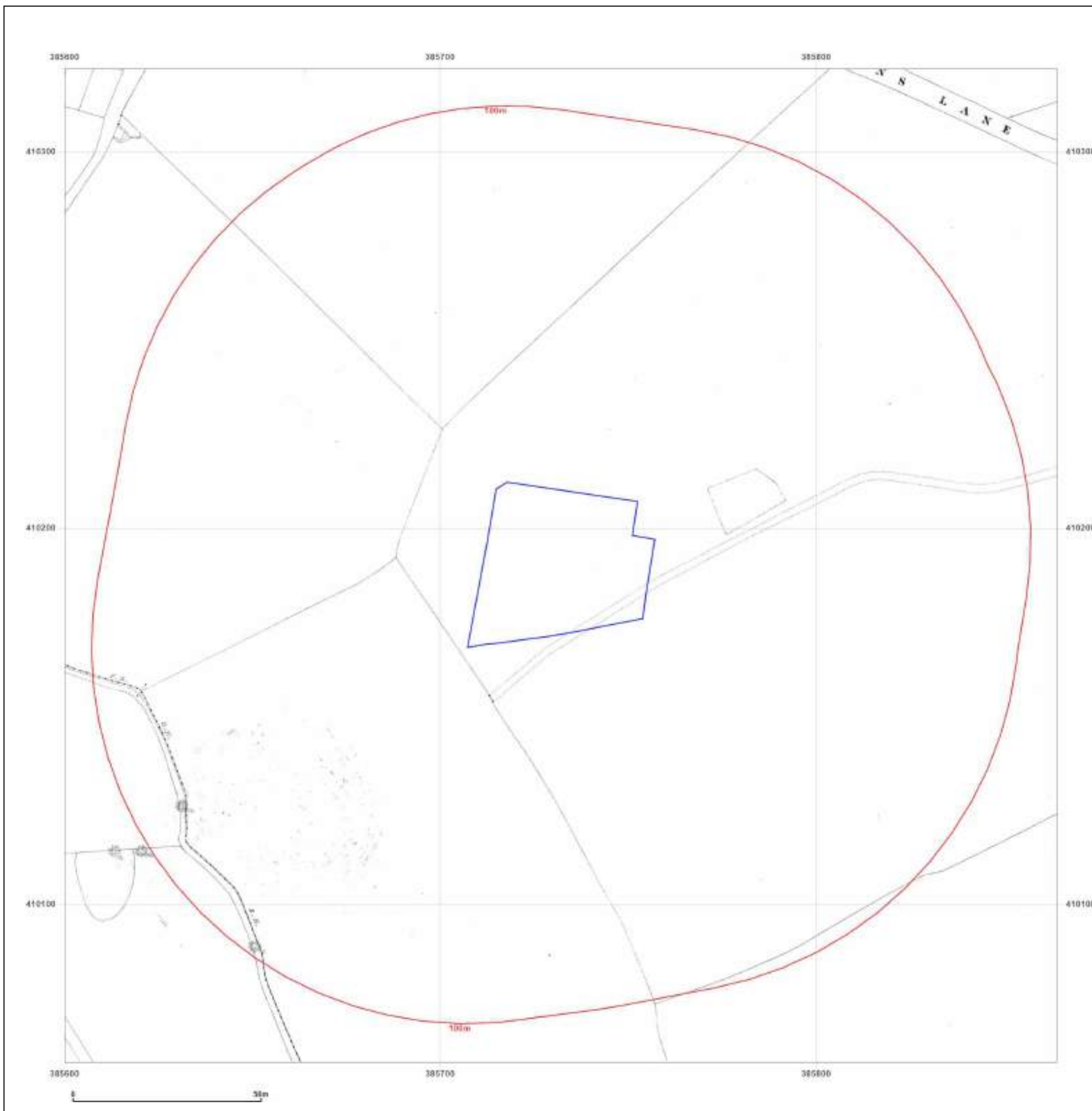


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Production date: 08 June 2022

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



Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: County Series

Map date: 1890

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1890
Revised 1890
Edition N/A
Copyright N/A
Levelled N/A

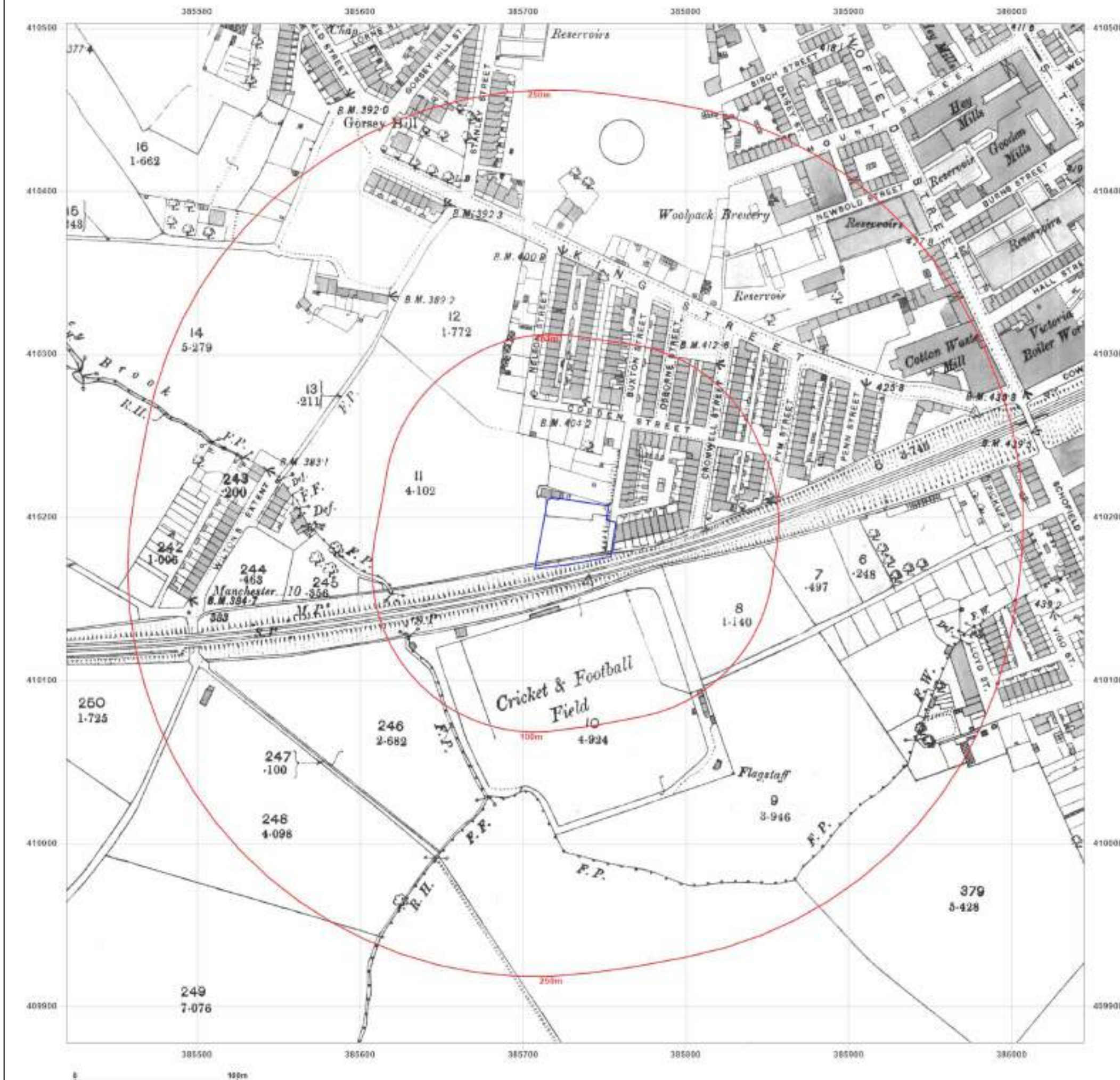


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Production date: 08 June 2022

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



Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: County Series

Map date: 1910

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1910
Revised 1910
Edition N/A
Copyright N/A
Levelled N/A

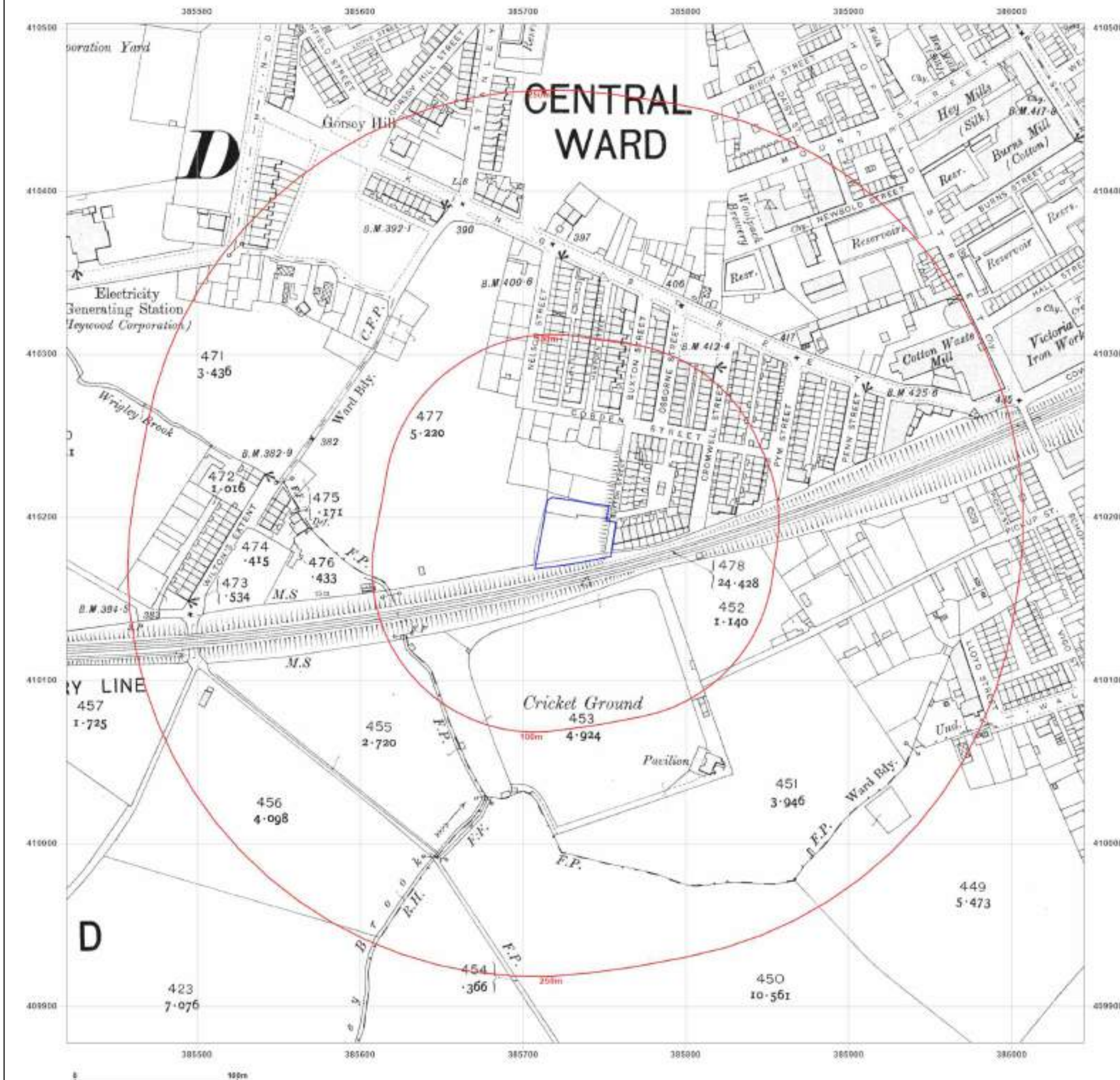


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Production date: 08 June 2022

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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: County Series

Map date: 1929

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1929
Revised 1929
Edition N/A
Copyright N/A
Levelled N/A

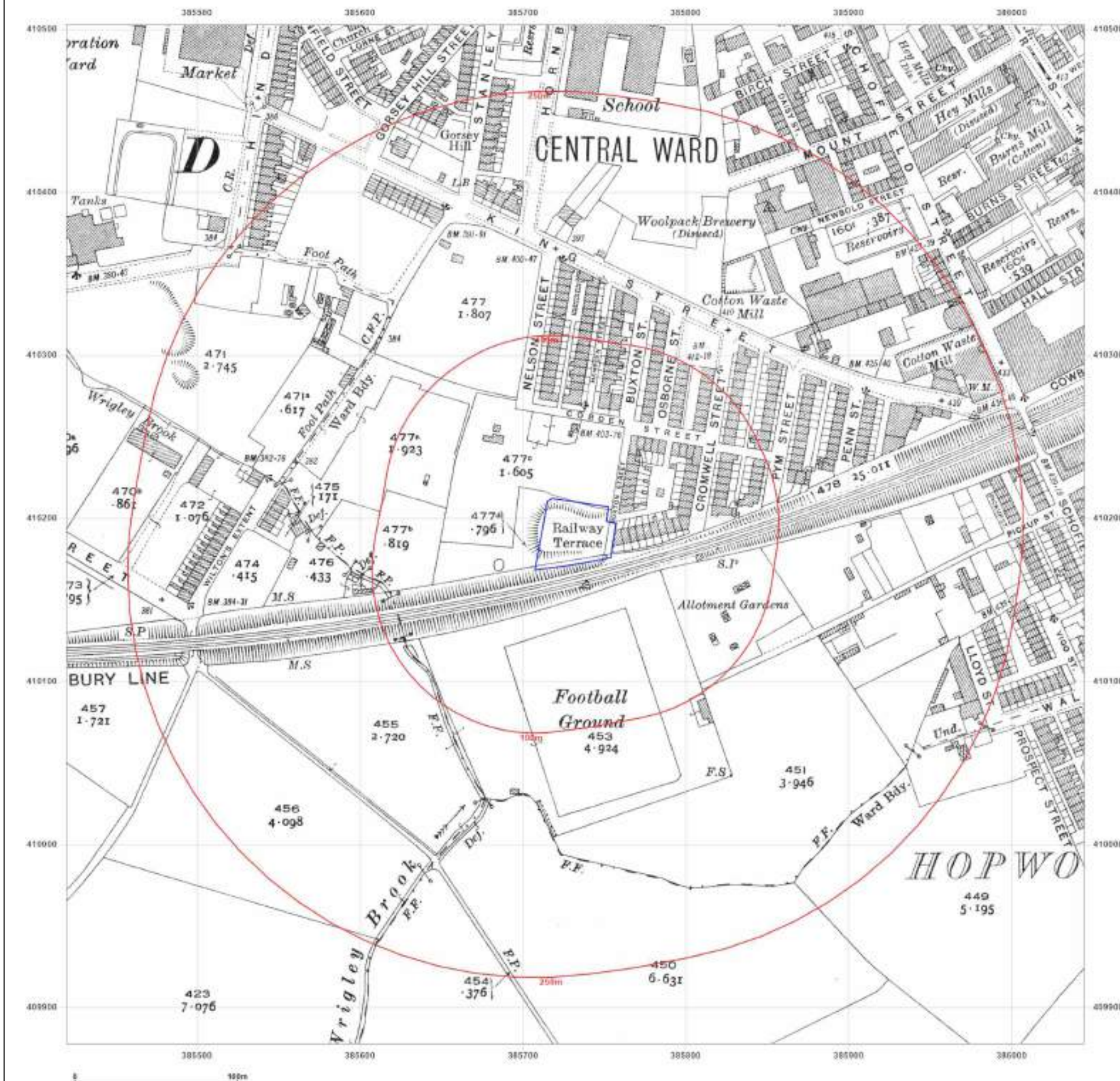


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Production date: 08 June 2022

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



Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: County Series

Map date: 1937

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1937
Revised 1937
Edition N/A
Copyright N/A
Levelled N/A

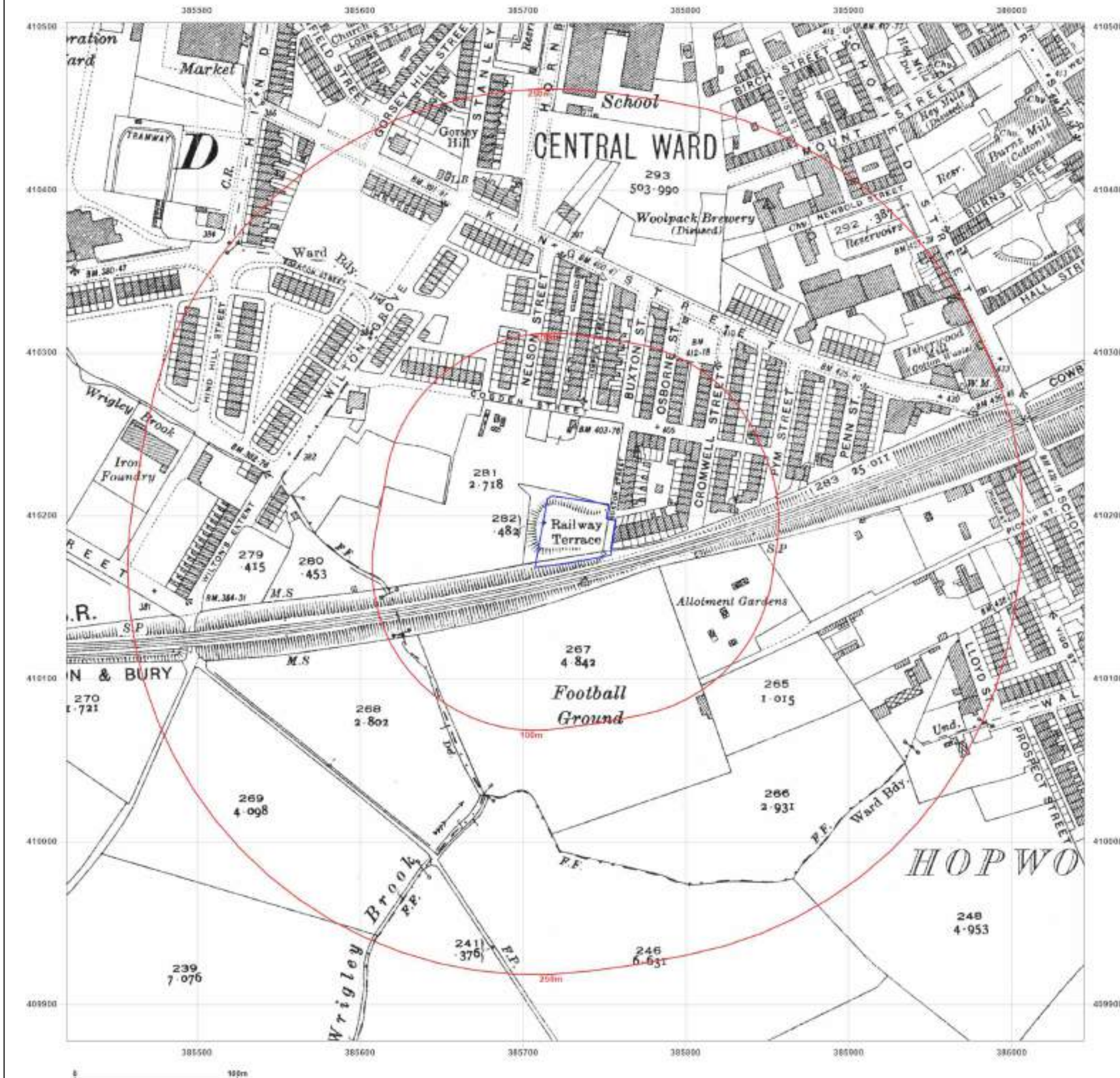


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Production date: 08 June 2022

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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: National Grid

Map date: 1956

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1956
Revised 1956
Edition N/A
Copyright N/A
Levelled 1928

Surveyed 1956
Revised 1956
Edition N/A
Copyright N/A
Levelled 1928

Surveyed 1956
Revised N/A
Edition 1956
Copyright N/A
Levelled 1928

Surveyed 1958
Revised 1956
Edition N/A
Copyright N/A
Levelled N/A

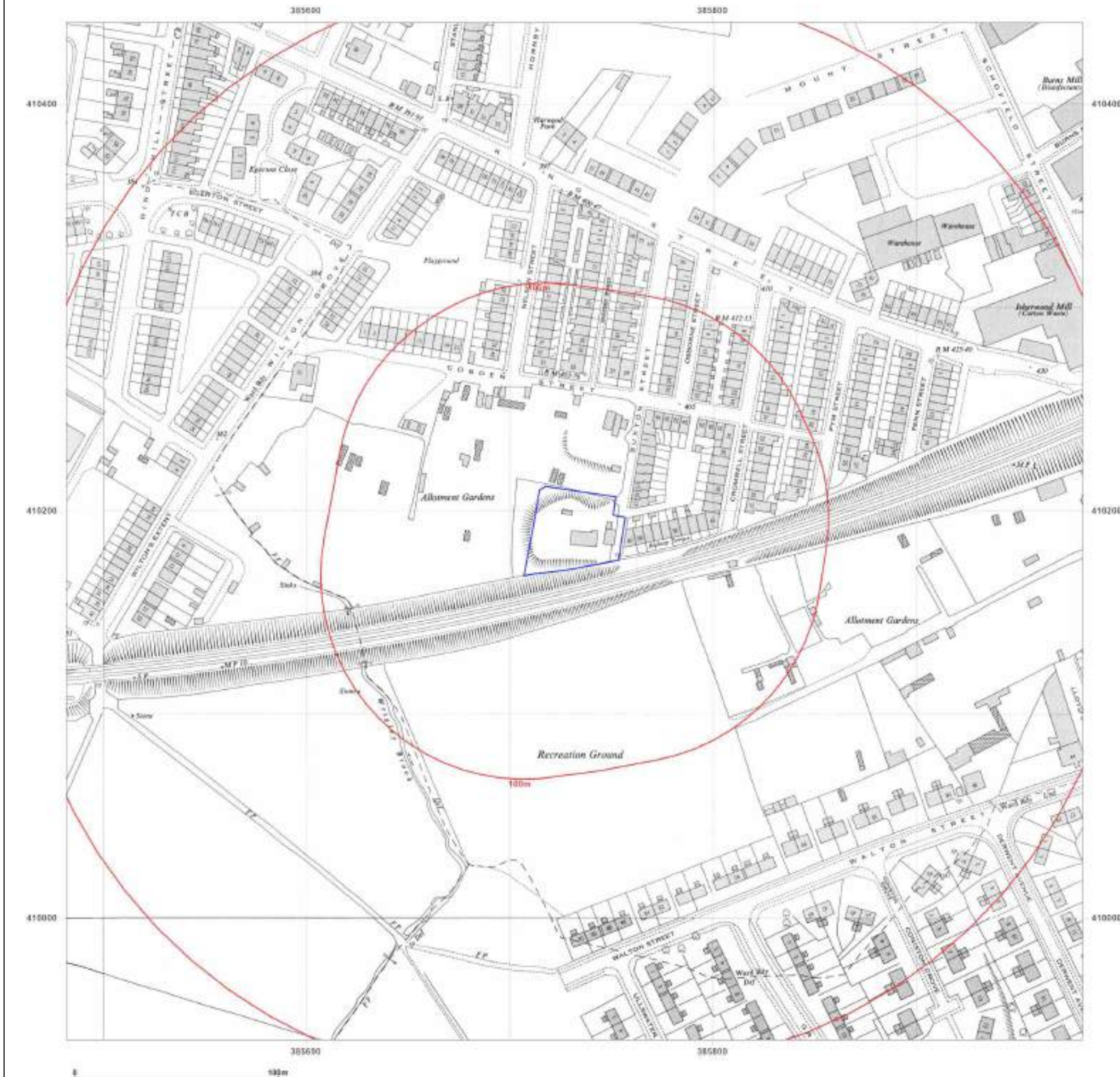


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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: National Grid

Map date: 1957-1958

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1958
Revised 1956
Edition 1957
Copyright N/A
Levelled 1928

Surveyed 1958
Revised 1956
Edition 1958
Copyright N/A
Levelled 1928

Surveyed 1958
Revised 1956
Edition 1957
Copyright N/A
Levelled 1928

Surveyed 1958
Revised 1956
Edition 1957
Copyright N/A
Levelled 1928

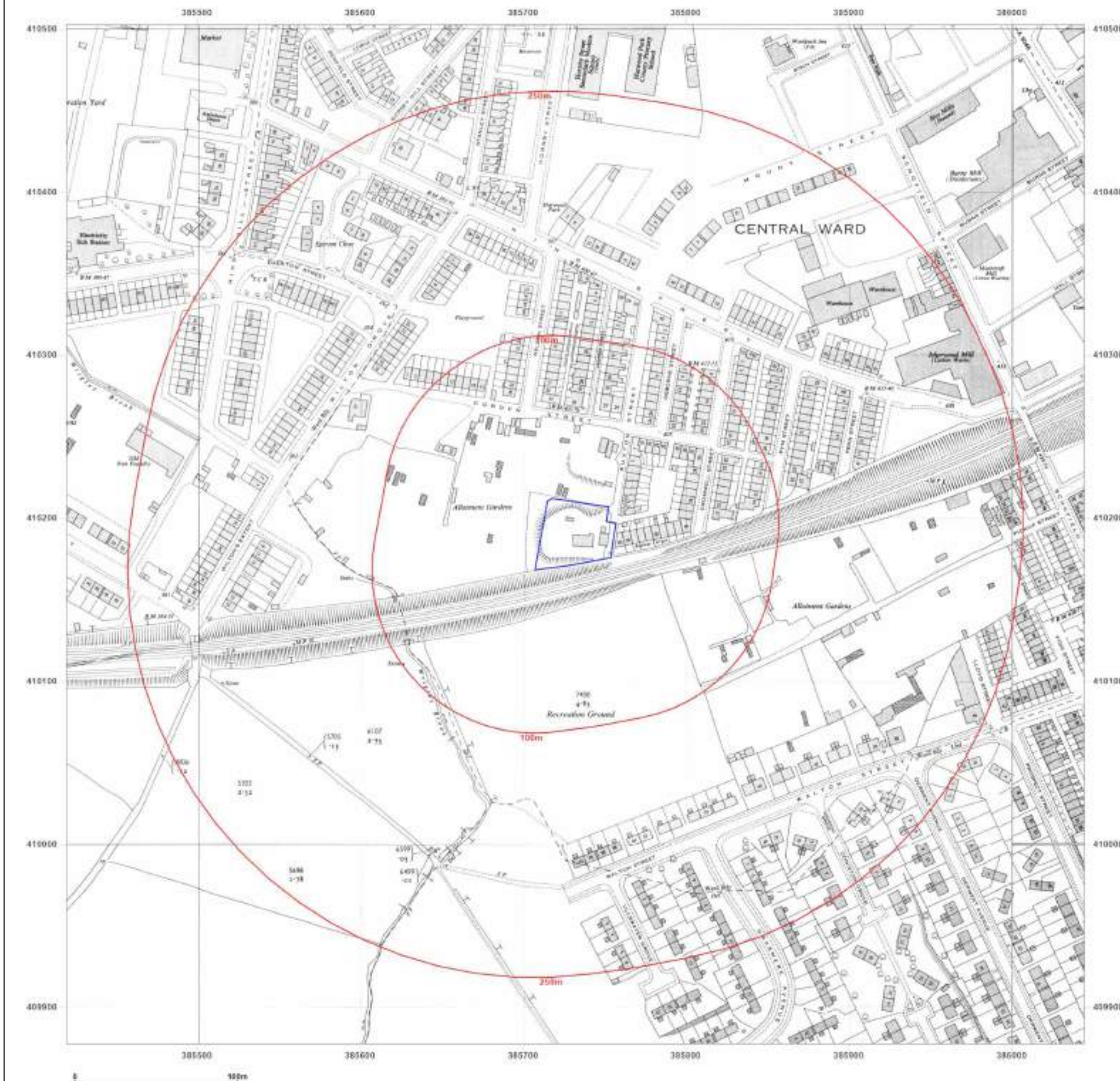


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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: National Grid

Map date: 1965

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1956
Revised 1964
Edition N/A
Copyright 1965
Levelled 1962

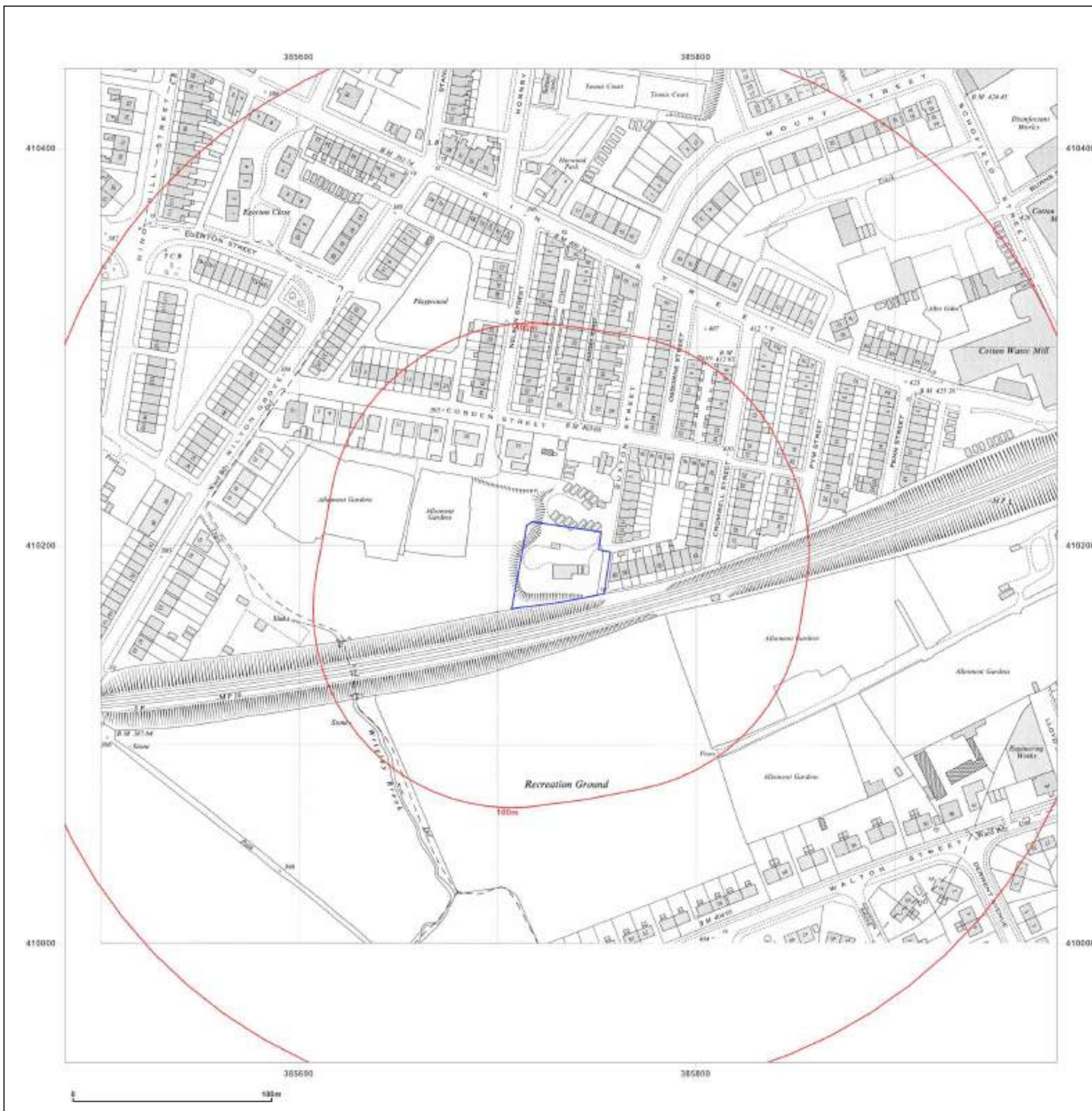


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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: National Grid

Map date: 1969-1970

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1967
Revised 1967
Edition N/A
Copyright 1969
Levelled 1962

Surveyed 1968
Revised 1968
Edition N/A
Copyright 1970
Levelled 1956

Surveyed 1968
Revised 1968
Edition N/A
Copyright 1969
Levelled 1962

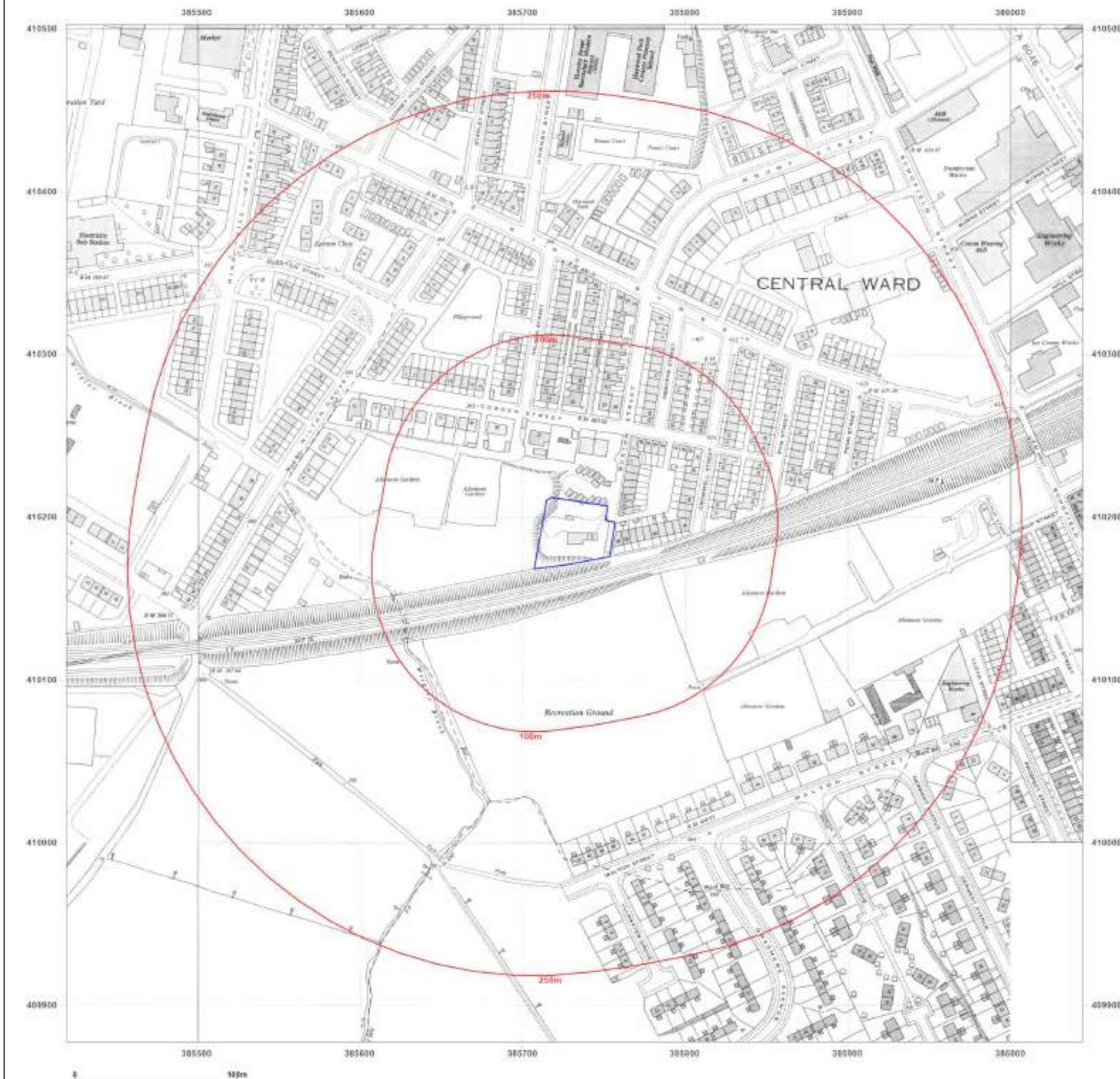


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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: National Grid

Map date: 1971-1975

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1956
Revised 1970
Edition N/A
Copyright 1971
Levelled 1962

Surveyed 1956
Revised 1973
Edition N/A
Copyright 1974
Levelled 1962

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1975
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1974
Levelled N/A

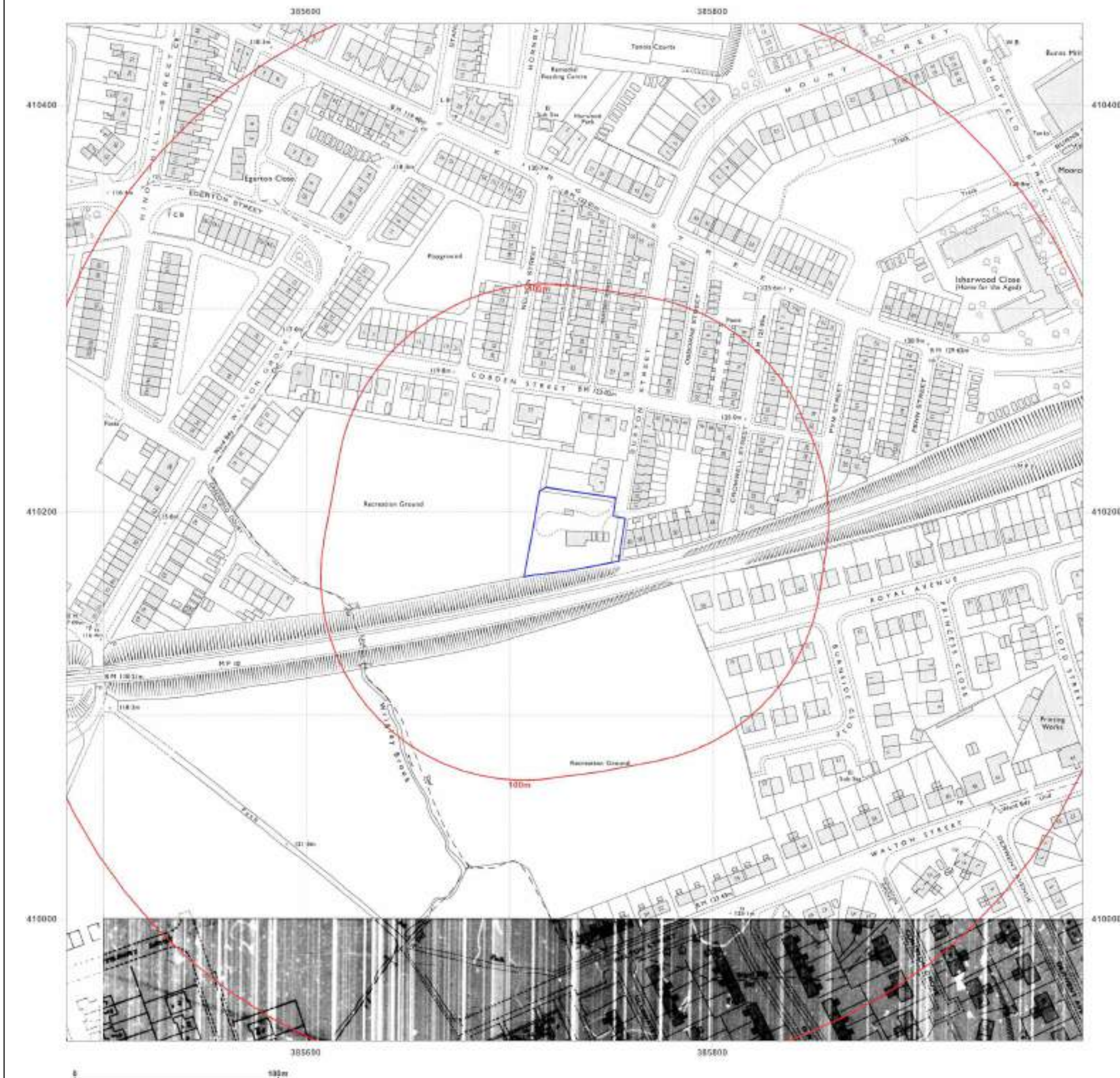


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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: National Grid

Map date: 1977-1978

Scale: 1:1,250

Printed at: 1:2,000



Surveyed N/A
Revised N/A
Edition N/A
Copyright 1978
Levelled 1962

Surveyed 1958
Revised 1976
Edition N/A
Copyright 1977
Levelled 1962

Surveyed 1958
Revised 1977
Edition N/A
Copyright 1978
Levelled 1962

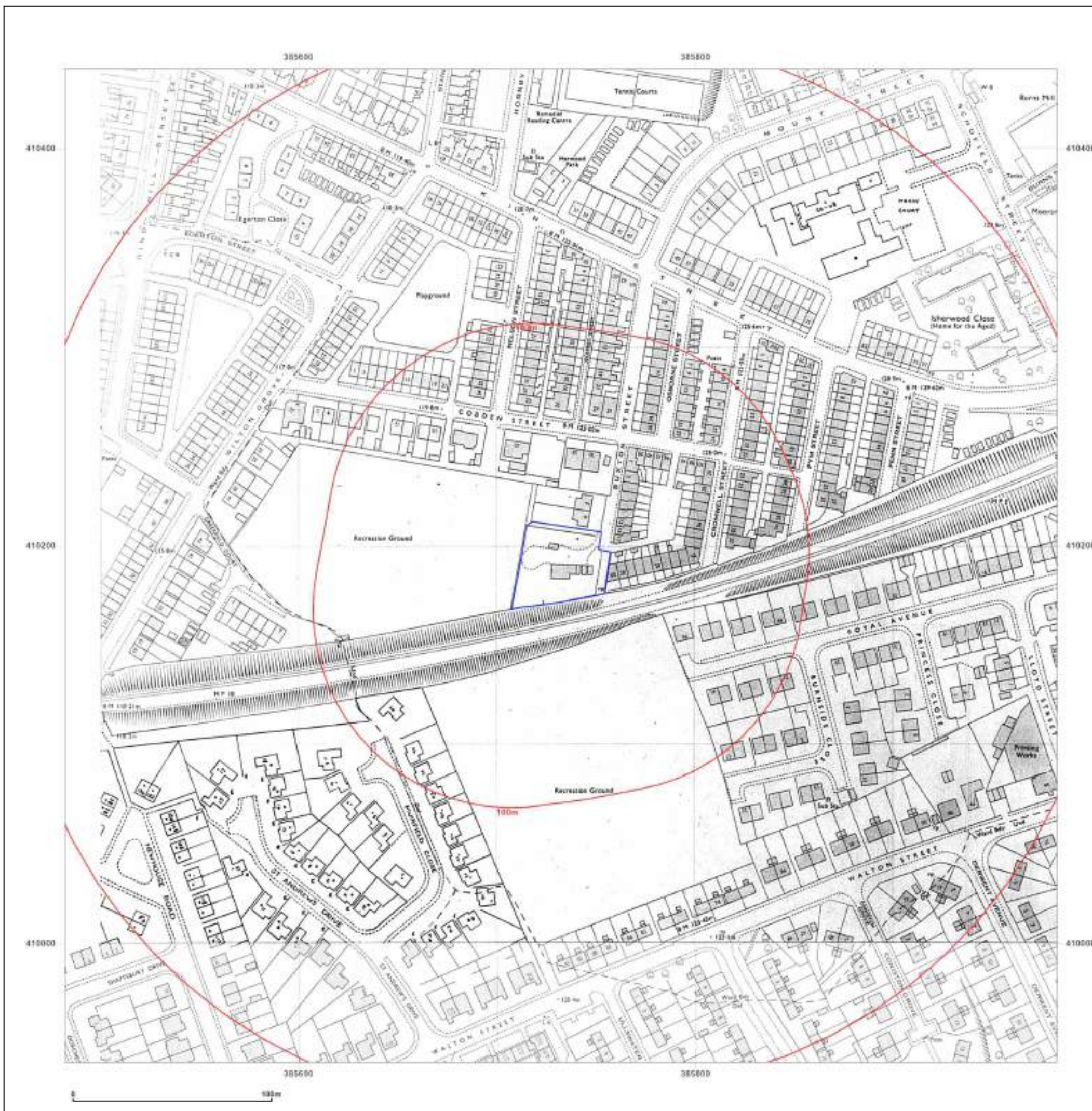


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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: National Grid

Map date: 1988-1992

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1962
Revised 1988
Edition N/A
Copyright 1988
Levelled 1962

Surveyed 1956
Revised 1989
Edition N/A
Copyright 1990
Levelled N/A

Surveyed 1992
Revised N/A
Edition N/A
Copyright 1992
Levelled N/A

Surveyed 1990
Revised 1990
Edition N/A
Copyright 1990
Levelled N/A

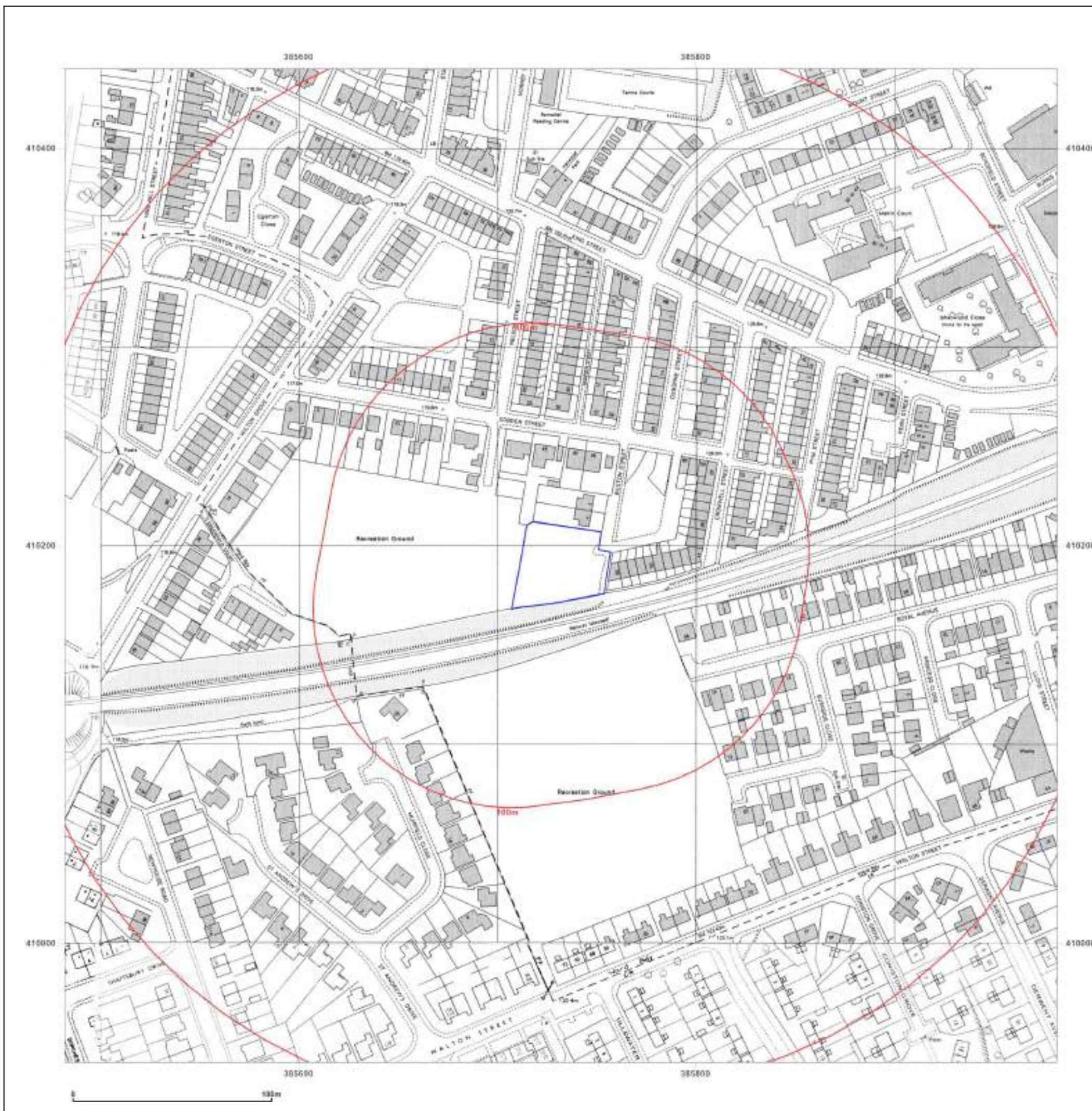


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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: National Grid

Map date: 1988-1992

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1962
Revised 1988
Edition N/A
Copyright 1988
Levelled 1962

Surveyed 1992
Revised N/A
Edition N/A
Copyright 1992
Levelled N/A

Surveyed 1992
Revised N/A
Edition N/A
Copyright 1992
Levelled N/A

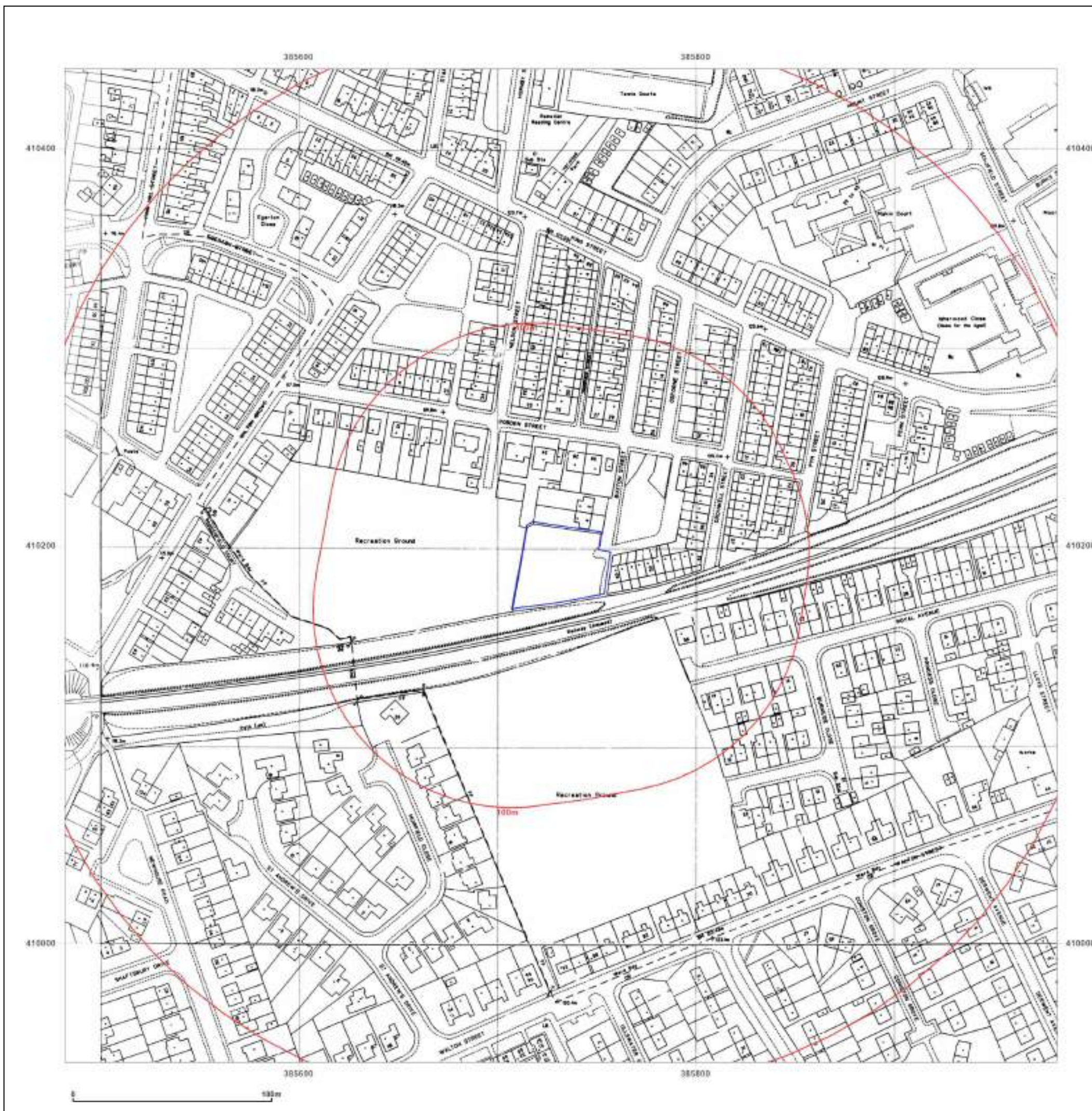


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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: LandLine

Map date: 2003

Scale: 1:1,250

Printed at: 1:1,250



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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: County Series

Map date: 1851

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1847
Revised N/A
Edition 1851
Copyright N/A
Levelled N/A

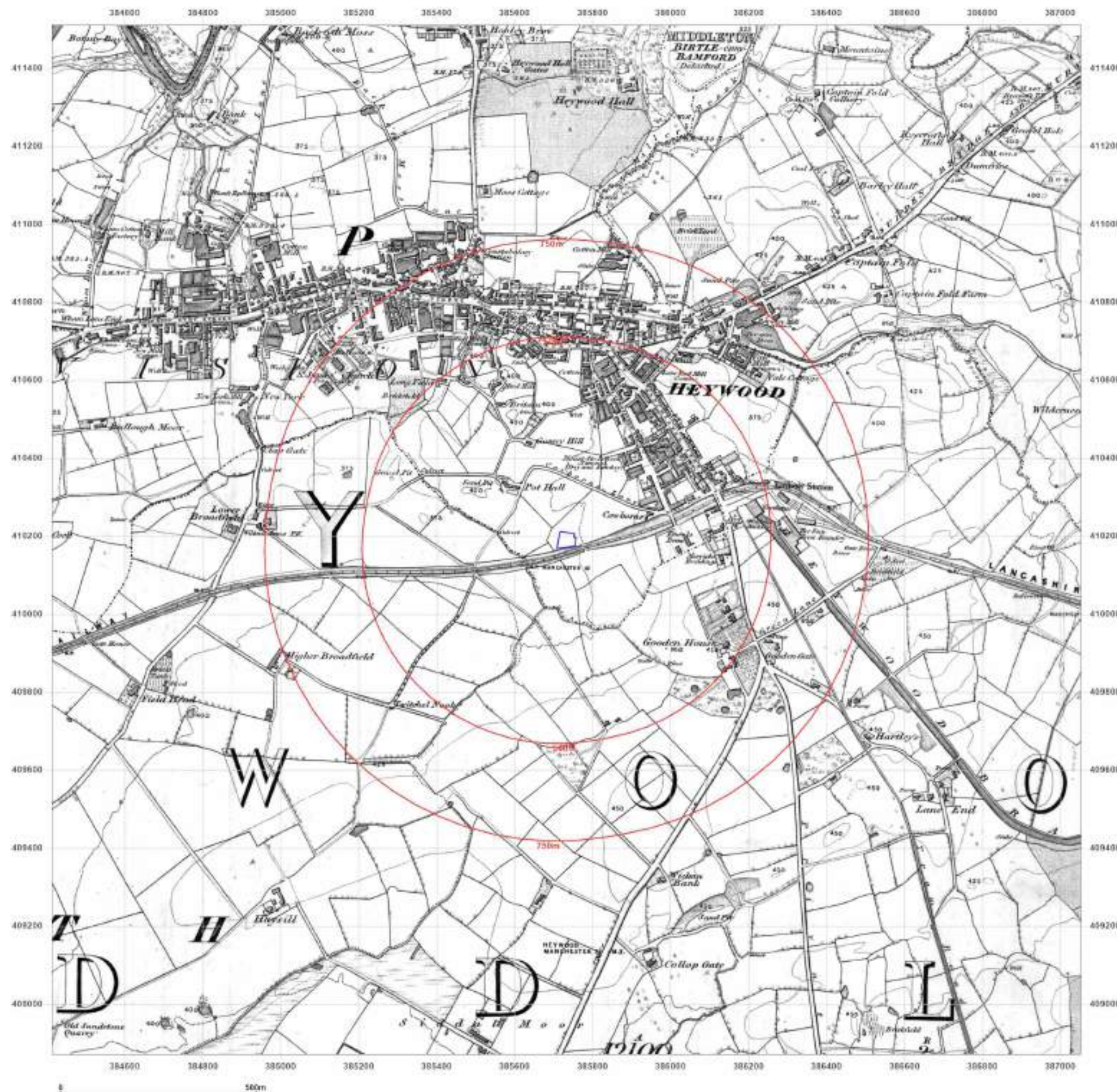


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Production date: 08 June 2022

Map legend available at:
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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: County Series

Map date: 1890-1891

Scale: 1:10,560

Printed at: 1:10,560



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

Surveyed 1890
Revised 1890
Edition N/A
Copyright N/A
Levelled N/A

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

Surveyed 1890
Revised 1890
Edition N/A
Copyright N/A
Levelled N/A

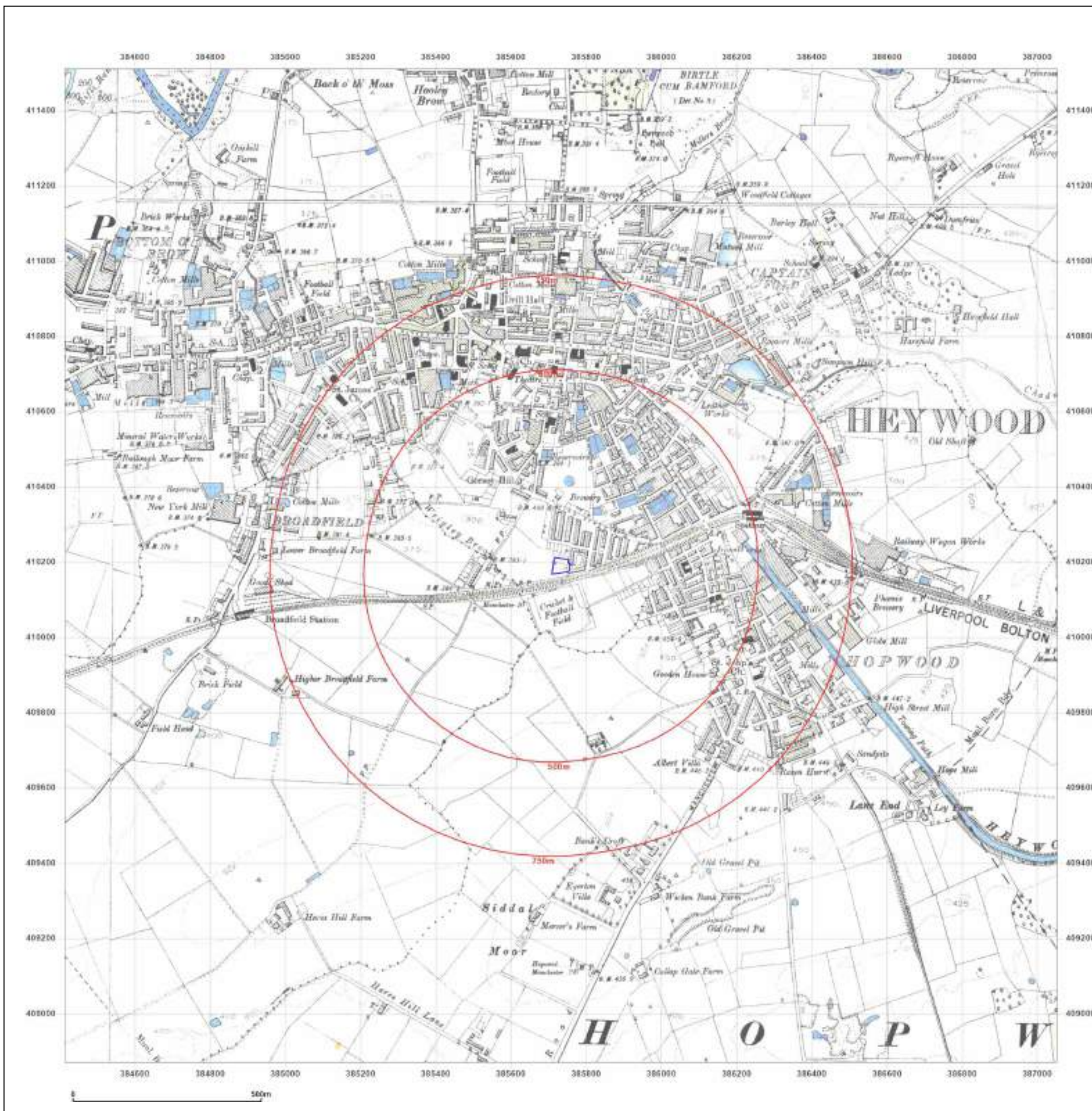


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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: County Series

Map date: 1908-1909

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1848
Revised 1908
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1844
Revised 1908
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1848
Revised 1909
Edition N/A
Copyright N/A
Levelled N/A

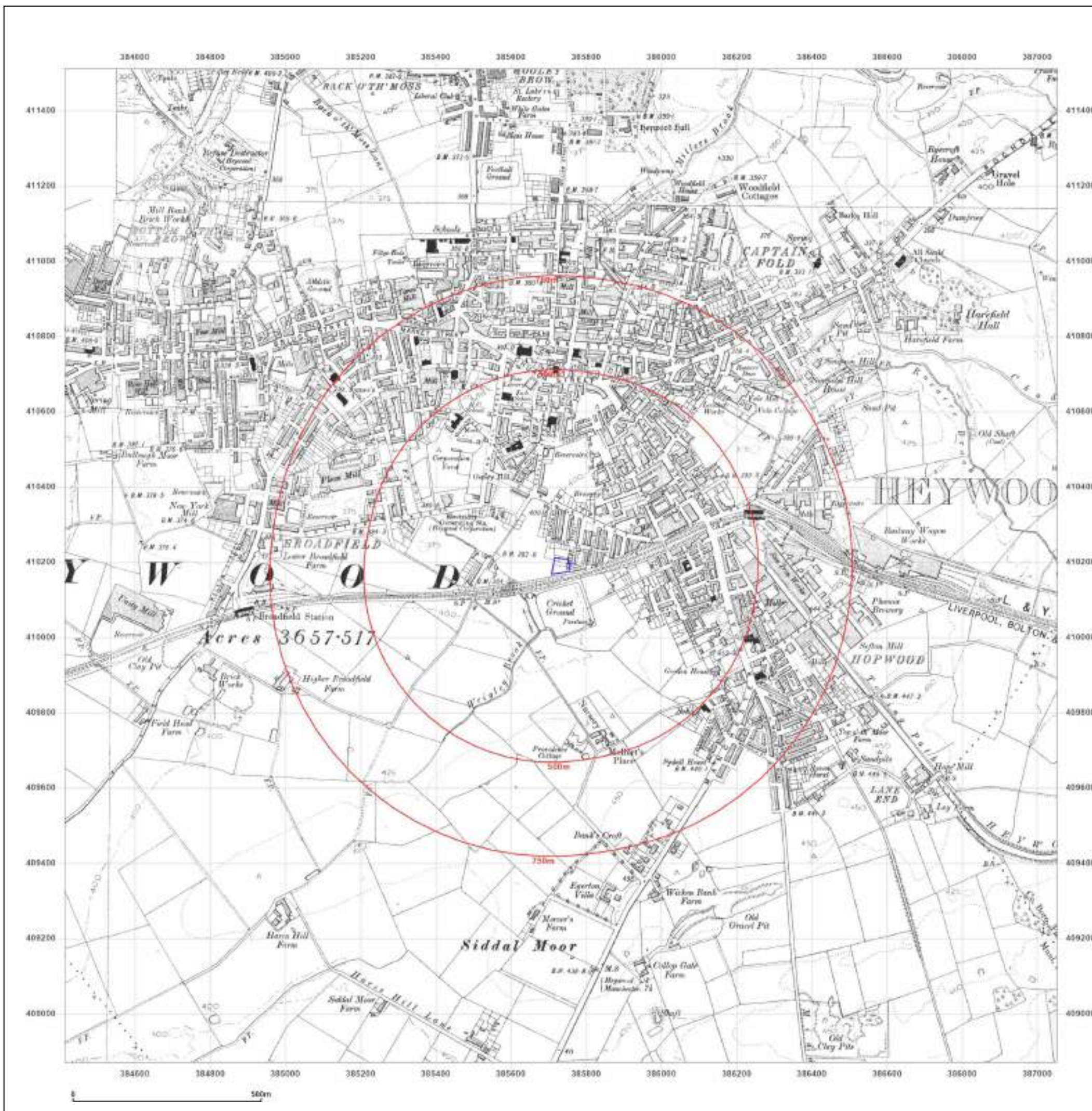


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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: County Series

Map date: 1928

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1848
Revised 1928
Edition N/A
Copyright N/A
Levelled N/A

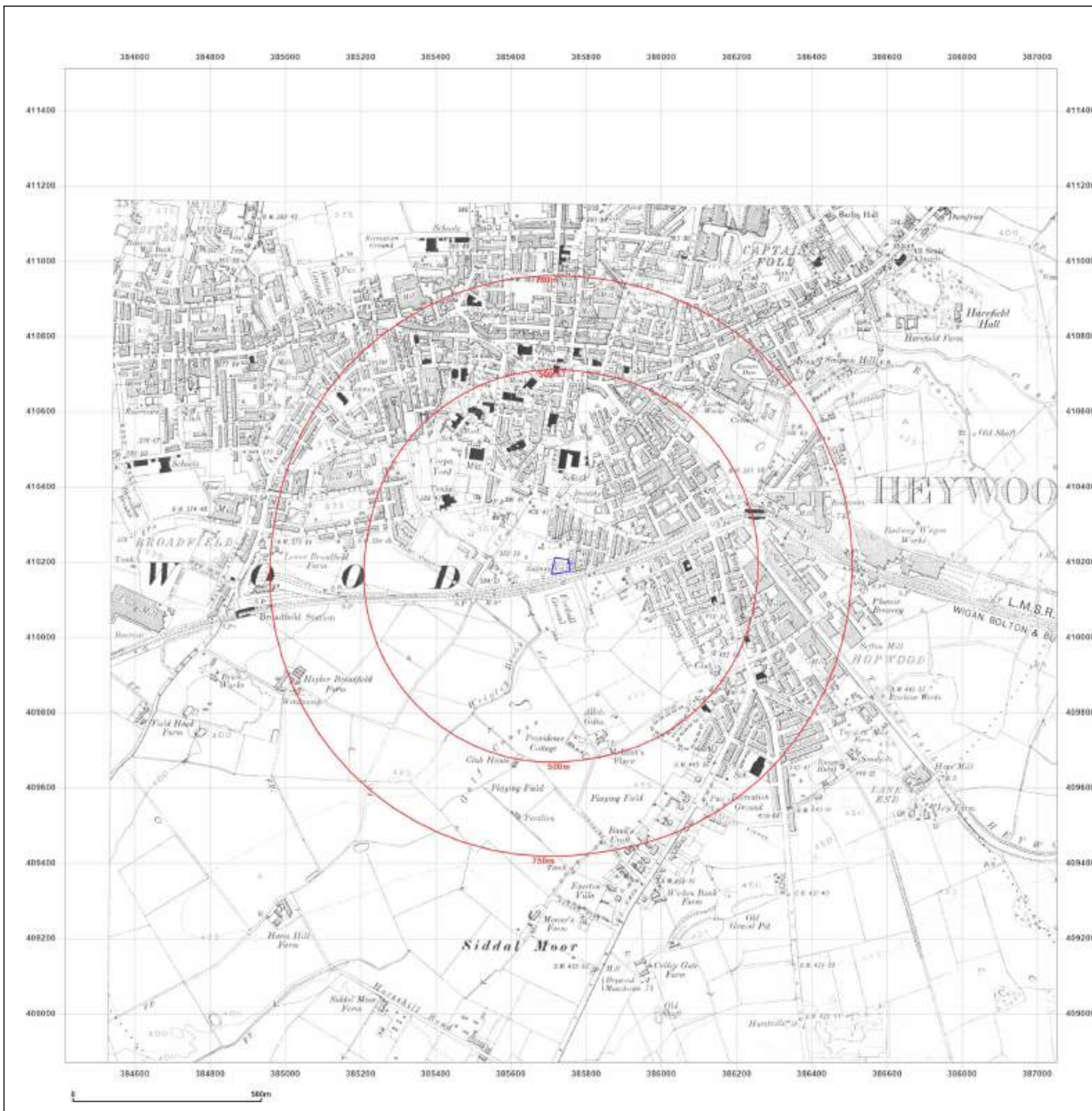


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Site Details:

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HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: County Series

Map date: 1938

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1848
Revised 1938
Edition N/A
Copyright N/A
Levelled N/A

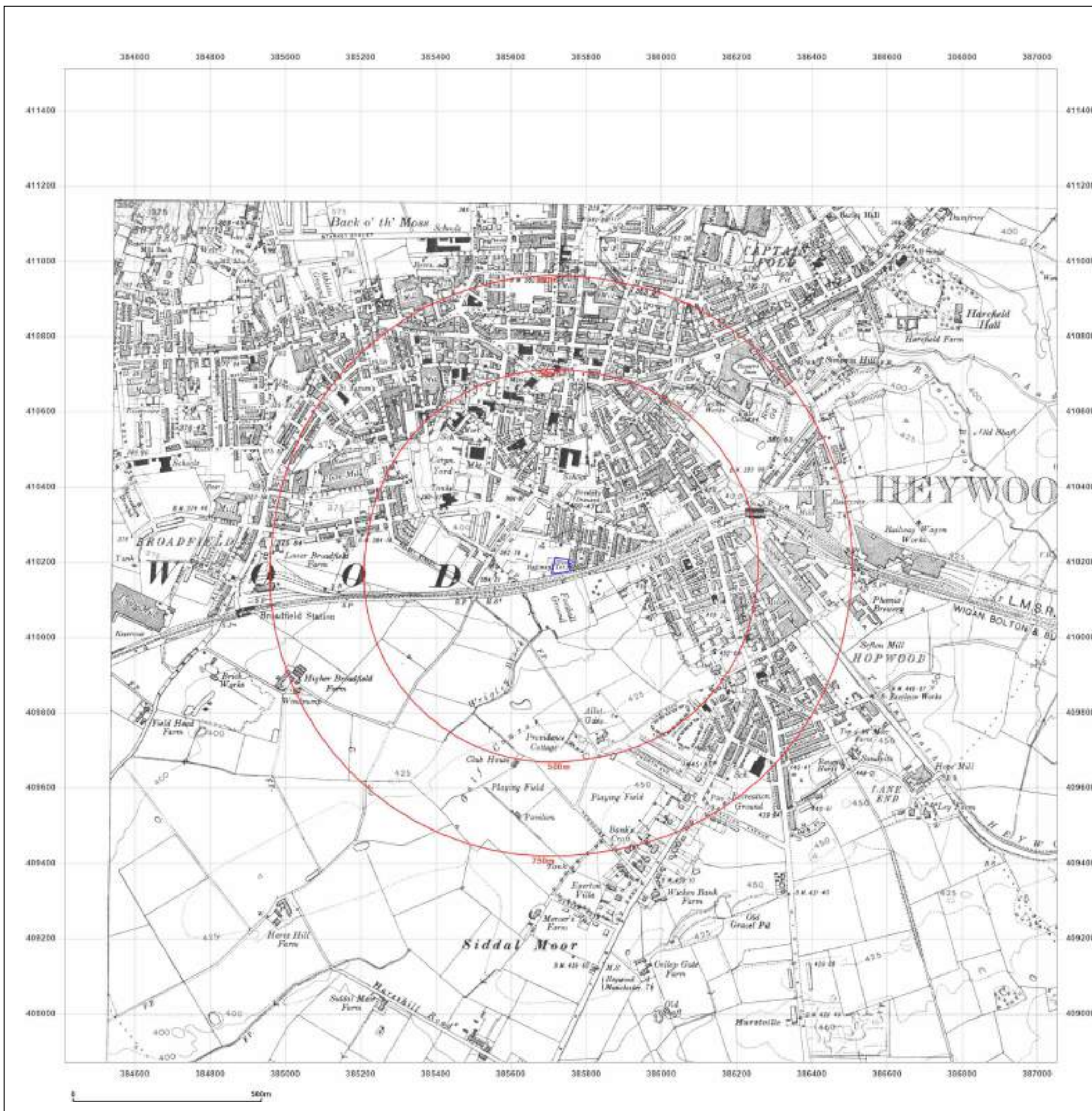


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Site Details:

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HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: Provisional

Map date: 1955-1956

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1949
Revised 1949
Edition N/A
Copyright 1956
Levelled N/A

Surveyed N/A
Revised 1955
Edition 1956
Copyright N/A
Levelled N/A

Surveyed 1949
Revised 1955
Edition 1955
Copyright N/A
Levelled N/A

Surveyed N/A
Revised 1955
Edition N/A
Copyright N/A
Levelled N/A

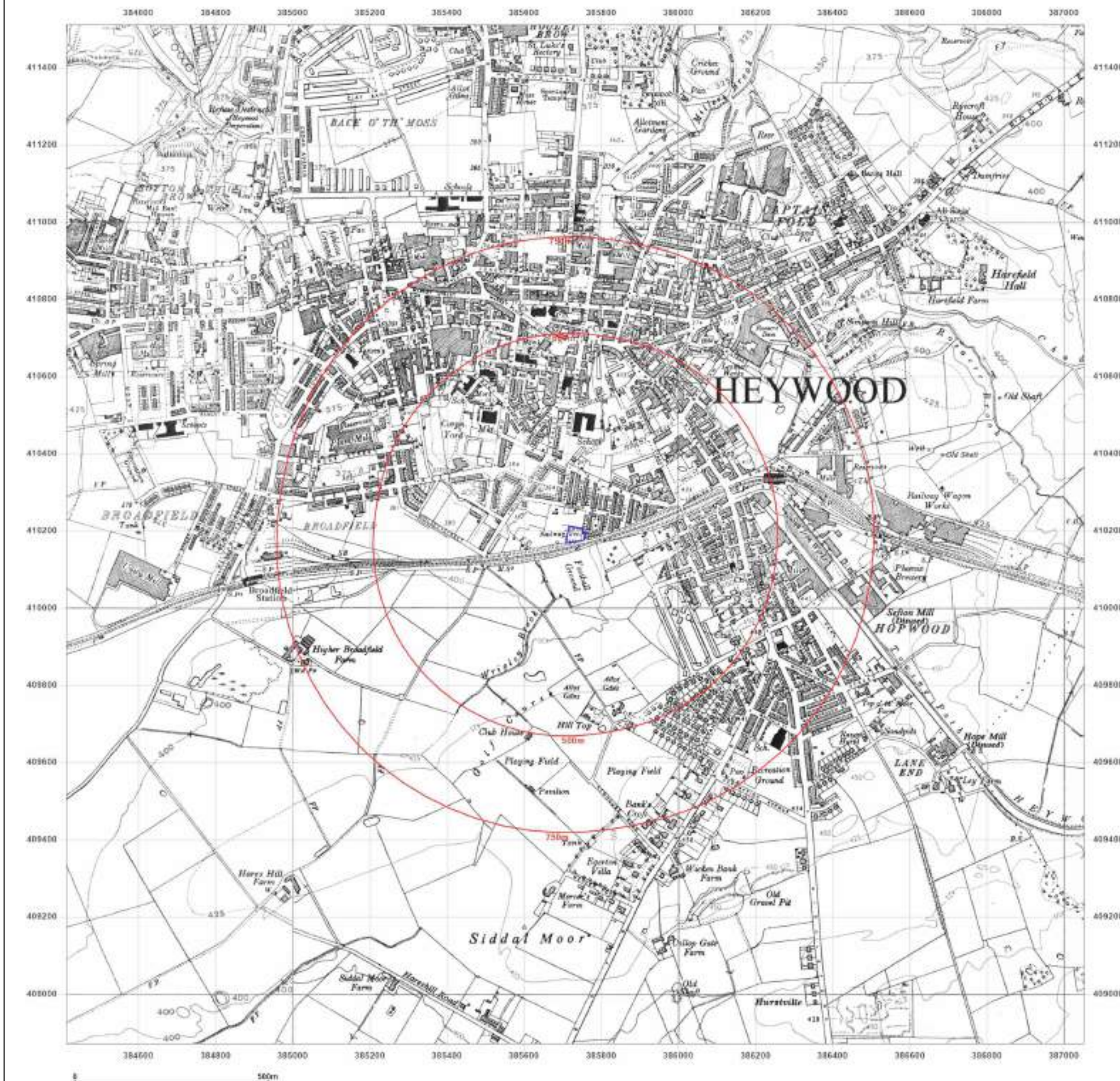


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Production date: 08 June 2022

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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: Provisional

Map date: 1965-1968

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1967
Revised 1967
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1968
Revised 1968
Edition N/A
Copyright N/A
Levelled N/A

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

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

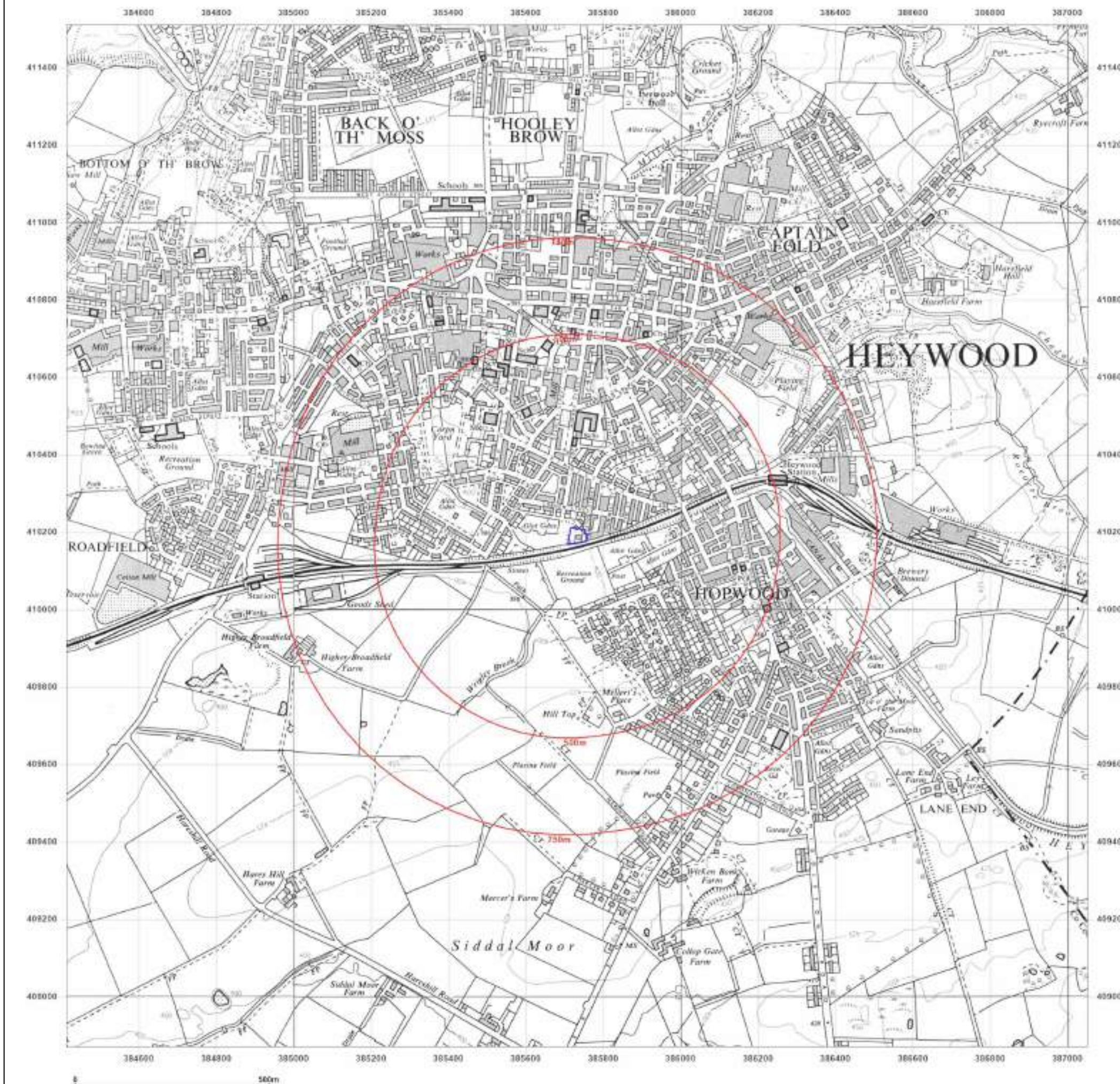


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Site Details:

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HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: National Grid

Map date: 1974-1975

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1974
Revised 1975
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1974
Revised 1974
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1974
Revised 1975
Edition N/A
Copyright N/A
Levelled N/A

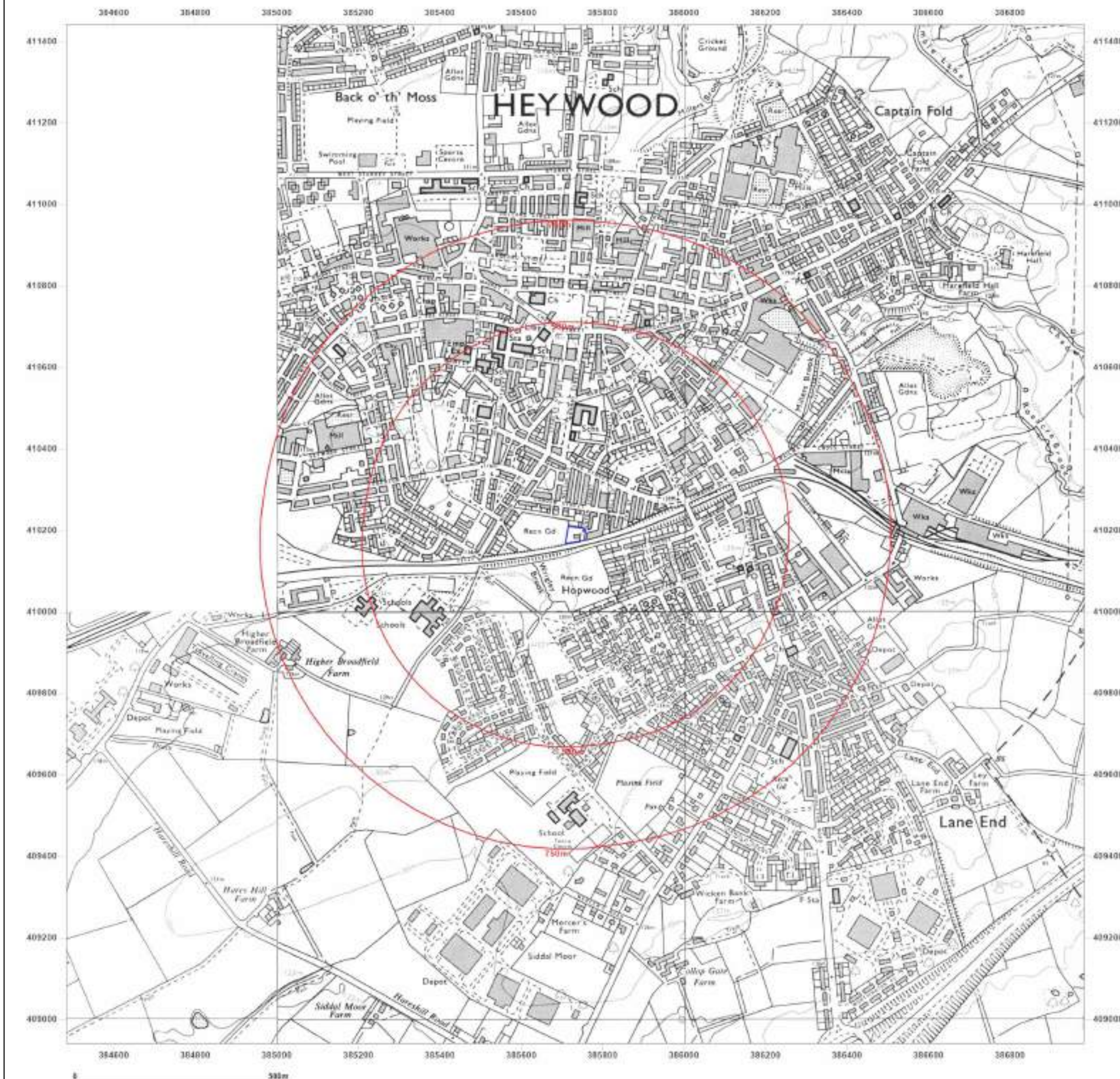


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Site Details:

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HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: National Grid

Map date: 1981-1983

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1977
Revised 1983
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1980
Revised 1981
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1980
Revised 1982
Edition N/A
Copyright N/A
Levelled N/A

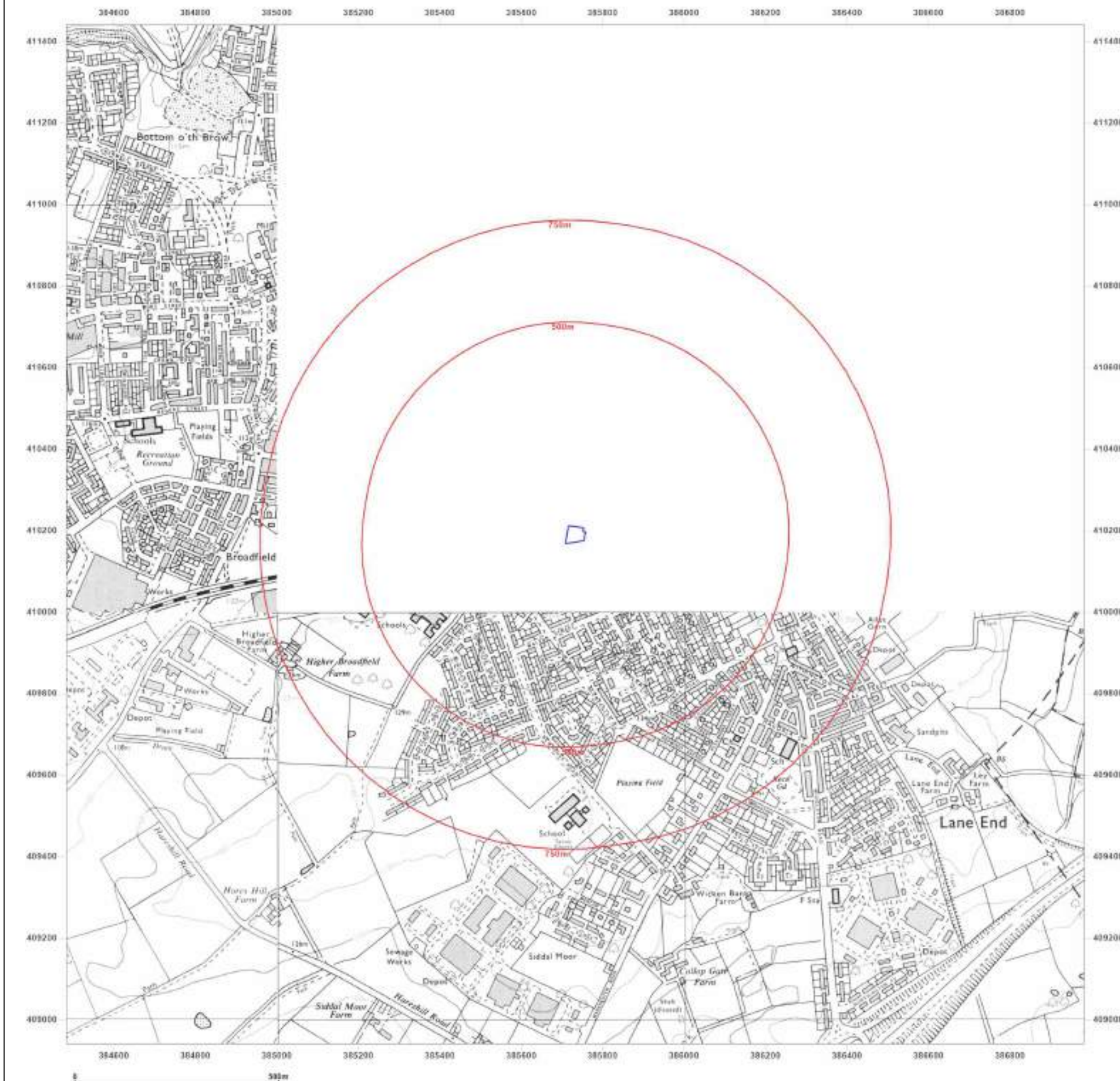


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Site Details:

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HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: National Grid

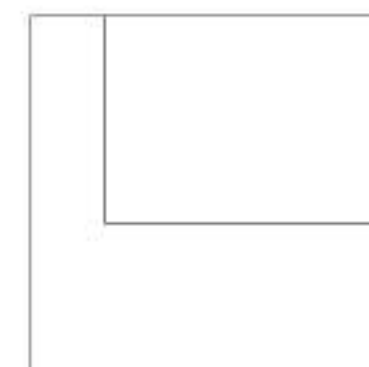
Map date: 1987

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1984
Revised 1987
Edition N/A
Copyright N/A
Levelled N/A

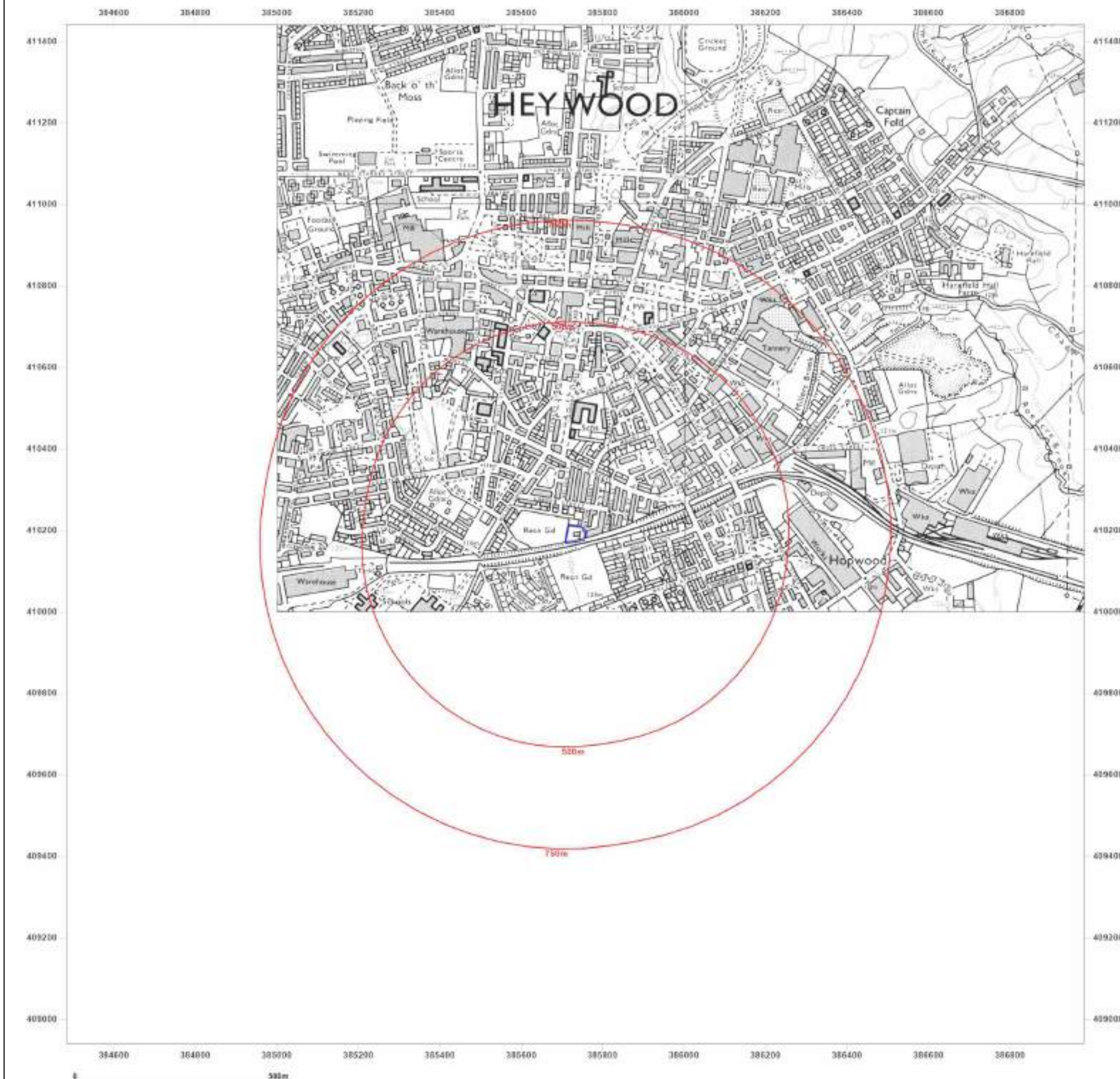


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Production date: 08 June 2022

Map legend available at:
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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: National Grid

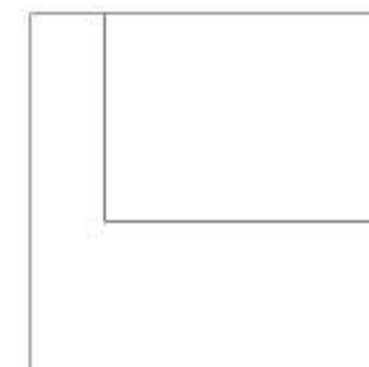
Map date: 1992

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1984
Revised 1992
Edition N/A
Copyright N/A
Levelled N/A

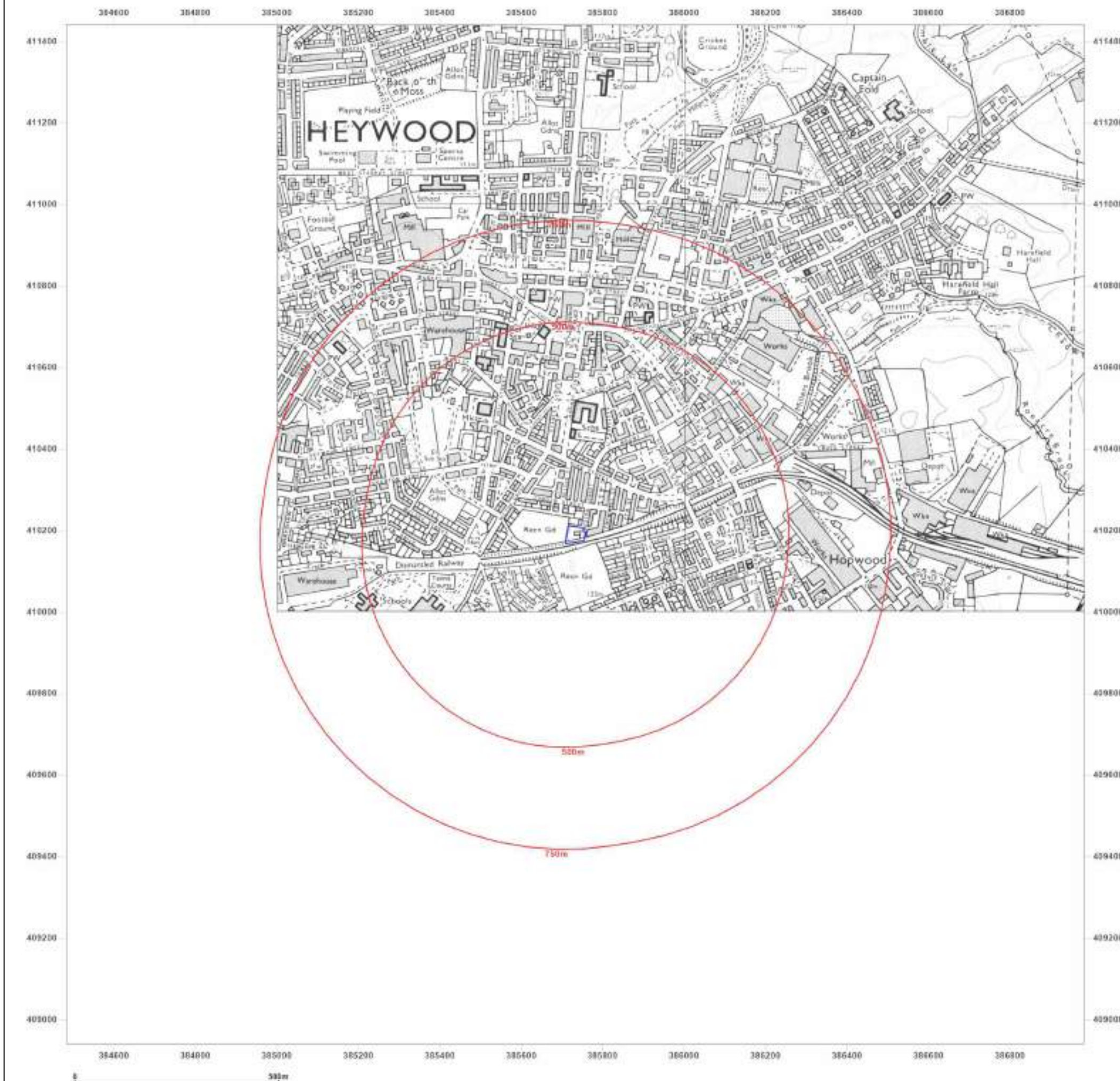


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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: National Grid

Map date: 2001

Scale: 1:10,000

Printed at: 1:10,000

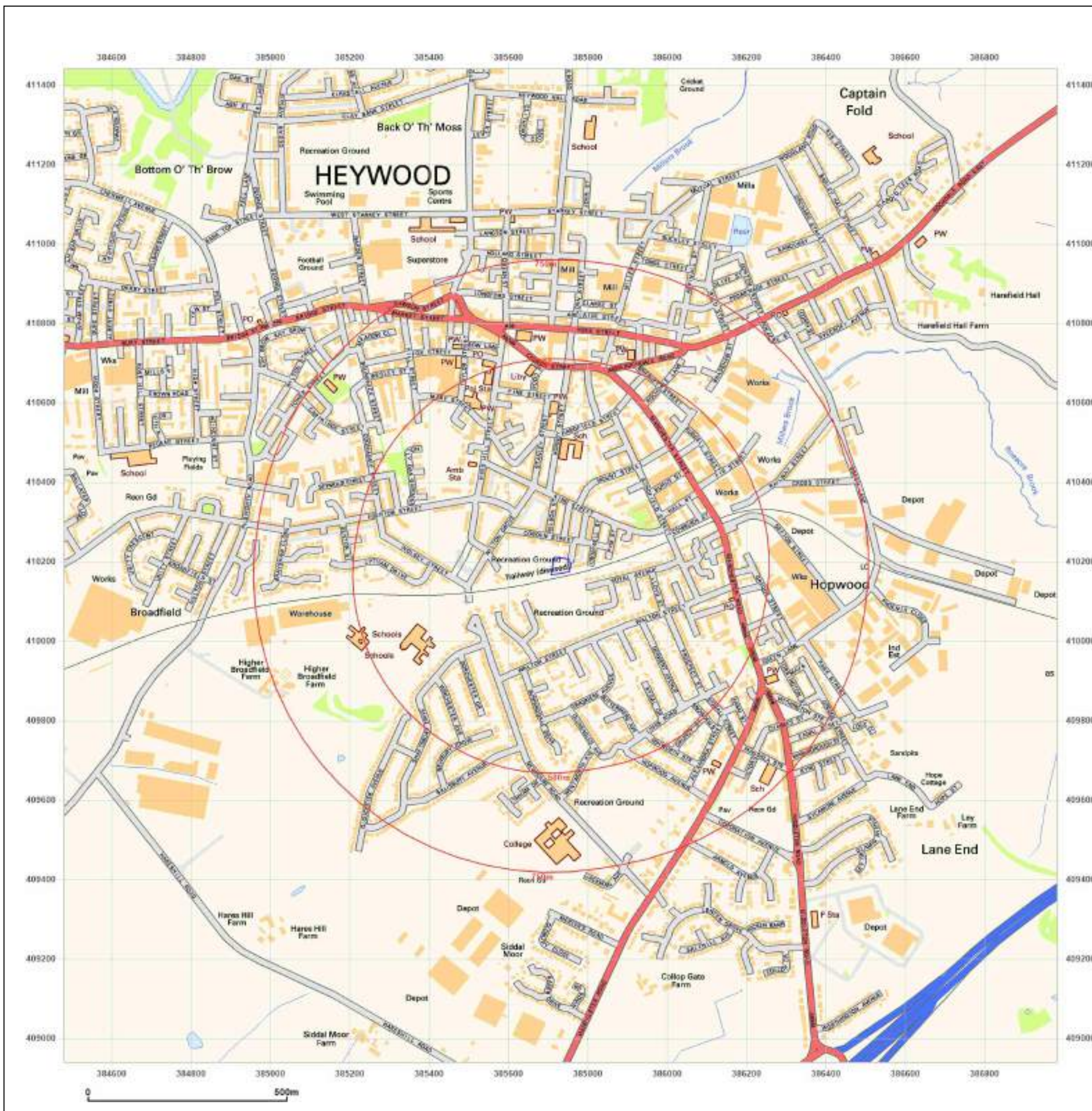


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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: National Grid

Map date: 2010

Scale: 1:10,000

Printed at: 1:10,000

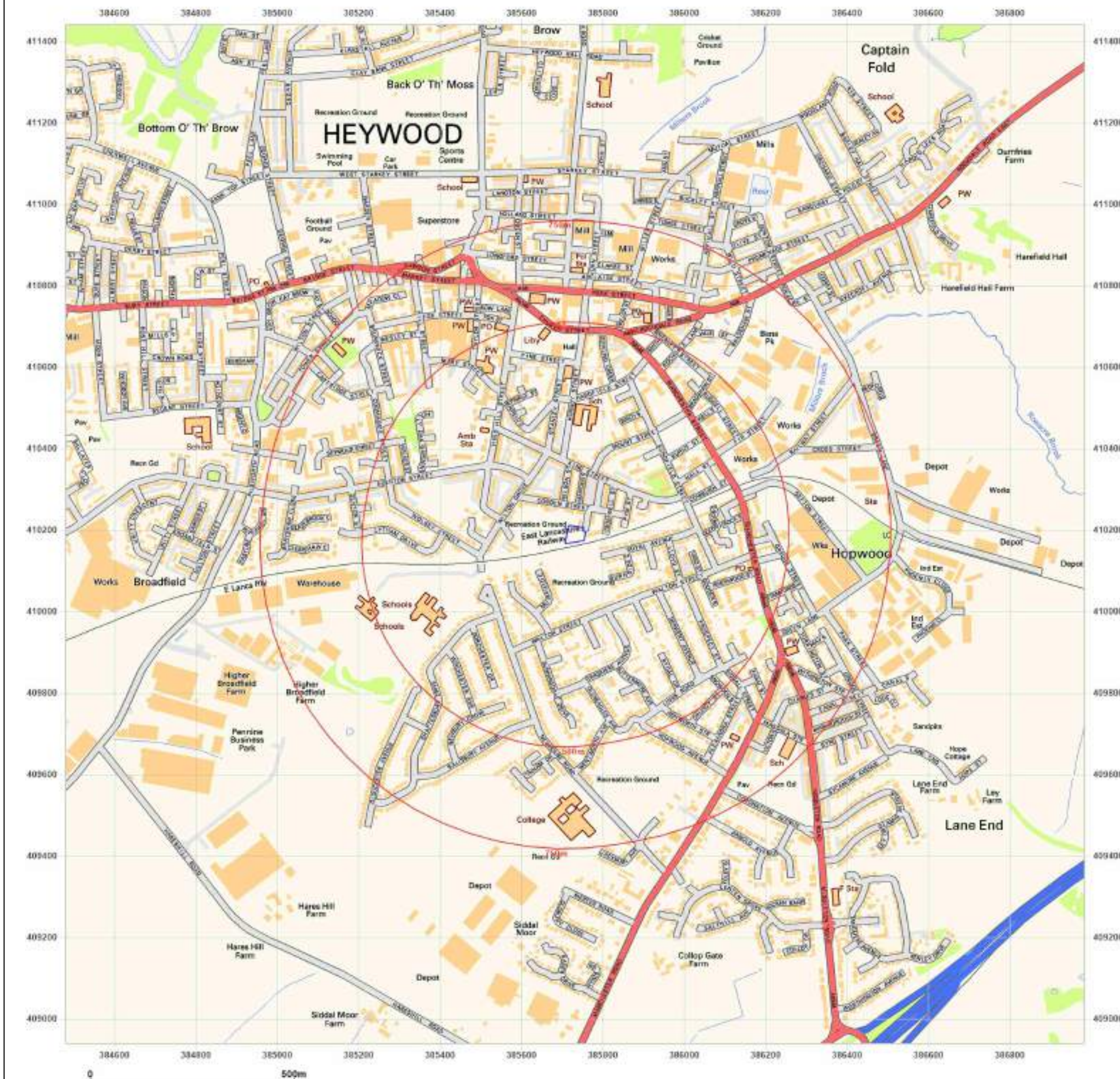


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Site Details:

44, RAILWAY TERRACE,
HEYWOOD, OL10 1BT

Client Ref: 001837
Report Ref: GS-8805964
Grid Ref: 385732, 410190

Map Name: National Grid

Map date: 2022

Scale: 1:10,000

Printed at: 1:10,000

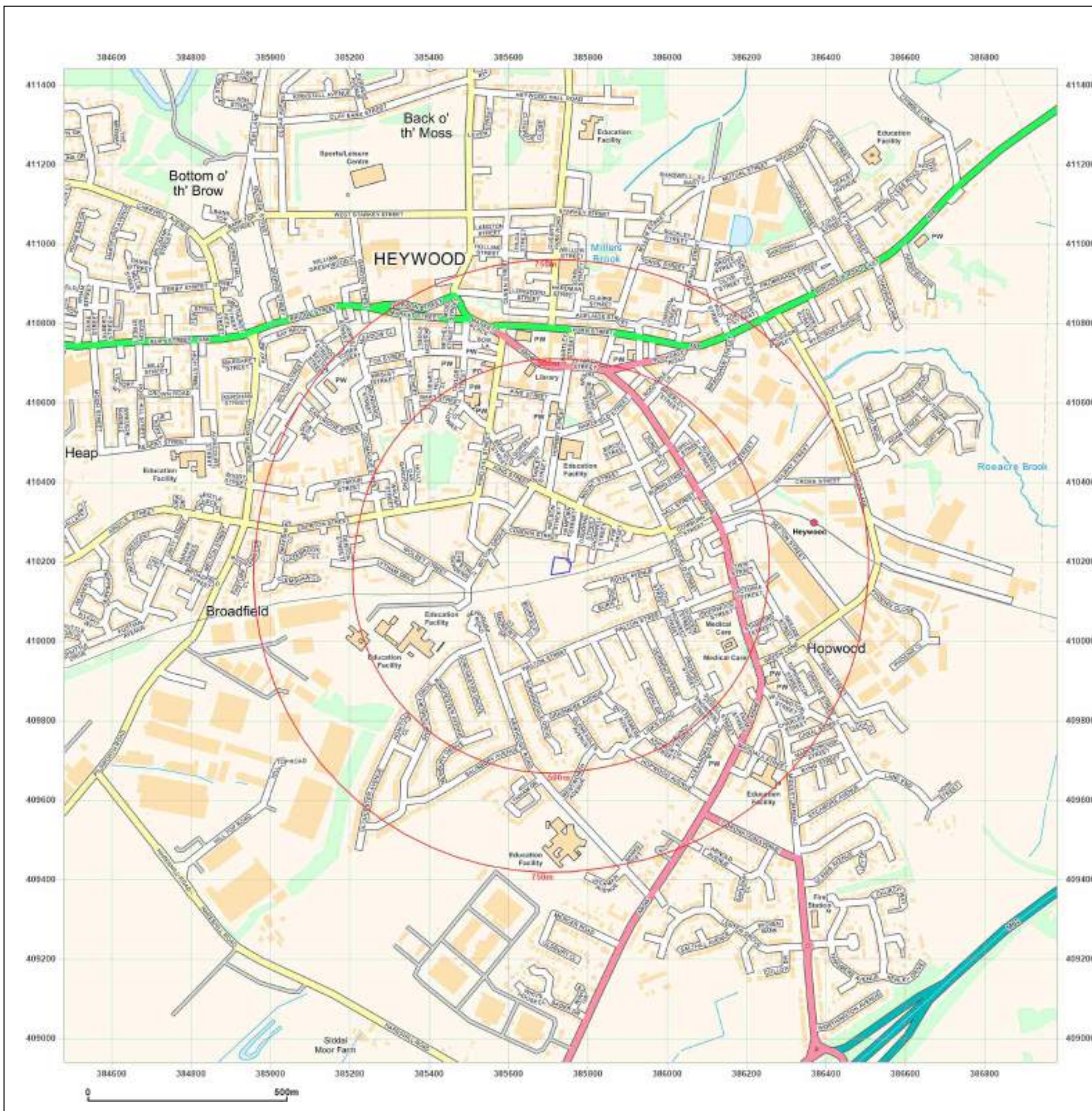


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APPENDIX X

COAL AUTHORITY REPORT



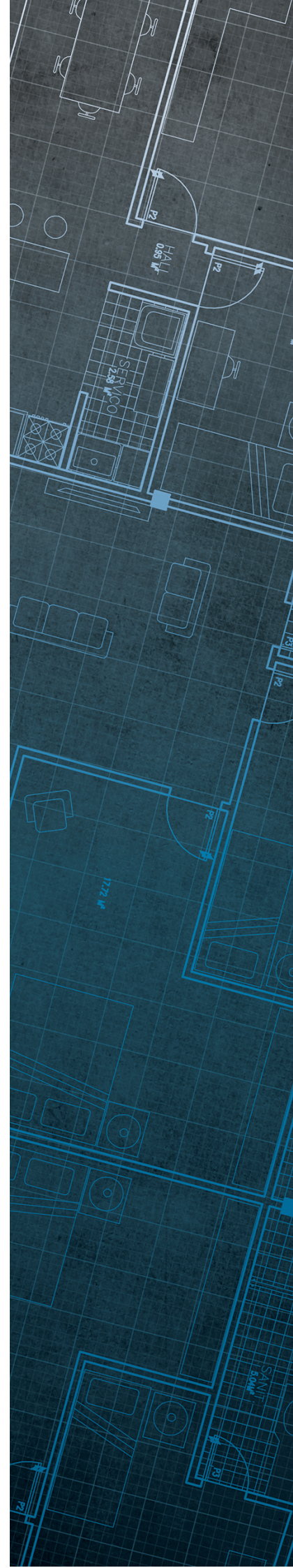
The Coal
Authority

Consultants Coal Mining Report

44, Railway Terrace, Heywood, OL10
1bt
Greater Manchester

Date of enquiry: 8 June 2022
Date enquiry received: 8 June 2022
Issue date: 8 June 2022

Our reference: 51003165650001
Your reference: GS-8805965



Consultants

Coal Mining Report

This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

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Approximate position of property



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Section 1 – Mining activity and geology

Past underground mining

No past mining recorded.

Probable unrecorded shallow workings

Yes.

Spine roadways at shallow depth

No spine roadway recorded at shallow depth.

Mine entries

None recorded within 100 metres of the enquiry boundary.

Abandoned mine plan catalogue numbers

The following abandoned mine plan catalogue numbers intersect with some, or all, of the enquiry boundary:

16820		
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Please contact us on 0345 762 6848 to determine the exact abandoned mine plans you require based on your needs.

Outcrops

No outcrops recorded.

Geological faults, fissures and breaklines

No faults, fissures or breaklines recorded.

Opencast mines

None recorded within 500 metres of the enquiry boundary.

Coal Authority managed tips

None recorded within 500 metres of the enquiry boundary.

Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

Site investigations

None recorded within 50 metres of the enquiry boundary.

Remediated sites

None recorded within 50 metres of the enquiry boundary.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

None recorded within 500 metres of the enquiry boundary.

Mine water treatment schemes

None recorded within 500 metres of the enquiry boundary.

Section 3 – Licensing and future mining activity

Future underground mining

None recorded.

Coal mining licensing

None recorded within 200 metres of the enquiry boundary.

Court orders

None recorded.

Section 46 notices

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

Withdrawal of support notices

The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Section 4 – Further information

Based on the responses in this report, no further information has been highlighted.

Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk**.

Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

Opencast mines

Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

Coal Authority managed tips

Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

Site investigations

Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

Remediated sites

Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

Coal mining subsidence

Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

Mine gas

Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission.

Mine water treatment schemes

Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

Future underground mining

Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

Coal mining licensing

Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

Court orders

Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

Section 46 notices

Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

Withdrawal of support notices

Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

Payment to owners of former copyhold land

Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.

The map highlights any specific surface or subsurface features within or near to the boundary of the site.

Key

Approximate position of the enquiry
boundary shown



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