PROPOSED CADET HUT
2 HUDDERSFIELD ROAD
MIRFIELD
WF14 9DQ

REMEDIATION AND ENABLING WORKS STRATEGY

PREPARED FOR:

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EXECUTIVE SUMMARY

Site Address	Proposed new one-storey cadet hut, 2 Huddersfield Rd, Mirfield WF14 9DQ	
Grid Reference	SE 19365 20286.	
Site Area	Approximately 0.20 Ha	
Current Site Use	The site currently comprises an area of hardstanding ground with two single-storey modular buildings and a shed.	
Proposed Development	The development proposal for the site comprises a one-storey modular cadet hut with associated hardstanding and landscaped areas.	
Environmental Setting	**Drift Geology**	None mapped by BGS (Alluvium mapped just off site to the south).
	Bedrock Geology	Clifton Rock Sandstone. Contact with Pennie Lower Coal Measures just off site to the south.
	Hydrogeology	Superficial – None mapped. Bedrock – Secondary A
	Hydrology	The closest identified surface water feature is 111m to the southwest and shown as the River Calder.
	Flood Risk	The southern boundary of the site is shown to lie within a Flood Zone 3 area.
Site History	The earliest maps show in 1855 the site as an undeveloped plot. There are a number of residential buildings on the east of site between 1888 - 1977. The site remains empty till a building labelled club appears in 1990, with the second building appearing in 2010.	
Utility Locations	A Formal drainage survey has not been completed.	
Landfill Sites and Ground Gases	Area of Landfill noted on-site.	
Radon	The property is not within a Radon Affected Area. The site is identified as an area where between less than 1% of properties are above the action level. No radon protection measures are required for developments undertaken in these areas. The requirement for radon protection measures for any proposed development should be confirmed with local building control.	
Coal Mining/Land Stability	According to the Coal Authority interactive map the site is not positioned within a 'development high risk area.' Inspection of the OS Plans does not indicate evidence of quarrying on site, or in the immediate vicinity.	
Brine Workings	See Phase 1 report	
Hazardous Installations	See Phase 1 report	

SITE INVESTIGATION

Ground Investigation Works	Fieldwork undertaken in December 2023 by PWA Geo-Environmental Ltd. The works comprised 2 cable percussive boreholes drilled to depths of between 14.50 to 15.60 m bgl. 8no. hand pits were also to a maximum of 0.2mbgl for contamination sampling. (Report Ref: 23109-PWAG-00-XX-RP-G-2000-P01).
Ground Conditions	**MADE GROUND** Made ground was encountered in all exploratory holes, with proven depths of 1.6-4.3 m bgl and typically consisted of dark brown gravelly clayey fine to coarse SAND with becoming slightly clayey and very gravelly in places, with some cobbles and boulders. The gravel content comprised of brick, concrete, limestone, clinker, slate, and mudstone.
	Drift Superficial deposits comprised of a soft / firm light brown slightly to very sandy sometimes gravelly CLAY underlain by slightly clayey gravelly SAND and light brown subangular to rounded fine to coarse gravel.
	SOLID – Weathered bedrock geology encountered in the base of CP02 seen as very dense course gravel of MUDSTONE. (Pennie Lower Coal Measures).
	GROUNDWATER – 14.50 – 15.60 m bgl Groundwater was encountered in in both locations .

CONTAMINATED LAND ASSESSMENT

Human Health	The preliminary Tier 1 Human Health risk assessment has identified contaminants of concern: Asbestos was not noted in the samples tested, however a previous report by G&M dated November 2022 noted 2 out of 6 samples tested had tested positive for asbestos. Loose fibrous debris of amosite was identified in TP2 at 3.00 m bgl, and loose fibrous debris of chrysotile, amosite, and crocidolite was identified in TP2 at 1.00 m bgl. However, it is noted that this asbestos was not quantified at the time of reporting. Further sampling and testing will be required to quantify the asbestos on site. Details of this previous investigation can be viewed in the Phase II report 23109-PWAG-00-XX-RP-G-2000-P01 & G&M November 2022 which should be viewed in conjuncture with this report and are appended. A cover system or further remediation may be required if locations of exceedances noted above are located within a soft landscaped area. Excavated materials retained on site must be stored on an appropriate containment membrane to prevent any potential spread of contamination. Following waste category testing, these materials will be transported to a licensed waste disposal facility as required.

	Both previous Phase II reports noted exceedances in the following contaminants of concern: HP01 – Lead, Dibenzo[a,h]anthracene HP02 – Lead, Dibenzo[a,h]anthracene HP03 – Lead, benzo[a]pyrene, benzo[b]fluoranthene, Dibenzo[a,h]anthracene HP04 - Dibenzo[a,h]anthracene HP05 – Lead, Arsenic, benzo[a]pyrene, benzo[b]fluoranthene, Dibenzo[a,h]anthracene HP08 - benzo[a]pyrene, benzo[b]fluoranthene, Dibenzo[a,h]anthracene However, both reports had used comparisons for that of a residential site. When compared with commercial settings which we are advised is correct for this site, no exceedances were noted. It is possible that as yet unidentified contaminant impact is present within localised hotspots at the site. It is considered that any such contamination could be addressed by the delineation, excavation, and treatment of impacted soils, if identified. The site is deemed to pose low risk to human health following mitigation measures.
Controlled Waters	See Phase 1 report
Ground Gas	G&M Consulting conducted six rounds of gas monitoring in 2022. No ground gas generation was noted, and the site was deemed a preliminary characteristic situation of CS1. A review of the complete gas monitoring data indicates a maximum concentration of 0.3% v/v carbon dioxide, non-detect methane, 17.4% v/v oxygen concentration as the minimum and non-detect flow. All positions were monitored over the course of the six visits. A site characteristic gas screening value (GSV) is calculated based on the borehole hazardous gas flow rate. This is calculated for methane and carbon dioxide in accordance with BS:8485:2015+A1:2019 based on the measured gas flows, gas concentrations or a limit of detection (taken as 0.1 l/hr for flow and 0.1% for gas concentration), whichever is higher. The derived GSV is used to determine a characteristic gas situation (CS). The GSV for carbon dioxide was calculated using the maximum steady state flow and maximum steady gas concentrations. A GSV of 0.0003 l/hr was derived that equates to CS1. As such, no special precautions are required in regard to a ground gas risk.
Potable Water Infrastructure	It is considered that the ground poses no risk to the potable water supply and barrier pipes will not be required, although further testing may be required to confirm this.

REMEDIATION AND ENABLING WORKS

Objectives	The objectives of this report are to: Prepare overview of contaminated land remediation requirements; Evaluate feasible remediation technologies; Define validation criteria to demonstrate the successful implementation of a site remediation and enabling works plan; and Ensure the safe, cost effective and regulatory compliant redevelopment of the site.
Remediation and Enabling Works	The site remediation and enabling works strategy provides a comprehensive specification for the regeneration of the land to negate identified pollutant linkages. The salient features of the remediation and enabling works strategy are summarised as follows: Implementing of all works in strict accordance with UK Environmental Permitting and local planning authority requirements; Management of all anthropogenic material impacted by trace asbestos fibre in a controlled and legislatively compliant manner; Excavation of MADE GROUND in a controlled manner; Validation sampling and testing to confirm material retained on site poses no unacceptable risk to the residential end users or wider environ. The developer's works will also include the completion of the following additional elements: Excavation and disposal to a suitable licenced waste facility of the asbestos material identified at the location of the aforementioned hand pits.

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1 INTRODUCTION

1.1 BACKGROUND

Murray Rix has been instructed by CWT Building Consultants, (The Client) to develop a remediation strategy for the Proposed new Cadet Hut, 2 Huddersfield Rd, Mirfield WF14 9DQ.

1.2 REPORT OBJECTIVES

The objectives of This report are to:

Prepare overview of contaminated land remediation requirements;

Evaluate feasible remediation technologies;

Define validation criteria to demonstrate the successful implementation of a site remediation and enabling works plan; and

Ensure the safe, cost effective and regulatory compliant redevelopment of the site.

1.3 SCOPE OF WORKS

The development of the risk management strategy for the subject site includes the following tasks:

Identification of the relevant pollutant linkages;

Review of site characteristics;

Identification of geotechnical constraints;

Developments of remedial objectives;

Selection of appropriate remedial technology; and

Development of remedial strategy.

1.4 PREVIOUS WORKS

The following phases of Geo-Environmental investigations have previously been carried out at the site:

- G&M Consulting Geo-Environmental Appraisal Report ref: C541 – November 2022
- PWA Geo-Environmental Ltd: Phase 2 Geo-Environmental Assessment. Report ref: 23109-PWAG-00-XX-RP-G-2000-P01 – March 2024

To inform the assessment of the potential risk to contaminated land within the context of the proposed development and to inform the preparation of the remediation strategy, the pertinent points from the above report are summarised within section 2.

For the avoidance of any doubt, all previous reports should be read both as a precursor to and in conjunction with this document.

1.5 REDEVELOPMENT PLAN

CWT Building Consultants Ltd intends a development that should be considered commercial, concerning the construction of a cadet hut.

1.6 SUMMARY OF PARTIES INVOLVED

Function/interest	**Name of Party**
Local Planning Authority	Kirklees Council
Developer	Integra Buildings Ltd
Geo-Environmental Consultant	PWA/Murray Rix
Remediation/Enabling Works Contractor	Integra Buildings Ltd
Human Health Regulator	Kirklees Council
Controlled Waters and Waste Regulator	Environment Agency/Canals Trust
Highways Adoption Authority	Kirklees Council

1.7 REGULATORY CORRESPONDENCE

It is presumed that as part of the planning approval process, the planning authority will undertake consultation with the pertinent statutory consultants, which will include:

Environmental Health/contaminated land officer at the local authority (or external advisor); and

Environment Agency planning liaison.

1.8 SITE DETAILS

Site Address	2 Huddersfield Rd, Mirfield WF14 9DQ
National Grid Reference	SE 19365 20286
Site Area	Approximately 0.20 Ha

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

A site location map is presented the previous report, provided in Appendix C

2. SITE SUMMARY

Two known previous report have been completed for the site as referenced in section 1.4. these should be read as a precursor to the remediation and enabling works. These previous reports include a Phase I Desk Study and a Phase II Geo-Environmental Investigation.

2.1. CURRENT SITE USE

The site currently comprises an area of hardstanding ground with two single-storey modular buildings and a shed.

2.2 SURROUNDING FEATURES

The site is secured to all boundaries by a tall palisade fence. The site is bounded to the south by light industrial units and to the west by a set of private garages and east by residential properties. The ground levels adjacent to the western boundary were noted to be similar to the main part of the site, whereas the levels on the eastern boundary were noted to be similar to the levels at the toe of the slope.

3. SITE HISTORY

3.1. ON-SITE HISTORICAL DEVELOPMENT

Full details of historical site developments, including mapping and aerial photographs can be found in the Phase 1 Desk study (G&M Consulting: C541 – November 2022).

3.2 SUMMARY OF OFF-SITE HISTORY

The earliest available maps from 1855 depict the site as undeveloped. Between 1888 and 1977, a number of residential buildings were constructed to the east of the site. The site itself remained vacant until 1990, when a building labelled as 'Club' was first noted. A second building appeared on the site in 2010.

4. SITE SETTING

4.1. GEOLOGY

The 1:50,000 Scale British Geological Survey map of the area shows the site to be located on superficial strata of Glaciofluvial deposits which overlie bedrock strata of the Wildmoor Sandstone Member.

4.1.1. DRIFT

Alluvium - Clay, silt, sand, and gravel. Sedimentary superficial deposit formed between 11.8 thousand years ago and the present during the Quaternary period.

Mapping shows Alluvium just off site to the south, however deposits of Alluvium are noted in the Borehole logs.

4.1.2. SOLID

Clifton Rock - Sandstone. Sedimentary bedrock formed between 319 and 318 million years ago during the Carboniferous period.

Pennine Lower Coal Measures Formation - Mudstone, siltstone, and sandstone. Sedimentary bedrock formed between 319 and 318 million years ago during the Carboniferous period. (Noted just off-site to the south.

4.1.3. ARTIFICIAL & MADE GROUND.

The Groundsure and BGS 1:10,000 maps show no records of artificial and made ground within 500m on-site and surrounding site to the north and south.

4.1.4. BOREHOLE RECORDS.

Five BGS Borehole record is noted within 250m of site. Information on these can be viewed in the Phase 1 report.

4.1.5. BEDROCK FAULTS AND OTHER LINEAR FEATURES.

Seven bedrock features are noted in the BGS maps or Groundsure maps within 500m of the site. Information on these can be viewed in the Phase 1 report.

4.2. HYDROGEOLOGY

Information provided by the EA indicates that the underlying bedrock (Pennine Lower Coal Measures) is classified as a 'Secondary A,' aquifer which is defined as having;

'Permeable layers capable of supporting water supplies at a local level rather than strategic scale, and in some cases forming an important source to base flow to rivers. These are generally aquifers formerly classified as minor aquifers.'

The site is not shown to be within a Source Protection Zone.

4.3. HYDROLOGY

According to the Phase 1 report, the risk posed to the site by groundwater flooding is 'Low', (within 50m)'.

The highest risk posed to the site from 'Surface Water Flooding' according to the Phase 1 Report is highlighted to be '1 in 30 years, 0.1m-0.3m (within 50m)'.

According to the Phase 1 report, the closest identified surface water feature is 111m to the southwest and shown as the River Calder.

The site is identified to lie within the catchment of 'Calder from River Colne to River Chald' in the operational catchment of 'Calder Lower.'

The southern boundary of the site is shown to lie within a Flood Zone 3 area.

The site is not shown to be within a "Nitrate Sensitive Area" or a "Nitrate Vulnerable Zone."

Surface Water features

No surface water features are noted within 50m of site.

Flood Risk

The southern boundary of the site is shown to lie within a Flood Zone 3 area.

4.4 INITIAL CONCEPTUAL SITE MODEL

The conceptual site model can be viewing in subsection in the Phase I Desk Study.

4.4.1. POTENTIAL CONTAMINANTS

Based on the information provided in the phase II Geo-Environmental Assessment, summarised below the following potential contaminants within the underlying soils have been identified:

- Asbestos (noted on a previous Site Investigation)

4.4.2. PATHWAYS

Migration pathways are defined as route between source and receptor. Exposure pathway can be direct (i.e., stays with in the same exposure media) or indirect transport from one medium to another to another takes place.

Receptors may be potentially at risk from the identified potential sources of contamination via the following pathways:

Inhalation

Breathing dust, fibres, and vapours from contaminated soil in indoor air. Fibres can also be carried into buildings if contaminated surfaces are walked across by pedestrians, resulting in inhalation by the occupants.

Dermal Contact and Soil Ingestion

Direct contact with impacted Made Ground through either the skin or via the intestinal tract.

Leaching

Soluble contaminants can leach from unsaturated zone soils due to water infiltration into the dissolved phase / or exist as a separate phase within any underlying groundwater.

Migration of Contaminated Groundwater

Migration laterally (both on and offsite) or vertically (depending on the solubility of the compound) of impacted groundwater dependent on permeability, preferential pathways, and man-made voids.

Aggressive Attack

Some buildings and materials can be damaged by direct contact with aggressive ground, for example sulphate attack on concrete and hydrocarbon attack on plastics.

5. PREVIOUS INTRUSIVE GROUND INVESTIGATIONS

A Phase II Geo-Environmental Investigation and Risk Assessment has previously been carried out by PWA Geo-Environmental Consultants based on an agreed upon scope of works set out at the time of the investigation in March 2024.

5.1. GROUND CONDITIONS

The ground investigation generally confirmed the published geology and identifies the strata set out in Table 5.1.

TABLE 5.1 SUMMARY OF STRATA

HOLE	DEPTH TO STRATUM (m bgl)					
	TOPSOIL	MADE GROUND	CLAY	SILT	SAND & GRAVEL	BEDROCK
CP01	None Encountered	GL – 5.30	5.30 – 6.50 13.30 – 15.60	None Encountered	6.50 – 13.30	None Encountered
CP02	None Encountered	GL – 4.30	4.30 – 10.00 12.00 – 12.40	None Encountered	10.00 – 12.00 12.40 – 13.50	13.50 – 14.50

5.1.1. MADE GROUND

Made Ground was encountered in all exploratory positions. Made Ground encountered was generally seen as mixed gravel fill and bricks/concrete at the surface over slab, reworked clay and fine to medium gravelly sand.

5.1.2. DRIFT DEPOSITS

Drift deposits were encountered within both locations to a proven depth of 15.60m bgl.

The drift deposits comprised Alluvium seen generally as medium dense to very dense orange to brown gravelly fine to medium sand, with firm to stiff silty gravelly and sandy clays with mudstone.

5.1.3. SOLID GEOLOGY

Possible solid bedrock geology was encountered at the base of CP02, seen as coarse angular gravel of mudstone.

5.1.4 GROUNDWATER

Groundwater was encountered during the intrusive ground investigation works. The depth of the strikes is shown on the exploratory hole records in Appendix E and are summarised in Table 3.2.

TABLE 3.2 SUMMARY GROUNDWATER STRIKES

Location	DEPTH TO STRIKE (m)	NOTES
CP01	9.60	Strike in SAND, non-rising.
BH 1A	9.10	Strike in CLAY, non-rising.

5.1.5. FIELD OBSEVATIONS

The sides of the exploratory boreholes within the natural strata appeared to be generally stable.

The near surface materials were drilled with relative ease. Refusal was noted in both locations on very dense ground noted as possible bedrock.

5.2. LABORATORY CONTAMINATION TESTING

The quantity of samples tested at the laboratory for soil contamination analysis across the site was advanced to target specific potential contaminant sources and spatially distributed to offer the maximum representative coverage of the site.

The results of the soil contamination testing undertaken was assessed by PWA Geo-Environmental Engineering.

5.2.1. SOILS

Chemical testing detected lead, arsenic, and several PAH contaminants in multiple samples. However, the initial assessment compared these results against residential screening levels applicable at the time of reporting. Upon review, it was identified that the site is classified as a commercial setting. A reassessment of the chemical results using commercial screening criteria determined that no exceedances were present.

Asbestos was also noted during a previous investigation in shallow made ground samples. (G&M Consulting: C541 – November 2022).

Not olfactory evidence of contamination was noted during these works.

6. SITE REMEDIATION AND ENABLING WORKS

6.1. REMEDIATION TECHNOLOGY

Considering the site-specific conditions, including the nature of the identified impacts, the geology and the objectives of the remediation, the most appropriate remedial technologies are considered to be:

- Management of all soil impacted via delineation of all deleterious materials
- Excavation and disposal of asbestos impacted material.

It is considered that these technologies and methodologies will address the identified active pollutant linkages, as detailed in the following subsections.

6.1.1. CONTAMINANTS OF CONCERN

ASBESTOS CONTAINING MATERIALS (AMC'S)

No asbestos was identified in any of the shallow PWAG samples. G&M (November 2022) reported 2 out of 6 samples tested had positive asbestos identification. Loose fibrous debris of amosite was identified in TP2 at 3.00 m bgl, and loose fibrous debris of chrysotile, amosite, and crocidolite was identified in TP2 at 1.00 m bgl.

If any visible pieces of asbestos-containing material are identified during the site remediation and enabling work, this material must be dealt with in strict accordance with the Control of Asbestos Regulations (CAR) 2012, UK Waste Management Legislation and the Environmental Protection Act 1994.

ASBESTOS QUANTIFICATION:

The previous site investigation (G&M November 2022) identified the presence of asbestos on the site, but the asbestos content was not quantified. To ensure appropriate remediation, further testing by a UKAS-accredited laboratory is recommended to quantify the asbestos content as a percentage

by weight (% w/w). This quantification will allow for a more accurate risk assessment and inform the appropriate course of action.

If the asbestos content is below 0.001% w/w, the material will not be classified as asbestos-containing under current UK legislation, and no further action will be required.

Materials with asbestos content between 0.001% and 0.099% w/w will be classified as ACMs, requiring risk assessment and either removal or encapsulation by a competent contractor under non-licensed asbestos removal procedures.

For asbestos content at or above 0.1% w/w, the material will be classified as ACM under the Control of Asbestos Regulations 2012, necessitating removal by a licensed asbestos removal contractor with appropriate notifications submitted to the Health and Safety Executive (HSE).

All remediation works should be carried out by qualified contractors in accordance with HSE guidance, with air monitoring, waste disposal, and clearance certification as appropriate. A site-specific method statement must be prepared before works commence, outlining control measures, personal protective equipment (PPE), and emergency procedures to ensure the safety of workers and site users.

In accordance with CAR 2012 the contractor shall prepare a plan of work prior to the commencement of the work, The plan should include:

The nature and probable duration of the work;

The number of people involved in the work;

The address and location where the work is to be carried out;

The methods to be used to prevent or reduce exposure to asbestos, e.g., prevention and control measures and arrangements for the handling and disposal of asbestos waste;

The type of equipment, including PPE and RPE, used for:

Protecting and decontaminating those carrying out the work

It should also include the site layout with a description of the location and nature of asbestos.

An asbestos management plan should be prepared for the site. The contractor shall determine whether the works constitute licensable work (LW), notifiable non-licenced work (NNLW) or non-licensable work (NLW) under CAR 2012. Although NLW and NNLW can be undertaken by those without a licence from the HSE the work will still need to be carried out in accordance with the requirements of CAR 2012. To be reviewed by the appointed principal contractor and or principal designer.

The plan of work should be submitted to the appointed specialist for approval prior to commencement of the installation of the cover system. The asbestos management plan will need to be signed off by a suitable qualified competent person.

Should off-site disposal be required, then additional asbestos quantification and waste classification testing may need to be undertaken to ensure that it is classified correctly and disposed at a suitably licensed facility. However, it is not envisaged that the material will need to be disposed of as special waste due to the percentage of asbestos shown by the quantification testing.

FIGURE 6.1 ASBESTOS CONCEPTUAL SITE MODEL

Notes
ND None Detected
0.001% Soils may contain ≤ 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 >1.00m 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.

6.2 IDENTIFICATION OF FEASIBLE REMEDIATION OPTIONS

6.2.1. OBJECTIVES

The remediation works must be completed in a safe and sustainable manner that ensures that the post remediation condition of the site poses no unacceptable risk to the wider environs. The developed Conceptual Model must ensure no complete pollutant linkage to ensure successful implementation.

The remediation works must be completed in a manner that promotes sustainable re-use of material in a manner that minimises waste and maximises retention of material on-site.

The works should be designed and implemented in a manner that ensure no risk to the identified receptor during the works in terms of odour, air quality or noise impact.

Works should be designed, planned, and implemented in a manner that ensures full compliance with all pertinent waste management and environmental permit legislation.

6.2.2. AVALIABLE TECHNOLOGIES

Potential remedial technologies that can be applied in order to remediate the identified contaminants of concern are summarised in Table 6.1. The remedial techniques considered would potentially break any source-pathway receptor linkages, thereby reducing the risk to human health to acceptable levels.

TABLE 6.1 SOIL REMEDIATION TECHNOLOGIES

REMEDIAL TECHNOLOGY	CLASSIFICATION	APPLICATION	MEDIUM	LINKAGE ELEMENT AFFECTED
Capping	Containment	In situ	Soil	Pathway interruption
Excavation and offsite disposal	Civil Engineering	Ex situ	Soil	Removes Source

6.2.3. SELECTION OF TECHNOLOGY OPTIONS

Several remedial technologies have been considered in addressing the contaminant linkages of concern identified at the site, as summarised in Table 6.2, overleaf.

In order to assess which of these technologies are most viable for this particular project, each technology has been reviewed on the basis of applicability, permissibility, cost, timescale, and acceptability (including sustainability).

Sustainable remediation is, “the practice of demonstrating, in terms of environmental, economic and social indicators, that the benefit of undertaking remediation is greater than its impact and that the optimum remediation solution is selected through the use of a balanced decision-making process”, (as defined within “A Framework for Assessing the Sustainability of Soils and Groundwater Remediation”, produced by Sustainable Remediation Forum UK, dated March 2010).

TABLE 6.2 ASSESSMENT OF REMEDIATION TECHNOLOGIES APPLICABILITY

REMEDIAL TECNOLOGY	APPLICABLITY	REGULATORY APPROVAL / PERMITRY	COST	TIME-FRAME	SCORE	SUITABILITY COMMENT
Excavation and offsite disposal	5	5	1	5	16	Ground bearing floor slab and cover system in soft landscaped areas

6.3. SUMMARY OF PREFERRED REMEDIATION OPTIONS

Based on the options appraisal, it is considered that the following remediation technologies and or combination of remediation technologies provides the most sustainable, viable and economic solutions that will ultimately result in the successful remediation for the site:

Option 1 – Assuming proposed building is to be constructed using a ground bearing floor slab.

Off-site removal of made ground will be required in the area of noted contamination exceedances due to ACMs and/or implementation of a cover system.

A delineation exercise should be undertaken to assess the contamination (if any) in areas of made ground directly adjacent to known areas of contamination.

Samples should be taken at similar depths at 1 and 2m intervals in all 4 cardinal directions from the point of known contamination to understand any spread.

6.4. OVERVIEW OF WORKS

Prior to the commencement of works on site, the contractor must establish all necessary plant, equipment and site welfare facilities as is necessary to complete the contract within the agreed timescales to the rationale as outlined in the following subsections.

For the avoidance of any doubt, the proposed operations as set out herein document the required performance objectives and validation sampling protocols; however, the specific methods of work deployed to ensure the remediation objectives are achieved in a compliant manner on site will be the responsibility of the appointed contractor.

The Works will need to be carefully planned and sequenced by the contractor. The Contractor shall provide a draft version of their Method Statement as part of their tender submission. This document will require acceptance from the Supervising Geo-Environmental Engineer in advance of the works.

The Contractor should satisfy themselves that sufficient investigation and testing has been undertaken and shall confirm in their Tender submission that the ground investigation and site information (Geotechnical and Geo-Environmental) available is adequate for their proposed works. If considered necessary, they should supplement it with additional ground investigation and further testing. Any such proposals or allowances shall be submitted to the Client and Supervising Geo-Environmental Engineer within the tender for approval.

Soils maybe subjected to lime modification (the addition of lime <2%) as a drying agent to modify the moisture content of the soil to render it suitable within compaction. Should the Contractor choose to lime improve site won soil, they are required to prepare and submit a method statement, detailing the application rates and controls.

The Contractor is to comply with the clients H&S and environment policies and any site-specific design specifications and requirements, design drawings and planning conditions and restrictions including any perimeter boundary restrictions, ecological protection or tree protection measures required.

The contractor shall comply with the earthwork's specification and the overarching master guidance and specifications and any other site-specific related specifications and documents including RMS and MMP.

All surveys, site testing data and diary notes are made available and accepted by the Supervising Geo-Environmental Engineer.

The Contractor shall allow sufficient time in their programme for the required testing, its turnaround and review of results, for both geotechnical and chemical samples.

RE-1 – PRE-COMMENCEMENT REGULATORY COMPLIANCE

Prior to the commencement of any site development activities, it will be the responsibility of the developer (or their nominated contractor) to ensure that all reports associated with applicable contaminated land and remediation planning conditions have been submitted to the regulatory authorities for their written approval.

All excavated materials[1] generated during the site enabling works and development activities which are either re-used at other locations within the development boundary or are subject to treatment prior to replacement at the same point are considered a waste. Where any excavated material is defined within the scope of the *CL:AIRE Definition of Waste Code of Practice (DoWCoP)*, meets a suitable for use criteria and will be re-used at the site of origin, this material can achieve 'end of waste' status through full conformance with the DoWCoP. This includes the generation of a Materials Management Plan and a subsequent peer review and declaration submission from a CL:AIRE approved 'Qualified Person.' This also includes any clean, naturally occurring soils (sub/topsoil) from a suitable off site donor location for re-use on the development.

1 Excluding clean, naturally occurring topsoil that will be re-used at the same development for the same purpose.

RE-2 – ENVIRONMENT AND NUISANCE CONTROL

Management of all works is required so as to ensure that no environmental nuisance is created through dust emissions, noise, or vibration levels.

All works are to be completed in a manner so as not to create any structural risk to the adjacent Highways and Railways.

Temporary works are to be implemented as necessary to support excavations throughout the duration of the works.

In the event that a complaint is made in respect of dust emissions, noise, or vibration levels, remedial measures and a programme of ongoing monitoring should be agreed with the local authority and implemented on site.

The Contractor is responsible for maintaining the public roads adjacent to all site entrances that are in use for the Works in a clean condition. Sweeping to public roads may be required to maintain cleanliness of adjacent roads during the works. All vehicles shall be inspected before leaving site to ensure load is secure, there is no seepage from the tailgate, there is no debris on the wagon and the dust sheet completely covers the load.

RE-3 – RISK TO INFRASTRUCTURE

Site works should be completed in a manner that ensures no risk of disturbance to the adjacent infrastructure, any adjacent commercial properties, and adjacent dwellings.

Dependent on the proposed methodology and distance to the sensitive receptors, it is recommended that vibration monitoring is undertaken within the works area. This is to be detailed with the contractors RAMS for approval.

The Contractor shall take reasonable precaution against the damage of services. The contractor shall carry out all searches/investigations to identify and locate any buried utilities and services they consider necessary prior to start of works and are responsible for determining and protecting any existing services or arranging any diversion needed to allow the earthworks to be undertaken.

The contractor shall carry out all searches/investigations to identify and locate any above ground utilities and services they consider necessary prior to start of works and are responsible for determining and implementing any protection and safety methodologies to allow the earthworks to be undertaken.

RE-4 – STRUCTURAL DEFECTS SURVEY

Prior to the works commencing it is recommended that a structural defects survey is undertaken on adjacent structures to ensure that the remediation and enabling works do not negatively impact neighbouring structures.

RE-5 – DELINEATION, EXCAVATION AND TREATMENT OF IDENTIFIED ASBESTOS IMPACT

Asbestos fibres have been identified within shallow MADE GROUND at two number locations conducted on a previous site investigation, (G&M November 2022). It should be noted that any asbestos located in the natural strata may have been carried there from a shallower depth during the drilling exercises, however this cannot be guaranteed.

The contractor must ensure than all personnel working on site are trained in the identification of ACM and the risks associated with impacted soils.

Where any visual evidence of ACM is identified, these materials should be carefully segregated and removed from the soil matrices (if/where possible).

Validation sampling of any processed MADE GROUND should be completed to demonstrate compliance with the developed conceptual site model.

Where asbestos is identified at concentrations above ≤0.001%, a hotspot excavation will be required, and the impacted Made Ground removed to a suitable off-site facility along with the implementation of a suitable cover system.

This process should be completed under strict controls to be devised and employed by the nominated contractor to ensure no potential for fibre release into ambient air.

If necessary, reassurance air testing in accordance with the requirements of HSG248 should be completed during the operation to move the soils to demonstrate the deployment of the required control procedures and safe working methods.

RE-6 – REMOVAL OF DELETERIOUS MATERIAL

All potentially deleterious and geotechnically unsuitable materials will be delineated, stockpiled, and removed from site by the contractor to a licensed waste facility.

RE-7 – PREPARATION OF SOFT LANDSCAPE FOR COVER SYSTEM

As part of the land remediation works, garden and landscaped areas will be prepared in a manner that will facilitate the placement of the clean cover system during the development phase of the works. The preparation of the areas requiring clean cover is critical in ensuring delivery of the site in a manner that will ensure no risk to the proposed end users.

Where MADE GROUND is deemed unsuitable for retention in a garden, the area will be subject to a reduced-level dig to remove unsuitable material to a minimum depth of 600 mm (450mm subsoil & 150mm of topsoil) below finished garden level or verified natural stratum (in the case of the front garden area).

Excavated soil will be stockpiled pending the results of the appropriate validation testing (to be completed in accordance with this specification) prior to reuse in an area of no sensitivity or, where necessary, this material will be removed from site in accordance with UK waste management legislation.

The placement of certified subsoil and topsoil will be completed as part of the developer works/build-phase mitigation plan. All garden areas where a cover system is required will be subject to plot-specific independent validation.

RE-8 – PROVISION OF SUBSOIL

There is limited potential for suitable subsoil material to be present on site and as such there will be a requirement to import suitable material for use within the upper 600 mm of clean cover to residential gardens and areas of soft landscaping.

The garden and landscaped areas will require depth validation to satisfy the requirement of the Council of Mortgage Lenders (CML) in order to demonstrate that the appropriate thickness has been provided as a growing medium (if/where appropriate).

RE-9 – PROVISION OF TOPSOIL

There is limited potential for suitable topsoil material to be present on site and as such there will be a requirement to import suitable material for use within the proposed development.

Topsoil whether site won or imported will require testing in line with the schedule present within Section 8 and Table 6.3.

The garden and landscaped areas will require depth validation to satisfy the requirements of the CML in order to demonstrate that the appropriate thickness has been provided.

RE-10 – REMEDIAL VERIFICATION REPORT

Collation of information relating to site clearance, chemical testing, remedial works, remedial verification, material movements and waste transfer documentation are required, where appropriate. Complete remedial validation is to be reported in line with regulatory guidance. This will include a detailed risk assessment. The report will be submitted to the local authority for approval following completion.

6.5. VALIDATION SAMPLING PROTOCOL

In accordance with the current requirements of the regulatory authorities, validation samples will be collected from all materials that are to be subject to movement under the protocols outlined within this remediation and enabling works strategy, or for materials to be imported onto site to facilitate the proposed residential development.

Upon removal of the hotspots of unsuitable Made Ground, validation samples will be collected from the base (two samples) and sidewalls (four samples) of the excavation to reasonably demonstrate no residual impact to the underlying strata.

Soil samples destined for chemical analysis will be collected at regular intervals in appropriate sampling containers. All samples will subsequently be stored in cooled boxes prior to submission to a UKAS/MCERTS accredited laboratory.

All samples will be collected using appropriate personal protective equipment (PPE) and sampling equipment, which will be cleaned at each sampling location.

A detailed copy of sampling methodology, QA procedures and laboratory chain of custody forms will be documented within the site records and presented with the final validation report for the site.

Where material is found to contain concentrations of potential contaminants at levels in excess of the site-specific screening criteria (as detailed within Appendix D), further assessment and recommendations on the appropriate use for the material in question will be required, which may involve the disposal of such materials off site to a suitable waste management facility.

The sampling frequency for materials to be managed under the remediation strategy is presented within Table 6.3.

TABLE 6.3 SPECIFICATION OF CHEMICAL VALIDATION LABORATORY ANALYSIS

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Site-Generated		
Hotspot Validation Samples	1 Sample per 10 m of linear excavation to base and site wall	PAHs, Asbestos, Inorganic Heavy Metals
Imported		
Subsoil Greenfield Source (450mm soft landscape Cover)	1 sample per 200m^3	Speciated PAH, CLEA Inorganic Heavy Metals
Subsoil Brownfield Source (450mm soft landscape Cover)	1 sample per 50m^3	Speciated PAH, Speciated TPH (C5-C35), Asbestos, CLEA Inorganic Heavy Metals
Topsoil Greenfield Source (150mm soft landscape Cover)	1 sample per 200m^3	Speciated PAH, CLEA Inorganic Heavy Metals
Topsoil Brownfield Source (150mm soft landscape Cover)	1 sample per 50m^3	Speciated PAH, Speciated TPH (C5-C35), Asbestos, CLEA Inorganic Heavy Metals

Notes: All analysis prescribed above to be completed by UKAS-accredited laboratory.

6.6. REMEDIATION CONTRACTORS SITE MANAGEMENT AND RESPONSIBILITY

The appointed remediation contractor will take full and overarching responsibility for all methods of work required to complete the site remediation and enabling operations to ensure the delivery of the site and the completion of the objectives in a safe, legislatively compliant manner that ensures no pollution to the subject site or the wider environs.

For individual remediation operations as set out within the performance specification, the contractor will provide site-specific methods of work for individual operations pertaining to the removal and treatment of contaminated liquids and soils. For each and every operation as set out herein, the contractor will provide a written methodology of works to be supplied to the supervising Geo-Environmental engineer prior to the instigation of operations on site.

The site manager will be responsible for documentation of each day's activities with a full recorded schedule of works completed and corresponding site-specific method statements that have been utilised to ensure the completion of the task to the required standard.

7. MATERIALS MANAGEMENT AND LEGISLATIVE COMPLIANCE

The processing of recycled aggregates will not be required on this site.

Where necessary, operations as outlined within the remediation enabling works rationale summarised in this report may be subject to regulation using the appropriate environmental permit, standard rules exemption and materials management plan, to be created in accordance with version 2 of the CL:AIRE *Definition of Waste: Code of Practice (DoW CoP)*.

It is noted that if material is to be imported utilising the *CL:AIRE DoW CoP* from an alternative development site, then only chemically certified, clean, naturally occurring material can be transferred.

If required, the MMP will be created with due consideration of all proposed remediation and enabling works operations prescribed within this document and will be undertaken by a qualified person with a signed declaration submitted to the EA prior to reuse of materials on the site.

The importation of material for use within the proposed construction of a development platform will be subject to the compliance with the protocol for the importation of materials as set out within the Specification for material import included within Appendix D of this report.

8. ENVIRONMENTAL MONITORING AND VALIDATION

8.1. SITE MANAGEMENT

The tracking of materials will be based on the following hierarchy:

The principal contractor will have the responsibility for setting out areas of the site on the basis of the contract specification.

Operatives will have instructions only to excavate and to emplace materials in specified areas as assigned by the site manager/foreman.

The site manager (employed by the principal contractor) will issue daily instructions to drivers regarding the placement of materials sourced from specific stockpiles or areas, ensuring that appropriate documentary evidence is collected that details which materials are going where and why.

A Geo-Environmental consultant, who will be in attendance as required, will:

Inspect the excavation areas and certify that the correct materials are being excavated;

Conduct spot checks on loaded vehicles to ensure compliance with this remediation strategy; and

Ensure that any loads that fail visual, olfactory, or spot checks either remain on the vehicle or, if unloaded, are excavated, and set aside. This material will be treated according to the recommendations of the Geo-Environmental site engineer.

The appointed Geo-Environmental consultant will conduct an audit of waste consignment notes. All material imported and removed from site will have duty of care/consignment notes, copies of which will be retained on site by the site manager.

8.2. COMPLETION

Following the completion of the remediation works, a report will be compiled by the environmental consultant detailing all site enabling works undertaken, waste consignment notes, and all site investigations, laboratory test certificates and validation testing undertaken.

A certificate of completion of earthworks should be included within the report which should then be issued to the local authority for their approval.

Murray Rix considers that with the adoption of the above best practices the site can be safely redeveloped. The site enabling works process and presence of any residual contamination (if this is the case) should be recorded for future reference by landowners/occupiers. Future development at the site where this may result in penetration of new areas of hardstanding should be subject to no-less-stringent measures with respect to assessment and, where appropriate, monitoring, than those set out herein.

8.3. MITIGATION OF RISK FROM SOILS WITH ASBESTOS FIBRES

8.3.1. PRE-COMMENCEMENT WORKS

Prior to the commencement of works the following requirements must be satisfied:

Induction of all people that will be involved with the proposed site works; and

All methodologies must be agreed upon by all parties involved.

8.3.2. CONTROL, MONITORING AND REPORTING OF GENERAL AERIAL EMISSIONS FROM DUSTS AND PARTICULATES

DAMPING DOWN OF SOILS – MITIGATE PARTICULATE (DUST) EMISSION

During excavation, as outlined within the detailed working methodologies, soils will be regularly damped down using water to control the generation of dust (this may also comprise precipitation). The contractor will determine the best form of dust suppression to be used when a detailed programme has been issued.

If any previously unidentified asbestos-containing materials are identified, these should be dealt with in strict accordance with the *Control of Asbestos Regulations* (2012) and industry best practice as detailed in CIRIA 733.

GENERAL CONTROL OF DUST

The following control measures should be utilised to ensure that dust levels are kept to a minimum at all times:

Where necessary, haul road, work areas and stockpiles will be damped down with water spray.

The application of water to haul roads, work areas and stockpiles should be closely monitored by the resident engineer to ensure that soils are not saturated and, therefore, that the potential for water run-off is appropriately mitigated.

Once completed, any stockpiles will be sealed by compacting at the surface.

Vehicle speeds and movements on site will be kept to a minimum (< 5 mph) during civil excavation works to reduce the potential to generate dust.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

In accordance with the HSE *Guidance Note em6: Asbestos Essentials, Personal protective equipment (including RPE)*, Murray Rix recommend that all site operatives present within the work area where potential asbestos-impacted soils are being excavated are supplied with the following personal protective equipment:

Overalls:

Disposable overalls.

Type 5 (BS EN ISO 13982-1) are suitable.

Cotton overalls hold dust and need specialist laundering.

Waterproof overalls for outdoor work.

Use oversized overalls - this will help to prevent ripping at the seams.

If the cuffs are loose, seal them with tape.

Avoid wearing a long-sleeved shirt as these are difficult to cover properly.

Wear the overall legs over footwear as tucking them in lets dust into footwear.

Wear the hood over the RPE straps.

Failure to utilise and correctly employ PPE will result in immediate cessation of works. Works will not be permitted to recommence until the individual has undergone further training in the use of PPE, or the individual is removed from the works area.

At this current time, with the levels of ACM identified within the soils, the above-listed PPE is not considered to be required for all site personnel during the entire management of these soils.

When handling asbestos-impacted soils during the enabling works, asbestos monitoring works should be conducted in accordance with, but not limited to, the following HSE legislation and guidance:

Health & Safety at Work Act 1974;

The Control of Asbestos Regulations 2012;

CL:AIRE, 2016. *Control of Asbestos Regulations 2012 - Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry guidance*;

Approved Code of Practice L143 Work with materials containing asbestos;

Management of Health and Safety at Work Regulations 1999;

HSE *Guidance Note HSG248 Asbestos, the analysts guide to sampling and analysis*;

HSE *Guidance Note HSG247 Asbestos: The licensed contractors' guide*; and

CIRIA 733 Asbestos in soil and made ground: a guide to understanding and managing risks.

If required, air monitoring in accordance with HSG248 will be undertaken intermittently throughout the duration of the works at a frequency to be determined by the contractor, entirely dependent on whether asbestos-impacted soils are being handled at any given time. In general terms, during anyone monitoring period, ten standard monitoring pumps will be run throughout the day, for the appropriate time period to achieve the required limit of detection. These slides will be analysed as soon as possible by the off-site UKAS accredited laboratory.

Once any monitoring has been analysed by the off-site UKAS-accredited laboratory, the results will be delivered to the resident engineer who will then follow the correct site procedure. The results will then be included within the verification report.

9. GEOTECHNICAL ENGINEERING SPECIFICATION

9.1 GEOTECHNICAL ENGINEERING SPECIFICATION

Not required for this site.

10. RECORD-KEEPING AND VERIFICATION

10.1. RECORD-KEEPING

During the course of the remediation and site enabling works, the on-site Geo-Environmental consultant will undertake the following record-keeping protocols:

Detailed daily site diary including material movements;

Sampling register, testing results, photographs, details of locations of asbestos-impacted soils (drawings), details of hotspot removals, details of consignment notes of any asbestos impacted material that is required to be disposed of offsite; and

Record-keeping on site, in particular movements and analysis of specific material types, will be in the form of site diaries and a remediation excavation record. This record will remain on site and will be completed by the Geo-Environmental on-site engineer during the course of the remediation and site enabling works.

The contractor will keep a record of the following:

Detailed surveys (volumes) which are to be completed by the contractor.

10.2. VERIFICATION

The records listed above will then be compiled into a validation report produced by the appointed consultant on completion of the remediation and site enabling works, clearly referencing the origin of the materials used and testing carried out to confirm its suitability for use, where required. The consultant will also prepare an as-built development drawing clearly detailing the materials present on site to be cross referenced with the supporting validation documentation.

The validation report will include the following:

Remediation strategy (including copies of confirmation from regulatory authorities agreeing criteria);

Detailed surveys of all excavations and production of as-built drawings for the earthworks;

Copy of consignment notes relating to the movement of wastes to a licensed waste management facility;

Detailed drawings showing all sampling locations for both chemical and geotechnical testing;

Chemical test results;

Geotechnical test results;

Details of qualified persons signed declaration; and

Monitoring results if undertaken (e.g., asbestos in air, gas water).

11. CONTINGENCY PLAN

11.1. PREVIOUSLY UNIDENTIFIED CONTAMINANTS

Should significantly impacted material be encountered during the development, then it will be excavated and stockpiled on an impermeable material and sampled and tested for an appropriate range of determinants.

Once the laboratory analysis of the material is available, an assessment will be undertaken to determine whether it can be retained on site as part of the material management plan or whether it should be disposed of offsite.

Depending on the nature of any such impact, it may be necessary to undertake validation testing of the excavation faces in order to demonstrate that no such materials are left in situ.

12. SECOND PHASE MITIGATION AND MANAGEMENT – BUILD PHASE

This document details the construction works that are required to ensure full compliance with the remediation Strategy, Regulatory Authorities, Building Control & Warranty Providers;

The following should be implemented during the build phase of the development:

Laboratory testing of the imported topsoil;

Chemical validation of any additional subsoil imported for use within soft landscaped area's;

Placement and validation of sub-soil (clean material) in a 450mm layer within any plots where the material was not placed during the Remediation & Enabling works; and,

Placement and chemical validation of imported topsoil within all soft landscaped areas.

The validation protocols are presented within the Murray Rix Remediation and Enabling Works Strategy and are presented below.

12.1. PLACEMENT OF COVER SYSTEM

A cover system could be utilized for this site to effectively manage surface-level contamination. By installing a protective barrier over impacted areas, the cover system would reduce direct contact and minimize contaminant migration. This approach is suitable given the site's contamination profile and would ensure a stable, low-maintenance solution aligned with regulatory requirements.

12.1.1. PROCEDURE FOR PLACEMENT OF CHEMICALLY SUITABLE COVER SYSTEM

Garden and landscaped areas need to be backfilled with 450mm chemically validated subsoil, with 150mm topsoil overlaying this. Topsoil is required to be confirmed as chemically suitable prior to placement. Where sub-soil is not placed during Remediation & Enabling works, the contractor will be required to attend site and undertake independent validation of the correct placement of sub-soil. The placement of 600mm of clean material will be undertaken during the build phase works of the project.

The placement of subsoil and corresponding validation will be documented within the Validation Letters (to be issued on completion of the contractor's works).

If proposed utilities are to be placed within the cover system, the clean cover should be placed prior to installation of these utilities.

If natural drift deposits are encountered, excavation can cease here.

The contractor will collect photographic evidence of the placement of 150mm of certified topsoil and 450mm of subsoil on completion of construction works for all soft landscaped areas (to be agreed with the Local Authority). This element will also be checked by the Building Control Officer as part of the site completion prior to issuing of a CML certificate.

The validation procedure is detailed in Table 13.1.

TABLE 13.1 GARDEN VALIDATION PROCEEDURE

PROCEDURE	METHOD
Chemical Validation	Imported sub-soils and topsoil will need to be chemically analysed to confirm suitability for use with the proposed cover system prior to installation and completion of the garden systems. Murray Rix will issue an email to the appropriate party with an assessment of the chemical suitability of both sub soils and topsoils. If acceptable the materials can be installed to the required depth at which time the plot will be deemed complete following a validation procedure by a suitability qualified engineer.
Trial Holes	Trial holes are deemed necessary for every garden area (to be agreed with the NHBC and Local Authority) plots given that the 600mm cover system will need to be placed on each plot during the build phase.
Validation	Validation Photographic evidence will be taken by Murray Rix of the topsoil placement demonstrating the depth of topsoil and practical completion of works are required for each garden area (to be agreed with the Local Authority). For plots where sub-soil depths require validation by Murray Rix during the build phase, photographs will be taken and collated by Murray Rix.

Validation Certificate	Once the photographs of the placement of topsoil (over the clean material) have been provided, The appointed Engineer will issue a plot specific validation certificate to demonstrate that the required subsoil and topsoil has been placed in the required garden plots along with the chemical analysis.
Completion Report	Upon completion of all garden and landscaped areas within the development, a Completion Report will be issued providing the confirmation that all remediation requirements have been achieved.

Plate 1 provides an example of a garden validation photographs that will be required for each plot.

PLATE 1 EXAMPLE PLOT COVER SYSTEM VALIDATION

Plot No: 70		
Depth of Strata (m bgl)	0.00-0.15	Validated TOPSOIL
	0.15-0.60	Validated SUBSOIL

Depth of Cover System Materials	***Depth of Cover System Materials***
	
Depth of Cover System at Ground Level	***Depth of Cover System in Relation to Plot***
	

R

SYSTEM VALIDATION

Signed
For Murray Rix

J. Taylor BSC (Hons), FGS
Senior Geo-Environmental Engineer

Date March 2025

Project Number MRN 25142/1/RE
Version 1 – Final

END OF REPORT

APPENDIX A
LIMITATIONS

1. This report and its finding should be considered in relation to the terms of reference and objectives agreed between Murray Rix 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. Murray Rix 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 Murray Rix 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 Murray Rix In this connection without their explicit written agreement there to by Murray Rix

10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

APPENDIX B
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	Charted 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
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
p	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 C
PREVIOUS REPORTS

Geo-Environmental Ltd

Consulting Geo-Environmental Engineers

Phase 2 Geo-Environmental Assessment

CRFCA
YH08 – Mirfield Air Training Corps

Report Ref:
23109-PWAG-00-XX-RP-G-2000-P01

Prepared for:
Integra Buildings Ltd

Date:
March 2024

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DOCUMENT CONTROL SHEET

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Client: Integra Buildings Ltd

Report Ref: 23109-PWAG-00-XX-RP-G-2000-P01

Project: Mirfield Air Training Corps

Report: Phase 2 Geo-Environmental Assessment

Proposed Development: cadet building

Status: Preliminary

Date: March 2024

Document Production Record

Issue Details	Name	Signature
Prepared By:	Charlie Kelly	
Checked By:	Ian Parkinson	
Approved By:	Ian Parkinson	

Document Revision Record

Issue No	Date	Revision Details
P01	08/03/2024	Original Issue

Executive Summary

PWA Geo-Environmental Ltd (PWAG) was commissioned by Integra Buildings Ltd to undertake a Phase 2 Geo-Environmental Assessment for a proposed cadet hut located at Mirfield Air Training Corps. A summary of salient geo-environmental issues is provided below. However, the full report must be read in its entirety.

Key Details	
Site Description	The site is approximately 0.2 hectares, is located on the west of Mirfield and can be located by national grid reference SE 19365 20286. The site currently comprises of an area of hardstanding with two single story modular buildings and a shed. Theres a steep landscaped banking along the south and eastern of site with building rubble along the base of the southern bank. Numerous large trees run along the north east and west of site. Metal palisade fencing borders the site on all sides with an access gate to Huddersfield Road on the northern side.
Site History	The earliest maps show in 1855 the site as an undeveloped. There are a number of residential buildings on the east of site between 1888 - 1977. The site remains empty till a building labelled club appears in 1990, with the second building appearing in 2010.
Mapped Geology	The BGS 1:10,000 SE12SE (1999) indicates that the site is comprised of made ground overlying bedrock of Clifton Rock.
Radon	The property is not within a Radon Affected Area. The site is identified as an area where between less than 1% of properties are above the action level. No radon protection measures are required for developments undertaken in these areas. The requirement for radon protection measures for any proposed development should be confirmed with local building control.
Potential Contamination	The preliminary environmental risk assessment for the site identified potential sources of contamination associated with the made ground.

Geo-Environmental Findings	
Site Works	Fieldwork undertaken in December 2023 comprised 2 cable percussive boreholes drilled to depths of between 14.50 to 15.60 m bgl.
Summary of Ground Conditions	Made ground was encountered in all locations and was typically comprised of a layer of tarmacadam over sometimes yellowish brown or grey clayey silty sandy GRAVEL, silty sandy gravelly CLAY or clayey silty gravely SAND with medium to high cobble content and rare brick, coal and or pottery. Underlain by superficial deposits of Mostly yellowish or orangish brown, occasional sandy gravelly CLAY or occasionally clayey sandy GRAVEL with a medium to high cobble content. Below which a grey mudstone bedrock was encountered at 13.50 m bgl in CP02.
Contamination	Contamination on site is considered wide spread, with PWA-Geoenvironmental and G&M Consulting identifying elevated levels above the GAC's for a residential land use for lead, arsenic, and speciated PAH's. G&M Consulting also identified asbestos within the made ground at 1.00 m and 3.00 m bgl.
Foundations and Floor Slabs	Given the depths to suitable founding strata it would be prudent to consider the use of deep foundations such as piles or ground improvement techniques. The unit that is proposed on site is a prefabricated modular unit and therefore will arrive on site with the floor slab already constructed. These floor slabs are suspended.
Road and Paved Areas	The made ground present at shallow depth are likely to provide a CBR value of at least 4%.
Sulphate Class	Sulphate class DS-3, AC-3 within the made ground and DS-1, AC-1 in the underlying natural deposits have been allocated based upon chemical testing of soils done by G&M Consulting.

Contaminated Land Risk Assessment

Based on the information contained in this report, and with due regard to the proposed residential development, the site represents a moderate/low risk with respect to contaminated land liability issues in its current condition. Following remediation the site is expected to represent a low risk.

Recommendations

We recommend that copies of this report should be provided to:

- a structural engineer so that appropriate building foundations, floors and structures can be designed; and
- the appropriate regulator for review and comment before undertaking any additional work; and
- the implementation of 600mm clean cover system.

Contents

Appendices

Appendix A – Drawings

Drawing No.	Title
230711-015.03	Site : layout : proposed
23109-PWA-00-XX-DR-G-2001	Exploratory Hole Plan
23109-PWA-00-XX-DR-G-2002	Ground Model

Appendix B – Exploratory Hole Logs

Appendix C – Geotechnical Laboratory Results

Appendix D – Geochemical Testing Results

Appendix E – Historic Borehole Logs

Appendix F – Dynamic Cone Penetrometer Results

Appendix G – Risk Evaluation

1 FOREWORD

This report has been prepared for the sole use and reliance of Integra Buildings Ltd (the Client) and cannot be relied upon by any other parties without the express written authorisation of PWA Geo-Environmental Ltd. Any unauthorised third party relies on this report at their own risk and the authors owe them no duty of care.

The report presents observations and factual data obtained during our site walkover, along with information reviewed during the desk study and intrusive works and provides an assessment of geo-environmental issues with respect to information provided by the Client regarding the site. There may be other conditions on site not encountered during this investigation and which have not been examined. We cannot accept responsibility for any conditions not revealed by this investigation and confirmation of ground conditions between exploratory locations should be undertaken if considered necessary. Any spatial inference of ground conditions between investigation locations are for guidance only and no liability can be accepted for their accuracy.

The groundwater conditions encountered on site and recorded on exploratory records are those observed at the time of investigation. The normal rate of investigation does not enable the recording of an equilibrium water level. Furthermore, groundwater levels are subject to seasonal variation, changes in weather and changes in local drainage conditions. Therefore, this information is provided for guidance only and no liability can be accepted for their accuracy.

The report should be read in its entirety, including all associated drawings and appendices. PWA Geo-Environmental Ltd cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context.

The findings and opinions conveyed in this report (including review of any third-party reports) are based on information obtained from the sources listed, which PWA Geo-Environmental Ltd understands are reliable. All reasonable skill, care and diligence has been applied in examining the information obtained. However, PWA Geo-Environmental Ltd accepts no responsibility for inaccuracies in the data supplied or for opinions based on any such inaccurate data.

Where the report refers to the potential presence of invasive weeds such as Japanese Knotweed, or the presence of asbestos containing materials, it should be noted that the observations are for information only and should be verified by a suitably qualified expert.

PWA Geo-Environmental Ltd reserves the right to amend their conclusions and recommendations in the light of further information that may become available.

2 INTRODUCTION

2.1 The Commission and Brief

PWA Geo-Environmental Ltd (PWAG) was commissioned by Integra Buildings Ltd to undertake a Phase 2 Geo-Environmental Assessment for a proposed cadet building development located at Mirfield Air Training Corps. The overall objectives were to:

- Investigate ground conditions to confirm the depth and characteristics of possible made ground, natural superficial deposits and underlying bedrock;
- Provide preliminary geotechnical and geo-environmental recommendations for developing the site; and
- Provide recommendations for further work where necessary.

This report presents the factual information collected during this assessment, interpretation of the data obtained and recommendations relevant to the commission and brief. General notes and limitations relevant to all PWA Geo-Environmental Ltd investigations are described in the Foreword. These should be read in conjunction with this report. Should this report not address particular questions relevant to your requirements then this must be brought to our attention in advance of any works commencing so we can determine what additional work is needed.

2.2 The Proposed Development

The development proposal for the site comprises a one-storey modular cadet hut with associated hardstanding and landscaped areas. A site location plan is shown on Drawing No. 230711-015.03 and is included in **Appendix A**. It is assumed that levels will not be significantly different to those existing. Any changes to the proposed layout, site levels and/ or end use will require amendments to this report.

2.3 Geo-Environmental Assessment Methodology

Key aspects of this Phase 2 are summarised as follows:

- Undertake three days cable percussive drilling to undertake in-situ tests to obtain strength data, and collect geotechnical and geoenvironmental samples;
- Assessment of potential contamination;
- Assessment of anticipated ground conditions;
- Assessment of geotechnical properties of the near surface deposits to enable provision of foundation and highway recommendations;
- Preparation of a conceptual site model and preliminary risk assessment including recommendations for further investigation, if required.

This review relied on published information and information provided by the client and other parties, including anecdotal information, during the given time. PWAG cannot accept responsibility for the reliability and authenticity of information or reports prepared by third parties.

3 SITE DETAILS

3.1 Site Location and Description

Table 1. Site Location and Description	
Address	2 Huddersfield Rd, Mirfield WF14 9DQ
National Grid Reference	SE 19365 20286
Area	0.2 Hectares
Site Description	The site is approximately 0.2 hectares, is located on the west of Mirfield and can be located by national grid reference SE 19365 20286. The site currently comprises of an area of hardstanding with two single story modular buildings and a shed. Theres a steep landscaped banking along the south and eastern of site with building rubble along the base of the southern bank. Numerous large trees run along the north east and west of site. Metal palisade fencing borders the site on all sides with an access gate to Huddersfield Road on the northern side.
Location	

Table 1. Site Location and Description		
	Figure 1. Site location	
Ground Cover	**Ground Cover**	**Estimated percentage**
	Buildings and sheds	35%
	Hardstanding	25%
	Gardens and landscaped areas	40%
Known Services	Known services on site include electricity running from the eastern cadet hut to Huddersfield road, and drainage running from the east from that building, marked by thee man holes.	
Current Use	Cadet building	
Proposed Use[1]	cadet building	

3.2 Geology

The geology of the site has been obtained from publicly available information, the British Geological Survey (BGS) published geological map covering the site and the BGS GeoIndex Onshore viewer. These indicate that the geology comprises made ground overlying bedrock of Clifton Rock.

Figure 2: Geological Setting (reproduced from 1:10,000 SE12SE 1999)

1. Different site uses may introduce changes to pollutant linkages that are not considered in this report.

The BGS GeoIndex identifies two borehole records located 250 m north of the site and the historical borehole logs are included in **Appendix E**. These identified 0.3-0.5 m of topsoil over 0.5m of firm silty sandy gravelly CLAY underlain by sandstone bedrock, proven to 1.15m bgl.

4 PREVIOUS REPORTS

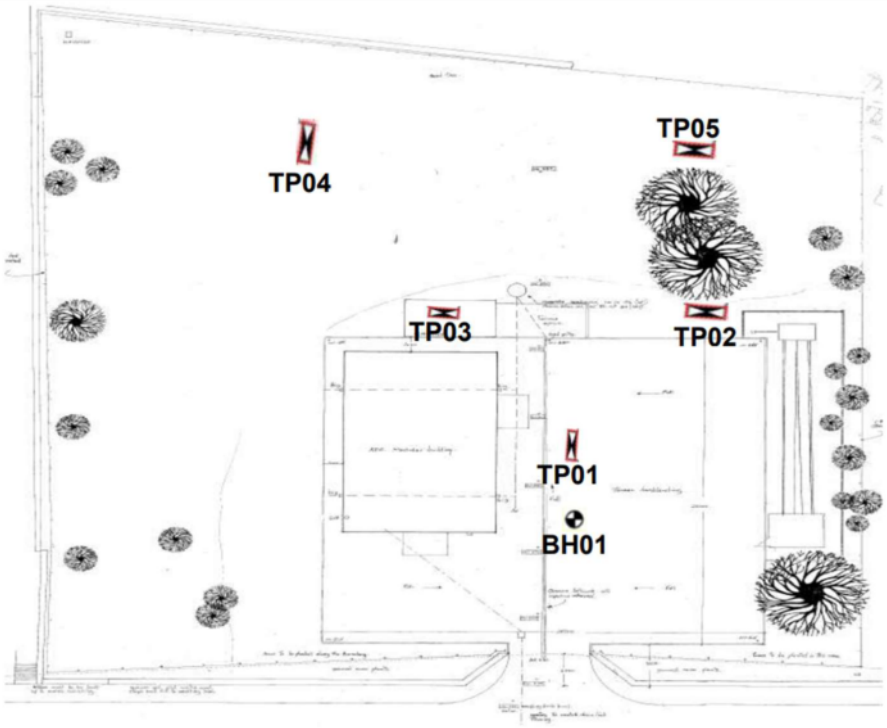
Previous reports include:

- G&M Consulting Ltd (November 2022). Geoenvironmental Appraisal of land at Mirfield Air Training Corps, Huddersfield Road, Mirfield, West Yorkshire.

Key findings of this are summarised below:

Table 2. Summary of Previous Findings

Site History	The earliest maps show in 1855 the site as an undeveloped. There are a number of residential buildings on the east of site between 1888 - 1977. The site remains empty till a building labelled club appears in 1990, with the second building appearing in 2010.
Published Geology	Area of land fill shown on site with no superficial deposits. Bedrock is the Pennine Lower Coal Measures Formation with the Clifton Rock Within.
Mining and Quarrying	According to the Coal Authority interactive map the site is not positioned within a 'development high risk area'. Inspection of the OS Plans does not indicate evidence of quarrying on site, or in the immediate vicinity.
Hydrogeology	Information provided by the EA indicates that the underlying bedrock (Pennine Lower Coal Measures) is classified as a 'Secondary A'
Hydrology	According to the GroundSure report, the closest identified surface water feature is 111m to the south west and shown as the River Calder.The southern boundary of the site is shown to lie within a Flood Zone 3 area.
Radon	The GroundSure report contains information on Radon Affected Areas as defined by the Health Protection Agency (HPA) and indicates that the site is within an area where less than 1% of properties are affected by Radon.
Scope of Works	Five trial pits were excavated to a maximum depth of 3.90 m bgl and one cable percussive borehole was drilled to 11.45 m bgl. Chemical testing was carried out on nine samples for heavy metals, five for water soluble sulphate and pH, six for phenol, ten samples for speciated PAHs and six for asbestos identification. Geotechnical testing included eight moisture contents, four Atterberg Limits and four water soluble sulphate.
Ground Conditions	Made ground was encountered in all exploratory holes, with proven depths of 1.6-4.3 m bgl and typically consisted of dark brown gravelly clayey fine to coarse SAND with becoming slightly clayey and very gravelly in places, with some cobbles and boulders. The gravel content comprised of brick, concrete, limestone, clinker, slate, and mudstone. Superficial deposits comprised of a soft / firm light brown slightly to very sandy sometimes gravelly CLAY underlain by slightly clayey gravelly SAND and light brown subangular to rounded fine to coarse gravel. Topsoil was not encountered.

Table 2. Summary of Previous Findings	
Exploration Location Plan	
Visual and Olfactory Evidence of Contamination	Probable ACMs were encountered in TP02. No other visual or olfactory evidence of contamination was noted.
Ground Gases	BH1 Installed with gas monitoring equipment, six rounds of monitoring were conducted. The has been characterized as CS1.
Chemical Testing	When compared to LQM/CIEH and DEFRA C4SL's Generic Assessment Criteria for Human Health Risk Assessment, elevated levels of arsenic, lead and PAH speciates were recorded in samples of the made ground along with asbestos (Chrysotile, amosite, and crocidolite), that was identified in two samples. Ground conditions regarding concrete classification have been calculated at DS-3 in the made ground and DS-1 in the underlying natural soils.
Geotechnical Findings	Made ground was deemed unsuitable for constructing foundations in and was too deep to extend shallow footings through. As such, a pied solution was recommended. An alternate solution of ground improvement was also suggested, utilising a raft foundation on top of the treated made ground.
Recommendations	Recommendations given by G&M are; • Implementation of a clean cover system to deal with the limited contamination identified on site. • Raft foundation solution if the made ground is treated by ground improvement, or a piled foundation solution if not.

5 FIELDWORK

5.1 Scope of Fieldworks

Fieldwork was supervised by PWA Geo-Environmental Ltd and comprised:

Table 3. Scope of Fieldworks			
Start date:	19/12/2023	**End date:**	21/12/2023
Site Works Summary Fieldwork undertaken in December 2023 comprised two cable percussive boreholes drilled to depths of between 14.50 to 15.60 m bgl.			

Table 3. Scope of Fieldworks			
Technique	**Exploratory Holes**	**Depths**	**Comments**
Cable percussive	CP01-CP02	14.50 – 15.60 m	To characterize shallow ground conditions, undertake in-situ testing to obtain strength data (standard penetration tests (SPTs)), and collect representative samples for laboratory testing. Evaluate potential depth to bedrock. The objective was to determine the suitability of the ground for constructing foundations for the proposed structures.
Hand pits	HP01-HP08	0.1 – 0.2 m	To sample shallow made ground for chemical testing.

Descriptions of strata and groundwater observations made during investigation works, together with samples recovered and the results of all in situ field testing, are presented on the exploratory hole logs in **Appendix B.** Exploratory hole locations are shown on Drawing No 23109-PWAG-00-XX-DR-G-2001-P01 in **Appendix A**.

5.2 Sampling Strategy

The principal objectives were to understand the sub-surface conditions and how they will influence bearing capacity and concrete classification, investigate possible contamination identified in the geoenvironmental appraisal, and provide recommendations for the proposed development. The site investigation was designed to investigate the location of the proposed development and provide general site coverage where access could be gained.

5.3 Geotechnical Laboratory Testing

Geotechnical laboratory testing on selected samples was carried out under subcontract with a UKAS-accredited laboratory. Geotechnical test results are presented in **Appendix C**.

Table 4. Geotechnical Laboratory Testing		
Type of sample	**Particle Size Distribution**	**Water Soluble Sulphate and pH**
Superficial deposits	3	3

5.4 Chemical Laboratory Testing

Selected samples of the topsoil and made ground were tested for a range of potential contaminants under subcontract with a UKAS and MCERTS accredited laboratory. Chemical test reports, as received from the laboratory, are presented in **Appendix D.** The testing was designed to supplement the contamination findings discussed in the report by G&M Consulting (November 2022).

Table 5. Chemical Laboratory Testing		
Type of sample	**No. of samples**	**Determinands**
Made ground	8	Heavy metals, total petroleum hydrocarbons (TPH), poly aromatic hydrocarbons (PAHs), and asbestos identification

6 GROUND CONDITIONS

6.1 Ground Conditions Encountered

A summary of ground conditions encountered is presented in the Conceptual Ground Model presented as Drawing No. 23109-PWAG-00-XX-G-DR-2002-P01 in **Appendix A**. **Table 6** provides a summary of the strata encountered:

Table 6. Summary of Ground Conditions Encountered		
Summary of Ground Conditions Made ground was encountered in all locations and typically comprised a layer of tarmacadam over sometimes yellowish brown or grey clayey silty sandy GRAVEL, silty sandy gravelly CLAY or clayey silty gravely SAND with medium to high cobble content and rare brick, coal and or pottery. This was underlain by superficial deposits of mostly yellowish or orangish brown, occasional sandy gravelly CLAY or occasionally clayey sandy GRAVEL with a medium to high cobble content. Grey mudstone bedrock was encountered at 13.50 m bgl in CP02.		
Strata	**Depth Encountered (Thickness)**	**Description and Distribution**
Made ground	Ground level (4.30 to 5.30 m)	Made ground was encountered in all locations and was typically comprised of a layer of tarmacadam over sometimes yellowish brown or grey clayey

Table 6. Summary of Ground Conditions Encountered		
		silty sandy GRAVEL, silty sandy gravelly CLAY or clayey silty gravely SAND with medium to high cobble content and rare brick, coal and or pottery. The Gravel typically constituted of angular to subrounded fine to coarse sandstone and mudstone.
Superficial deposits	4.30 – 5.30 m bgl (9.20 to 10.30 m)	Mostly yellowish or orangish brown, occasional sandy gravelly CLAY or occasionally clayey sandy GRAVEL with a medium to high cobble content. CP01 encountered a yellowish brown, gravelly SAND layer with a high cobble content 6.50 – 8.20 m bgl. Gravel was typically angular to sub-rounded fine to coarse sandstone and mudstone.
Presumed mudstone bedrock	13.50 m (Unknown thickness)	Bedrock was encountered in CP02 at 13.5 m bgl as grey mudstone, recovered as grey angular coarse GRAVEL.

6.2 Stability

No borehole instability was observed during the investigation.

6.3 Obstructions

No obstructions were encountered within superficial strata.

6.4 Visual and Olfactory Evidence of Contamination

There was no visual or olfactory evidence of contamination within any cable percussive or hand pit position.

6.5 Groundwater

Groundwater was encountered in both cable percussive position during this investigation.

Below is a table showing where and at what depth water strikes were encountered during the investigation.

Table 6. Groundwater Observations.		
Location	**Depth (bgl)**	**Comment**
CP01	9.60 m	Encountered within gravel.
CP02	9.10 m	Encountered within gravel.

However, water levels are likely to fluctuate with the seasons/rainfall and therefore may be substantially higher at wetter periods of the year, compared to those recorded during this investigation.

6.6 Classification Tests (Particle Size Distribution)

Three particle size distribution (PSD) tests were completed at depths between 6.00 – 10.50 m bgl. The testing has confirmed that the geological logging of the soil at the time of the investigation was generally correct.

The material was classified in accordance with Table 6/1 of the Specification for Highways Works (SHW) Series 600 Earthworks revealing:

Table 7. Material Classification Summary						
Sample & Depth	**Description**	**Cobbles (%)**	**Gravel (%)**	**Sand (%)**	**Silt/Clay (%)**	**Material Classification**
CP01: 9.00 m	Brown sandy clayey GRAVEL	0	72	17	11	Class 1A Well graded granular material
CP01: 10.50 m	Brown sandy slightly silty GRAVEL	0	83	15	2	Class 1A Well graded granular material
CP02: 5.10 m	Brown very sandy very clayey GRAVEL	0	42	28	30	2C Stony cohesive material

6.7 Standard Penetration Tests (SPT) – Fine Grained soils

Three SPTs were undertaken in fine grained soils. At 13.50 m bgl in CP01, and at 5.00 m and 12.00 m bgl in CP02. The corrected N60 value at 13.50 m bgl in CP01 was 143, and was presumed to be weathered bedrock. At CP02 it was 27 at 5.00 m and at 12.00 m it was 55.

The SPT 'N' value within the cohesive material ranged between 27 to 143 blows, the results are indicative of stiff to very stiff deposits, and the results indicate an increase in penetration resistance with depth. Where refusals were observed, engineering judgement was applied regarding whether refusal was due to an obstruction or strength of the material. If the SPT results were considered valid then this was extrapolated using a simple linear extrapolation to determine the estimated N-value per 300 mm.

Indicative undrained shear strengths of cohesive soils can be derived by applying a correlation to SPT 'N' values according to the material's plasticity after Stroud. Based on the average recorded plasticity index of 25% a correlation factor of approximately 5 can be applied. Using Stroud's correlation, the SPT 'N' values indicate undrained shear strengths of:

- Cu = 137 kPa @ 5 m bgl in CP02
- Cu = 274 kPa @ 12 m bgl in CP02

These values indicate that the material is high strength.

The result from CP01 has been removed as this is presumed to have encountered weathered bedrock.

6.8 Standard Penetration Tests (SPT) - Coarse Grained Soils

Seven standard penetration tests (SPTs) were undertaken in coarse grained soils, at 1.20 m bgl, and metre intervals following that, until 7.50 m bgl, at which point the intervals became 1.50 m intervals until 12.00 m in CP01, and 10.50 m in CP02. The corrected N60 values range between 14 – 117 blows, with three being >50 blows. The remaining values range between 14 – 27 indicating them to be medium dense gravels. The areas where > 50 blows were need was believed to have been areas of very dense gravel, that required chiseling.

The SPT results have been used to derive a conservative characteristic friction angle, of 36°.

6.9 Field Determination of California Bearing Ratio

One Dynamic Cone Penetrometer Tests (DCP) were undertaken within the existing car parking area to determine California Bearing Ratio (CBR) values to inform car park design. The testing was undertaken in accordance with Transport Research Laboratory (TRL) methodology. The results of the testing are presented as **Appendix F.**

Before testing began a small area of tarmac was excavated and the DCP was carried out on the underling soils. The DCP tests showed a CBR value in the top 100-250mm around 40-50% which sharply increased for the next 50mm returning values in the hundreds with a peak of 431%. Below which the CBR stabilized out to an average CBR value of 15-20%. The average overall CBR value was 74.5% with the minimum being 4%.

The peak values likely correlate to the obstruction within the soil, likely a cobble. As such the average CBR given Is likely greater than reality. Taking that into consideration, a typical CBR value of 3% is considered suitable for pavement design purposes in the made ground although this must be confirmed by plate load testing.

6.10 Soluble Sulphate and pH

The Aggressive Chemical Environment for Concrete classifications for the soil types identified at the site have been determined in general accordance with BRE Special Digest 1:2005 (SD1). SD1 requires that sites are first identified as being in one of four categories based on natural ground / 'Brownfield' conditions and pyrite content. The site has been categorized as: Brownfield - Non-pyrite with a mobile groundwater regime.

The Water-Soluble Sulphate Values (mg/l SO4) of natural soils at the site based on the testing carried out varied from 100 to 510 mg/l and the pH value ranged from 7.1 to 8.1. As the characteristic value of sulphate is less than 3,000 mg/l and the characteristic pH is greater than 5.5, the concentrations of magnesium, nitrate and chloride are not considered significant in determining the design sulphate class.

G&M Consulting carried out testing on three samples from the made ground and recorded Water-Soluble Sulphate Values of 41 to 1900 mg/l and pH values of 7.8 to 9.5. Testing was also conducted on two samples of natural soil which returned values of 60 mg/l and 120 mg/l and pH of 7.7 and 8.0.

Given the values the design sulphate class for the made ground is DS-3 and the underlying natural soil is DS-2.

7 RESULTS OF CHEMICAL TESTING

7.1 Assessment Criteria

All laboratory test data were reviewed for completeness and consistency. Those determinants that indicate potential contamination were subject to further evaluation. In this instance the dataset was considered representative of conditions encountered in those samples analysed.

For each potential contaminant of concern, analytical data for soil samples were compared to the relevant Generic Assessment Criteria (GAC) taken from the LQM/CIEH Suitable for Use Levels (S4ULs)[2]. Taking into consideration the proposed land use we have used values derived for a residential with homegrown produce end use. For those potential contaminants of concern where the selected GAC is dependent on Soil Organic Matter (SOM) content we have assumed 1% SOM unless otherwise indicated.

Where there are no applicable generic assessment criteria (GAC) for a given contaminant / parameter, it has been excluded from the table. Where analysis returned a concentration in excess of the GAC, the relevant sample is highlighted orange. In the cases where all the samples tested for a given substance were below the GAC, no further consideration is necessary for that substance.

Usually, statistical analysis of the results is undertaken in accordance with CL:AIRE statistics guidance. The purpose is to determine whether there is enough evidence that the true mean concentration of each determinant is less than the relevant GAC for that substance. On this occasion, statistical analysis has not been carried out due to the small data set.

7.2 Chemical Analysis - Soils

The chemical analysis certificates as received from the laboratory are presented in **Appendix D.** The information is summarised in **Table 8** and the samples analysed have the high total shown.

Table 8. Summary of Soils Analysis.

Determinand	GAC for residential with homegrown produce	Made Ground (Max)	Made Ground (Min)	Number of exceedances
Arsenic	37	42.3	14.2	1
Cadmium	11	1.8	0.4	0
Chromium	910	119	26.4	0
Copper	2400	93.7	44.2	0
Lead	200	884.8	124.6	4
Mercury, inorganic	40	0.6	<0.5	0
Nickel	180	54.5	22.9	0
Selenium	250	1	<0.5	0
Zinc	3700	796.1	246.5	0
Acenaphthene	210	0.47	<0.11	0
Acenaphthylene	170	0.28	<0.11	0
Anthracene	2400	0.84	0.4	0
Benzo[a]anthracene	7.2	3.31	0.9	0
Benzo[a]pyrene	2.2	3.28	1.02	3
Benzo[b]fluoranthene	2.6	3.86	1.2	3
Benzo[g,h,i]perylene	320	2.01	0.51	0
Benzo[k]fluoranthene	77	1.57	0.64	0
Chrysene	15	2.59	0.94	0
Dibenzo[a,h]anthracene	0.24	0.53	0.16	7
Fluoranthene	280	5.74	2.53	0

2. Nathanail, C. P., McCaffrey, C., Gillet, A. G., Ogden, R. C. and Nathanail, J. F. 2015. The LQM/CIEH <0.11S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham.0.5

Table 8. Summary of Soils Analysis.				
Determinand	**GAC for residential with homegrown produce**	**Made Ground (Max)**	**Made Ground (Min)**	**Number of exceedances**
Fluorene	170	0.35	<0.11	0
Indeno[1,2,3-cd]pyrene	27	2.06	0.5	0
Naphthalene	2.3	0.69	0.15	0
Phenanthrene	95	3.38	0.91	0
Pyrene	620	5.05	2.13	0
Total PAH 16	NA	5.05	12.6	0
Asbestos	NA	NAIIS	NAIIS	0

*Note: All units mg/kg unless otherwise stated. GAC = LQM/CIEH S4ULs. NA = Not applicable.

7.2.1 Made Ground

Eight samples were taken from the made ground from depths between 0.10 – 0.20 m bgl. A key objective was to evaluate the contamination findings from the G&M Consulting (November 2022) report. In summary, our findings were similar regarding arsenic, lead and PAHs. However, we did not identify asbestos in any of the samples tested.

Metals and inorganic analytes

One sample (from HP05) exceeded the GAC for arsenic of 37 mg/kg with a value of 42.3 mg/kg. This exceedance was considered quite minor although G&M (November 2022) reported 4 out of 9 samples tested above the GAC with results ranging from 37 to 140 mg/kg.

Four samples (from HP01, HP02, HP03, and HP05) exceeded the GAC for lead of 200 mg/kg with values in exceedance ranging between 252.8 - 884.8 mg/kg. G&M (November 2022) reported 4 out of 9 samples tested above the GAC with results ranging from 200 to 740 mg/kg.

All other samples were found to be below the GAC for metals and inorganic analytes.

Organics

Three samples (from HP03, HP05, and HP08) exceeded the GAC for benzo[a]pyrene of 2.2 mg/kg with values in exceedance ranging between 2.77 - 3.28 mg/kg. G&M (November 2022) reported 2 out of 10 samples tested above the GAC with results ranging from 11 to 20 mg/kg. It should be noted that G&M are using a less stringent GAC of 5 mg/kg.

Three samples (from HP03, HP05, and HP08) exceeded the GAC for benzo[b]fluoranthene of 2.6 mg/kg with values in exceedance ranging between 3.33 - 3.86 mg/kg. G&M (November 2022) reported 4 out of 10 samples tested above the GAC with results ranging from 2.8 to 17 mg/kg.

Seven samples (from HP01, HP02, HP03, HP04, HP05, HP06, and HP08) exceeded the GAC for Dibenzo[a,h]anthracene of 0.24 mg/kg with values in exceedance ranging between 0.26 – 0.47 mg/kg. G&M (November 2022) reported 4 out of 10 samples tested above the GAC with results ranging from 0.49 to 2.9 mg/kg.

While PWAG identified no samples in exceedance of the Benzo[a]anthracene GAC of 7.2 mg/kg, G&M (November 2022) reported 2 out of 10 samples tested above the GAC with results ranging from 10 to 18 mg/kg.

Asbestos

No asbestos was identified in any of the shallow PWAG samples. G&M (November 2022) reported 2 out of 6 samples tested had positive asbestos identification. Loose fibrous debris of amosite was identified in TP2 at 3.00 m bgl and loose fibrous debris of chrysotile, amosite, and crocidolite was identified in TP2 at 1.00 m bgl.

7.2.2 Phytotoxicity

Chemical testing results were compared with phytotoxicity criteria to determine if the soils could be harmful to plant life. The results are summarised in **Table 9**.

Table 9. Summary of Soils Analysis.				
Determinand	**Unit**	**Assessment criteria**	**Source Reference**	**Made ground (Max)**
Arsenic	mg/kg	250	MAFF 1998	42.3
Chromium	mg/kg	25	ICRCL 70/90 1990	119
Copper	mg/kg	<100	BS3882:2015	93.7
Nickel	mg/kg	<60	BS3882:2015	54.5
Zinc	mg/kg	<200	BS3882:2015	796.1

Based on the above results the soils tested at this site are potentially phytotoxic to plants, however current vegetation on site showed no sign of hardship.

8 RISK ASSESSMENT AND REVISED CONCEPTUAL SITE MODEL

8.1 Introduction

The preliminary conceptual site model given by G&M Consulting (November 2022) has been revised in light of the ground investigation and associated chemical analysis results, updating our understanding of surface and sub-surface features and contaminant sources.

Potential risks associated with asbestos containing materials in the fabric of the building are not considered in this assessment. We assume that these risks are identified on the facility's asbestos register and managed appropriately. At some time in the future, when the buildings require renovation/ demolition, we recommend that a further and more detailed pre-demolition asbestos survey is undertaken. Before renovation/demolition, all asbestos containing material must be removed from site by a suitably qualified contractor and supported by a detailed verification report.

Contaminated materials and their sources identified on site present concern on the condition that a potential impermissible risk exists. The possibility for harm to occur on site requires the fulfilment of three conditions:

- Source: The presence of substances (potential contaminants/pollutants), that may cause harm or pollution.
- Receptor: The existence of an entity that may become harmed from the Source.
- Pathway: A route that the Source takes to reach the Receptor.

Potential sources of contamination considered in the conceptual site model included the made ground. Generally, the potential risks were considered moderate/low. This was on the basis that the contamination is wide spread across the site including the landscaped areas. Given the buildings use as a cadet training hut it is likely that people will come into contact with the contaminated soil.

These finding have been used to update our understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors.

Table 10. Source, Pathway and Receptors		
Potential Sources of Contamination	**Potential Transport Pathways and Pollutant Linkages**	**Potential Receptors**
On-site sources Made ground.	• Direct exposure to potentially contaminated soils (direct contact, ingestion and dust inhalation). • Potential leaching of contaminants from made ground and the risk of infiltration into underlying groundwater. • Direct contact with conditions potentially aggressive to building materials and underground services.	**Controlled waters** • Underlying groundwater. • Surface water **Human Health** • Current site users. • Future site users. • Construction workers during redevelopment works. **Construction Materials** • Future buildings and services. • Underground services.

8.2 Qualitative Risk Assessment and Revised Conceptual Site Model

A qualitative risk assessment is undertaken of potential pollutant linkages following the guidance presented in **Appendix G**, and is based on consideration of both:

- The likelihood of an event (probability – considers both the presence of the hazard and receptor and the integrity of the pathway);
- The severity of the potential consequence (considers both the potential severity of the hazard and the sensitivity of the receptor).

Potential risks related to these plausible linkages are based on redevelopment of the site with a proposed residential end use assuming no mitigation is implemented. These are summarised in **Table 11**.

Table 11. Preliminary Environmental Risk Assessment

Source	Pathways to Receptor	Receptors	Associated Hazard [Potential severity]	Likelihood / Potential Mitigation	Potential Risk
Made ground	Direct contact, ingestion and dust inhalation	Current site users. Future site users.	Effect on human health [medium]	Low likelihood: Given the sites intended use, there is a chance that the cadets will come into direct contact with the surface material. No asbestos was identified in the surface samples collected. Potential mitigation measures include separating site users from the made ground. This could be achieved through a combination of the hardcover of the development and a clean cover system in landscaped areas.	Moderate/ low
		Construction workers.		Unlikely: Any risks can be mitigated by appropriate site management and use of suitable PPE during construction stage.	Low
	Leaching and infiltration	Controlled waters - groundwater	Leaching and infiltration into groundwater [Minor]	Low likelihood: Bedrock is secondary A aquifer and is of medium vulnerability.	Very low
		Controlled waters – surface water	Surface water runoff entering the river Calder. [Minor]	Likely: The site is in close proximity of the river Calder.	Low
	Direct contact	New in ground services and construction materials	Degradation [Mild]	Unlikely: Use of appropriate construction materials, chemical resistant supply pipes and use of oversized service trenches with clean fill can mitigate the risk	Very low

9 ENVIRONMENTAL RISK ASSESSMENT AND RECOMMENDATIONS

9.1 Human Health

G&M Consulting identified elevated levels above the GAC for a residential with plant uptake end land use for lead, arsenic, and speciated PAHs and identified asbestos within the soil. PWAGs following investigation identified elevated levels above the GAC for a residential with home grown vegetables end land use for lead, arsenic, and speciated PAHs. While residential with home grown vegetables end land is quite stringent land use for the site, we consider that a commercial end land use would not have been stringent enough for the end land use case.

Given the depth to the asbestos contamination it is unlikely that end users of the site will come into contact and the metal and organic contamination is not server, it is considered prudent that remediation measures are taken to protect the end user.

Where possible, the ground works on-site should be designed and planned to minimise the exposure of workers to contaminated soil. This should be considered in the Health and Safety plan under the CDM Regulations. Where risks cannot be removed entirely at the planning stage, mitigation measures should include the use of personal protective clothing (PPE) including gloves. Dust suppression measures should also be incorporated into the works to reduce ingestion and inhalation of contaminated dust.

9.2 Plant Life

Whilst there are large mature trees on site, the risk assessment indicates that the natural soils on site are considered potentially harmful to plant life. This should be reviewed by a suitably qualified landscape architect.

9.3 Radon

The site is within an area where no radon protection measures are required. This should be confirmed with local building control.

9.4 New Utilities and Water Supply Pipes

Given the contamination of the site we recommend that the use of barrier water supply pipes (such as Protecta-Line) may be acceptable. In addition, we recommend that the pipes are laid in trenches backfilled with clean granular material. However, we recommend that this is discussed with the water supply company before development starts to ensure they agree.

9.5 Outline Remediation Requirements

The made ground contamination is widespread across the site and as such it is recommended to implement a clean cover system. This should include 450 mm of clean topsoil and subsoil in gardens and landscaped areas, or hardstanding to act as a barrier between the contamination and future end users. Alternatively, the contaminated soil could be removed from site, but due to the extent of the contamination this is likely to be uneconomical.

Potential risks associated with asbestos containing materials in the fabric of the building are not considered in this assessment. We assume that these risks are identified on the facility's asbestos register and managed appropriately. At some time in the future, when the buildings require renovation/ demolition, we recommend that a further and more detailed pre-demolition asbestos survey is undertaken. Before renovation/demolition, all asbestos containing material must be removed from site by a suitably qualified contractor and supported by a detailed verification report.

9.6 Waste Management

The handling, re-use or disposal of waste is regulated by the Environment Agency. Any material excavated on-site may be classified as waste and it is the responsibility of the holder of a material to form their own view on whether or not it is waste. One of the ways this can be achieved is set out in the Definition of Waste: Development Industry Code of Practice (DoWCoP). This builds on the Environment Agency guidance document Definition of waste: developing greenfield and brownfield sites (2006). The Agency will consider the use of the DoWCoP in deciding whether to regulate materials as waste. If materials are dealt with in accordance with the DoWCoP, the Agency considers that those materials are unlikely to be waste at the point when they are to be used for the purpose of land development.

Good practice has three basic elements:

- Ensuring that an adequate Materials Management Plan (MMP) is in place, covering the use of materials on a specific site.
- Ensuring that the MMP is based on an appropriate risk assessment, concluding that the objectives of preventing harm to human health and pollution of the environment will be met if materials are used in the proposed manner.
- Ensuring that the requirements of the MMP are met.

All material proposed for off-site disposal (e.g. during future construction works) should be given a proper description and waste classification as required by the Environmental Protection Duty of Care Regulations, and in accordance with WM3 and the Environment Agency Technical Guidance on the assessment and classification of Hazardous Waste. Advice on the classification of wastes containing asbestos is provided in Chapter 3 of Environment Agency document 'Guidance on the classification and assessment of waste Technical Guidance WM3'.

9.7 Reuse of Site Won Material

This project may require the reuse of natural soils on site. Therefore, the contractor may need to prepare a Materials Management Plan (MMP) in accordance with the CL:AIRE Code of Practice (v2, March 2011). Alternatively, where quantities are small, a suitable exemption may be more appropriate.

The MMP will document how all of the materials to be excavated during the proposed site preparatory earthworks are to be dealt with. The MMP should also detail how materials will be tracked throughout the earthworks in order that the subsequent Verification Report can provide an auditable trail. Finally, the MMP will have to set out a Verification Plan that identifies how the placement of materials is to be recorded and the quantities of material to be used. It will contain a statement on how the use of the materials relate to the remediation or design objectives.

In the event that materials from this site are required to be transferred to other locations, or material is imported for landscaping, the MMP will assist with verification for regulatory authorities.

Once completed, the MMP will need to be reviewed by a Qualified Person (QP), who will sign a Declaration for submission to CL:AIRE and send a copy to the Client.

9.8 Unexpected finding protocol

If unexpected potentially contaminated materials (such as those with an unusual colour, odour or containing drums, chemicals or asbestos, etc) are encountered at any time during redevelopment then work should stop, and a suitably qualified environmental consultant contacted to provide advice on the appropriate course of action. This could be associated with former hydrocarbon storage equipment such as disused steel tanks and dispensing pumps.

10 GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

10.1 Proposed Development

This assessment has been prepared on the understanding that the development proposal for the site comprises a one-storey modular cadet hut with associated hardstanding and landscaped areas. A site location plan is shown on Drawing No. 230711-015.03 and is included in **Appendix A**. Finished floor levels have not been provided, therefore we have also assumed that the proposed levels will not be significantly different to those existing. If any of these assumptions are incorrect then the conclusions in this report will require reassessment.

10.2 Geotechnical Categorisation of the Proposed Development

Eurocode 7, Section 2 advocates the use of geotechnical categorisation of the proposed structure(s) to establish the design requirements. Initial categorisation can be made before site investigation and can be used to define the scope and extent of geotechnical investigation required. For the purposes of this investigation, the proposed structures have been classed as Geotechnical Category 2.

10.3 Mining

The possibility of risk from shallow coal mine workings to the proposed development was assessed as **low** and no further assessment is considered necessary.

10.4 Gas Risk

G&M Consulting conducted six rounds of gas monitoring in 2022. At the time of writing their report only two rounds of gas monitoring had been conducted. From the limited data they had, they gave these results a preliminary characteristic situation of CS1.

A review of the complete gas monitoring data indicates a maximum concentration of 0.3% v/v carbon dioxide, non-detect methane, 17.4% v/v oxygen concentration as the minimum and non detect flow. All positions were monitored over the course of the six visits.

A site characteristic gas screening value (GSV) is calculated based on the borehole hazardous gas flow rate – Q_{hg}. This is calculated for methane and carbon dioxide in accordance with BS:8485:2015+A1:2019 based on the measured gas flows, gas concentrations or a limit of detection (taken as 0.1 l/hr for flow and 0.1% for gas concentration), whichever is higher. The derived GSV is used to determine a characteristic gas situation (CS).

The GSV for carbon dioxide was calculated using the maximum steady state flow and maximum steady gas concentrations. A GSV of 0.0003 l/hr was derived that equates to CS1.

As such, no special precautions are required in regard to a ground gas risk.

10.5 Site Preparation and Stability of Excavations

Comments relating to the stability of excavations (i.e. trial pits) and groundwater seepages are included in the logs in **Appendix B**.

Based on observations made during fieldwork, shallow (<1.0 m) excavations should not require shoring to maintain stability in the short term. However, for deeper excavations further advice should be sought from the temporary works designer. The following factors should be considered:

- No ground can be relied upon to stand unsupported in all circumstances. Therefore, man entry into any excavation should only be undertaken where a suitable risk assessment has been carried out by a competent person.
- All trenches should be excavated in accordance with CIRIA Report 97 (1983) 'Trenching Practice';
- Trench shoring should be keyed into basal materials beneath the base of the trench. The embedment depth may be significantly deeper than the depth of the excavation being supported; and
- Consideration should be given to the re-use of arisings from foundation trenches / drainage runs etc. Where contamination has been encountered, it may be possible to reuse foundation arisings subject to risk assessment; however, certainty of use and volume should be confirmed in accordance with the requirements of CLAIRE guidance.

In line with BS6031, all excavations should be examined daily by a competent person to ensure that they remain safe. Where the sides cannot be sloped back to a safe angle, as approved by a competent and experienced person, their continued stability should not be taken for granted. Vertical or steep faces should be provided with support unless instructed otherwise by a competent person. No work should take place until the excavation is safe.

Groundwater was encountered below 9.00 m bgl in both exploratory positions. As such, it is envisaged that at shallow depths (<2.00 m) any groundwater seepages should be minor and may be controlled by sump pumping methods. However, at greater depth, significant groundwater ingress may be encountered and if present, a specialist dewatering contractor may be required. Groundwater should be controlled in accordance with CIRIA report 113 Control of Groundwater for Temporary Works.

It should be noted that groundwater levels may vary from those at the time of the investigation, for example in response to seasonal fluctuations.

Presumed bedrock was encountered in the form of mudstone at depth of 13.50 m bgl. Further obstructions, not encountered during the investigation, could be present such as unknown services. Based on observed ground conditions, shallow excavations in superficial deposits should be suitable for standard plant.

10.6 Preliminary Foundation Recommendations

Made ground was encountered in all three boreholes drilled on site and was present to depths of between 4.3 and 5.3 m bgl. As such, shallow foundations have been discounted.

Given the depths to suitable founding strata it would be prudent to consider the use of deep foundations such as piles or ground improvement techniques such as vibro stone columns to support structural loads. Both piling and vibro replacement contractors have their own proprietary methods of installation. Therefore, we recommend that discussions with specialist contractors take place at an early stage in the development. Settlement of superficial deposits and made ground could give risk to negative skin friction on driven piles. Due allowance should be made for down drag forces in the design of piles.

All foundations should be designed by a suitably qualified Structural Engineer.

10.7 Floor Slabs

The unit that is proposed on site is a prefabricated modular unit and therefore will arrive on site with the floor slab already constructed. These floor slabs are suspended.

10.8 Roads and Pavements

If the current tarmacadam is removed from site made ground is expected to be present across the site. Based on DCP results, the made ground is expected to be able to achieve a CBR design value of >3% over much of the site and can be used for preliminary design subject to insitu testing during construction.

Once design levels have been constructed, proof rolling of the formation will be required and any loose or soft spots must be removed and replaced with an engineered fill, in accordance with a suitable specification. Fine grained soils are susceptible to change during inclement weather and the formation level must be protected from deterioration. In addition, good practice shall be followed whereby all slopes are trimmed to falls to shed rain water and the surface sealed to limit infiltration.

Prior to the placement of the founding materials and the construction of the road pavement, the sub-formation and formation will need to be inspected and checked in accordance with a suitable specification, to ensure the ground conditions are as expected. All testing should be carried out in accordance with DMRB IAN 73/06 and confirm that the ground conditions at the time of construction are consistent with the previous design parameters.

Whilst the CBRs estimated above should be achievable, significant deterioration during/after periods of significant rainfall is likely and/or site trafficking. Consequently, it would be prudent to consider flexibility in the groundworks programme to enable highway construction during prolonged dry\warm weather when formation will be least vulnerable to deterioration. Alternatively, a minimum 200 mm thickness of suitable granular fill (ie a "blanket" of 6F2) could be placed along the line of proposed highways to protect formation during the construction phase.

All road designs should be discussed with the relevant local authority if highways are to be subject to a Section 38 agreement.

10.9 Buried Concrete

Based on the samples tested by PWAG and G&M Consulting, and in accordance with BRE Special Digest 1 (2005), a Design Sulphate (DS) Class of DS-3, AC3 within the made ground and DS-2, AC-2 within the natural underlaying strata.

RECOMMENDATIONS FOR FUTURE WORKS

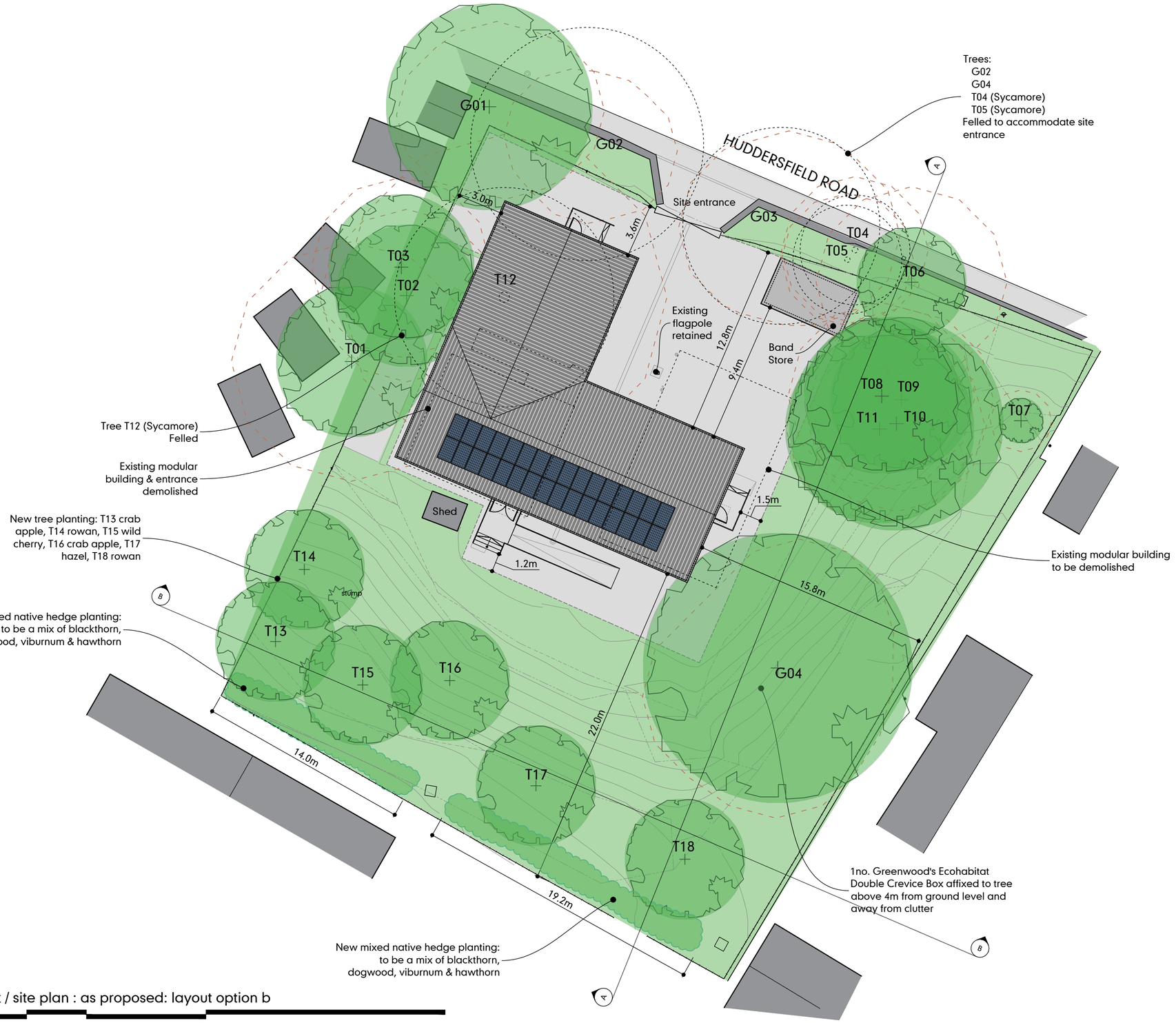
It is recommended that:

- copies of this report should be provided to a structural engineer so that appropriate building foundations, floors and structures can be designed;
- all ground investigation information is passed over to a suitable specialist piling contractor to advise on foundation design for the proposed development; and
- a remediation strategy is written for the site to set out how the minor concentrations of contamination should be dealt with.

11 REGULATORY APPROVALS

The conclusions and recommendations presented in this report are considered reasonable based on the information that was available. However, these are not guaranteed to gain approval from regulatory authorities or warranty providers. Therefore, we recommend that copies of this report are passed to the appropriate regulator or warranty provider for review and comment before undertaking any additional work.

Appendix A
Drawings



block / site plan : as proposed: layout option b

g:\shared drives\data store\001 active jobs\230711 integra crfca mirfield\2-00 docs-out (in-progress)\2-01 titled-drawings\230711 plng-drwgs 002-020.dwg : 11-Dec-23 . 15:20:37 : © Williams-Architects Ltd

drawing N° 230711-015.03 | status Planning

notes

~~Do not scale from this drawing - use stated levels and dimensions only. If in doubt, contact Williams Architects Ltd.~~

ver	notes	date
.03	*Northern steps reversed, additional planting information, site section lines added.*	11dec23
.02	*Stairs and ramps amended to new dimensions.*	29nov23

integra buildings

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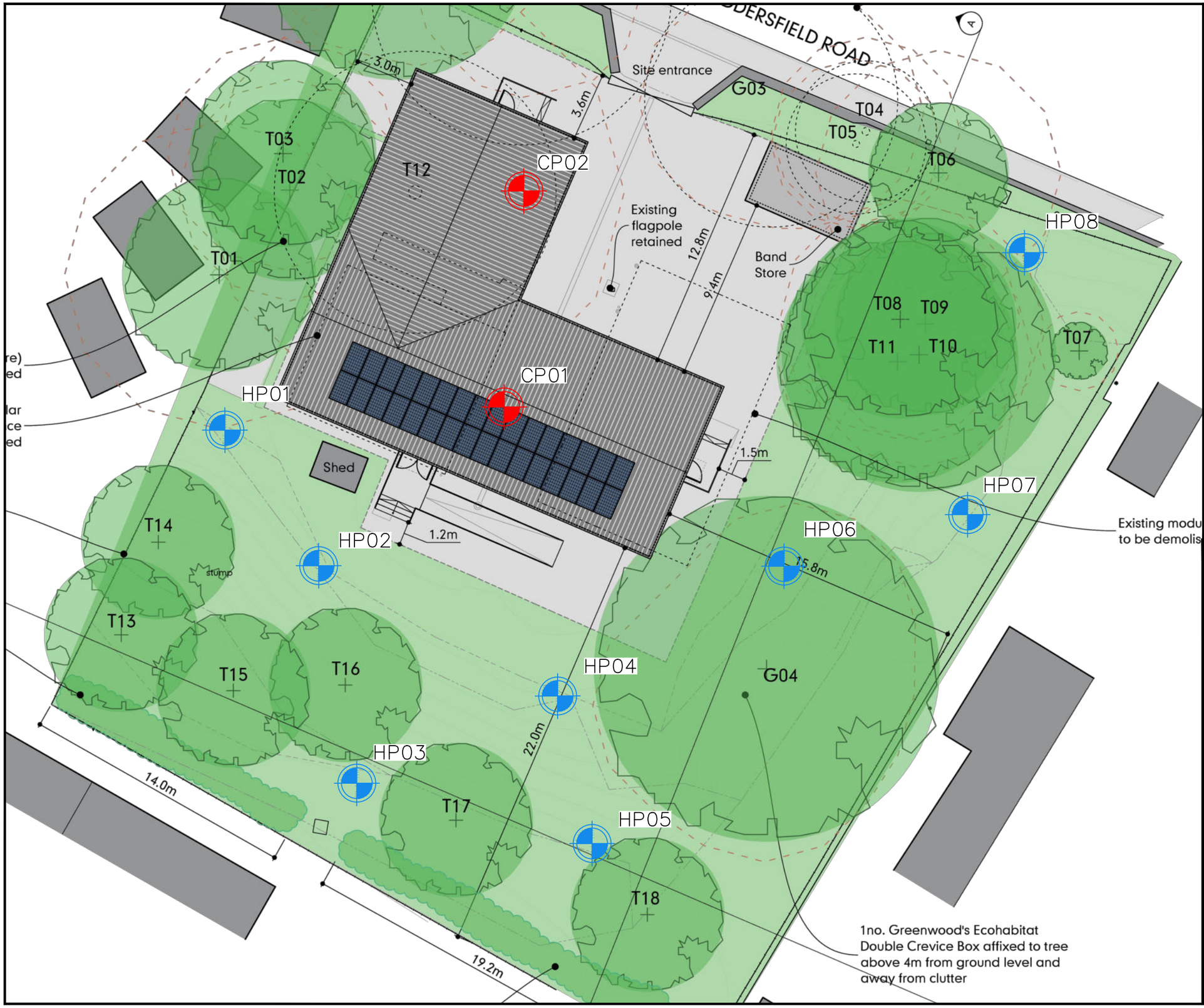
Registered in England & Wales. N° 5096848

client	Integra Buildings Ltd
created	01nov23
project	CRFCA Mirfield
job N°	230711
title	site : layout : proposed
scale	1:200 @ A2

drawing N° 230711-015.03 | status Planning



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KEY:

CABLE PERCUSSIVE BORE HOLE

HAND PIT

Rev	Date	Remarks	Drawn	Chk'd

PWA / GROUP

CIVIL	SUMMIT HOUSE, RIPARIAN WAY,	01535 633350
STRUCTURAL	THE CROSSINGS, CROSSHILLS,	info@pwagroup.co.uk
GEO-ENVIRONMENTAL	KEIGHLEY, BD20 7BW	www.pwagroup.co.uk

Client: INTEGRA BUILDINGS LTD

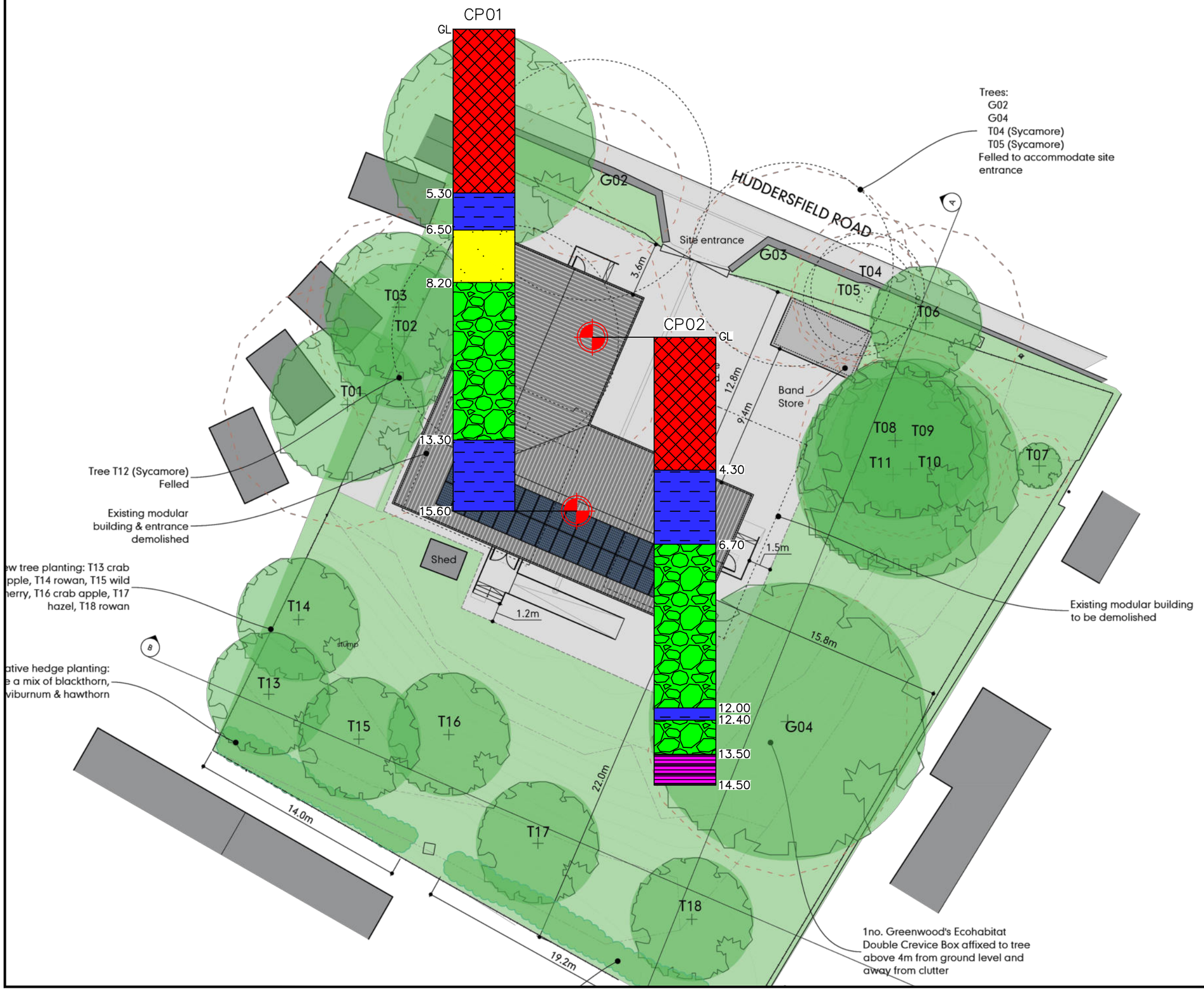
Project: MIRFIELD AIR TRAINING CORPS

Title: EXPLORATORY HOLE PLAN

Size	Scale	Designed	Checked	Date
A3	NTS	CK	TW	MAR 24

Drawing Status: PRELIMINARY

Job Number	Originator	Zone	Level	Type	Role	Drawing No.	Rev
23109	PWA	00	XX	DR	G	2001	P01



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KEY:

- CABLE PERCUSSIVE BORE HOLE
- MADE GROUND
- CLAY
- SAND
- GRAVEL
- MUDSTONE

Rev	Date	Remarks	Drawn	Chk'd

PWA / GROUP

CIVIL — SUMMIT HOUSE, RIPARIAN WAY, — 01535 633350
STRUCTURAL — THE CROSSINGS, CROSSHILLS, — info@pwagroup.co.uk
GEO-ENVIRONMENTAL — KEIGHLEY, BD20 7BW — www.pwagroup.co.uk

Client: INTEGRA BUILDINGS LTD

Project: MIRFIELD AIR TRAINING CORPS

Title: GROUND MODLE

Size	Scale	Designed	Checked	Date
A3	NTS	CK	TW	MAR 24

Drawing Status: PRELIMINARY

Job Number	Originator	Zone	Level	Type	Role	Drawing No.	Rev
23109	PWA	00	XX	DR	G	2002	P01

Appendix B
Exploratory Hole Logs

PWA Geo-environmental Summit House, Riparian Way BD20 7BW	**BOREHOLE LOG**	Borehole ID: **CP01** Sheet 1 of 2

Project Name:	Mirfield Air Cadets	Project Number: 23109	Elevation:	Hole Type: CP
Project Location:	2 Huddersfield Rd, Mirfield WF14 9DQ	Coordinates: E419364, N420281		Scale: 1:50
Client Name:	Integra Buildings Ltd	Dates: 19/12/2023 - 20/12/2023		Logged By: AE

Install.	Water Strike	Samples and In Situ Tests			Depth (m)	Legend	Stratum Description	Scale
		Depth (m)	Type	Results				
					0.12		Tarmacadam. MADE GROUND	
		0.60	B		0.49		Light greyish yellow slightly sandy gravelly angular to sub angular COBBLES of sandstone. Gravel is angular to sub rounded fine to coarse sandstone. MADE GROUND	1
		0.60	ES					
		1.20	SPT(C)	N=4 (1,1/1,1,1,1)				
		2.00	SPT(C)	N=7 (2,1/2,2,3,0)			Dark greyish brown silty gravelly CLAY with rare brick and medium cobble content of angular to rounded sandstone and mudstone. Gravel is angular to rounded fine to coarse sandstone and mudstone. MADE GROUND	2
					2.40			
		3.00	SPT(C)	N=4 (1,1/1,1,1,1)			Greyish brown gravelly medium to coarse SAND with rare brick and medium cobble content of angular to rounded sandstone and mudstone. Gravel is angular to sub rounded fine to coarse sandstone and mudstone. MADE GROUND	3
		4.00	SPT(C)	N=4 (1,0/1,1,1,1)	4.10			4
							Very dark greyish brown clayey sandy gravelly SILT with rare brick. Gravel is angular to sub angular fine to coarse sandstone and slate. MADE GROUND	
		5.00	SPT(C)	N=10 (2,2/3,2,2,3)	5.00		*Fabric encountered @ 4.65 m bgl.*	5
		5.40	D		5.30		Orangish brown with dark brown mottling slightly silty slightly sandy gravelly CLAY with rare brick glass and coal. Gravel is angular to sub rounded fine to coarse mudstone and sandstone. MADE GROUND	
		6.00	U					6
		6.30	D					
		6.50	B		6.50		Firm orangish brown slightly silty gravelly CLAY. Gravel is angular to rounded fine to coarse mudstone and sandstone.	
		7.30	D		7.30		Very dense yellowish brown gravelly fine to coarse SAND with high cobble content. Gravel is angular to round fine to coarse sandstone and mudstone.	7
		7.50	SPT(S)	N=69 (7,12/15,16,19,19)				
		7.50	D					
		8.20	B		8.20		Very dense yellowish brown gravelly fine to coarse SAND with high cobble content. Gravel is angular to round fine to coarse sandstone and mudstone.	8
		9.00	SPT(C)	N=17 (2,3/4,4,5,4)			Medium dense becoming very dense yellowish brown sandy angular to rounded fine to coarse GRAVEL of sandstone and mudstone with high cobble content. *Gravel content increases with depth.*	9
		9.00	B					
	▼							10

Remarks: No olfactory evidence of contamination.
Cable Percussion was refused at 15.6m bgl on presumed bedrock.
Groundwater was encountered at 9.6m depth.
Upon completion cable percussion hole was backfilled with arisings.

Key:
ES - Environmental sample
B - Bulk sample
D - Disturbed sample
SPT - Std. Penetration Test

pwa Geo Environmental	PWA Geo-environmental Summit House, Riparian Way BD20 7BW	**BOREHOLE LOG**	Borehole ID: **CP01** Sheet 2 of 2

Project Name:	Mirfield Air Cadets	Project Number: 23109	Elevation:	Hole Type: CP
Project Location:	2 Huddersfield Rd, Mirfield WF14 9DQ	Coordinates: E419364, N420281		Scale: 1:50
Client Name:	Integra Buildings Ltd	Dates: 19/12/2023 - 20/12/2023		Logged By: AE

Install.	Water Strike	Samples and In Situ Tests			Depth (m)	Legend	Stratum Description	Scale
		Depth (m)	Type	Results				
		10.50	SPT(C)	N=90			Medium dense becoming very dense yellowish brown sandy angular to rounded fine to coarse GRAVEL of sandstone and mudstone with high cobble content.	11
		10.50	B	(14,11/20,50,20,0)				
		12.00	SPT(C)	N=98				12
		12.00	B	(15,10/20,41,9,28)				
		13.00	SPT(S)	N=14 (2,3/4,3,4,3)				13
		13.00	D		13.30			
		13.50	SPT(C)	N=120			Stiff dark yellowish brown slightly silty gravelly CLAY with medium cobble content. Gravel is angular to sub rounded fine to coarse sandstone and mudstone.	
		13.50	D	(17,8/50,50,20,0)				14
		14.00	B					
		14.80	B		14.80		Firm yellowish grey silty gravelly CLAY with low cobble content. Gravel is angular to sub rounded fine to coarse mudstone.	15
		15.00	SPT(S)	N=84				
		15.00	D	(50,14/14,50,20,0)	15.60			
								16
								17
								18
								19
								20

Remarks: No olfactory evidence of contamination.
Cable Percussion was refused at 15.6m bgl on presumed bedrock.
Groundwater was encountered at 9.6m depth.
Upon completion cable percussion hole was backfilled with arisings.

Key:
ES - Environmental sample
B - Bulk sample
D - Disturbed sample
SPT - Std. Penetration Test

PWA Geo-environmental Summit House, Riparian Way BD20 7BW	**BOREHOLE LOG**	Borehole ID: **CP02** Sheet 1 of 2

Project Name:	Mirfield Air Cadets	Project Number: 23109	Elevation:	Hole Type: CP
Project Location:	2 Huddersfield Rd, Mirfield WF14 9DQ	Coordinates: E419363, N420297		Scale: 1:50
Client Name:	Integra Buildings Ltd	Dates: 20/12/2023 - 21/12/2023		Logged By: AE

Install.	Water Strike	Samples and In Situ Tests			Depth (m)	Legend	Stratum Description	Scale
		Depth (m)	Type	Results				
					0.12		Tarmacadam. MADE GROUND	
		0.40	B		0.46		Light yellowish brown slightly silty sandy gravelly CLAY with rare brick and pottery and high cobble content. Gravel is angular to sub rounded fine to coarse mudstone and sandstone. MADE GROUND	
		0.65	D					
		1.20	SPT(C)	N=4 (1,1/1,1,1,1)	0.90			1
		2.00	SPT(C)	N=4 (1,1/1,1,1,1)	1.70		Light yellowish brown with cream mottling slightly clayey silty sandy GRAVEL with rare brick and coal and high cobble content. Gravel is angular to sub rounded fine to coarse mudstone and sandstone. MADE GROUND	2
		3.00	SPT(C)	N=4 (1,1/1,1,1,1)	2.80		Dark yellowish brown slightly silty sandy gravelly CLAY with rare brick and high cobble content. Gravel is angular to sub rounded fine to coarse mudstone and sandstone. MADE GROUND	3
		3.00	D					
		4.00	SPT(C)	N=8 (1,1/1,2,2,3)			Yellowish brown slightly silty sandy gravelly CLAY with rare brick and medium cobble content. Gravel is angular fine to coarse sandstone and mudstone. MADE GROUND	4
		4.50	D		4.30			
		5.00	SPT(S)	N=27 (4,5/6,6,7,8)	4.80		Orangish brown slightly sandy gravelly CLAY with rare brick and high cobble content. Gravel is angular to sub rounded fine to coarse sandstone and mudstone. MADE GROUND	5
		5.00	B					
		5.10	B					
		6.00	U				*Gravel and cobble content increase with depth.*	6
					6.70		Firm dark orangish brown slightly silty sandy gravelly CLAY with high cobble content. Gravel is angular to rounded fine to coarse mudstone and sandstone	
		7.50	SPT(C)	N=19 (3,3/4,4,5,6)			Firm light brown sandy gravelly CLAY with medium cobble content. Gravel is angular to rounded fine to coarse sandstone and mudstone.	7
		7.50	B					
		7.50	B				Medium dense brown slightly clayey sandy angular to sub rounded medium to coarse GRAVEL of sandstone and mudstone with medium cobble content.	8
	▼	9.00	SPT(C)	N=12 (7,8/2,3,4,3)				9
		9.00	B					
					10.00			10

Remarks: No olfactory evidence of contamination.
Cable Percussion was refused at 14.5m bgl on bedrock.
Groundwater was encountered at 9.1m depth.
Upon completion the cable percussion hole was backfilled with arisings.

Key:
ES - Environmental sample
B - Bulk sample
D - Disturbed sample
SPT - Std. Penetration Test

pwa Geo Environmental	PWA Geo-environmental Summit House, Riparian Way BD20 7BW	**BOREHOLE LOG**	Borehole ID: **CP02** Sheet 2 of 2

Project Name:	Mirfield Air Cadets	Project Number: 23109	Elevation:	Hole Type: CP
Project Location:	2 Huddersfield Rd, Mirfield WF14 9DQ	Coordinates: E419363, N420297		Scale: 1:50
Client Name:	Integra Buildings Ltd	Dates: 20/12/2023 - 21/12/2023		Logged By: AE

Install.	Water Strike	Samples and In Situ Tests			Depth (m)	Legend	Stratum Description	Scale
		Depth (m)	Type	Results				
		10.50	SPT(C)	N=23 (4,4/5,5,6,7)			Dense brown sandy angular to rounded fine to coarse GRAVEL sandstone and mudstone with medium cobble content.	11
		10.50	B					
		11.50	B					
		12.00	SPT(S)	N=46	12.00			12
		12.00	B	(7,8/10,11,12,13)			Stiff dark brown slightly gravelly CLAY with low cobble content. Gravel is angular to rounded fine to medium sandstone and mudstone.	
		12.00	D		12.40			
		12.50	B				Very dense brown sandy angular to rounded fine to coarse GRAVEL of sandstone and mudstone with medium cobble content.	13
		13.50	SPT(S)	N=100	13.50			
		13.50	D	(11,14/50,30,20,0)			Presumed bedrock recovered as angular coarse GRAVEL of mudstone. MUDSTONE	14
		14.00	B					
					14.50			15
								16
								17
								18
								19
								20

Remarks: No olfactory evidence of contamination.
Cable Percussion was refused at 14.5m bgl on bedrock.
Groundwater was encountered at 9.1m depth.
Upon completion the cable percussion hole was backfilled with arisings.

Key:
ES - Environmental sample
B - Bulk sample
D - Disturbed sample
SPT - Std. Penetration Test

Appendix C
Geotechnical Laboratory Results

LABORATORY REPORT

Contract Number: PSL24/0062

Report Date: 22 January 2024

Client's Reference: 23109

Client Name: PWA Geo-Environmental
Summit House
Riparian Way
Cross Hills
Keighley
BD20 7BW

For the attention of: Charlie Kelly

Contract Title: Mirfiled ATC

Date Received: 3/1/2024
Date Commenced: 3/1/2024
Date Completed: 22/1/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

Checked and Approved Signatories:

A Watkins (Managing Director)
R Berriman (Associate Director)
S Royle (Laboratory Manager)
L Knight (Assistant Laboratory Manager)
S Eyre (Senior Technical Coordinator)
T Watkins (Senior Technician)

5 – 7 Hexthorpe Road,
Hexthorpe,
Doncaster,
DN4 0AR
Tel: 01302 768098
Email: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
CP01	2	U	6.00		Brown slightly gravelly CLAY.
CP01	7	B	9.00		Brown sandy clayey GRAVEL (Class 1A)
CP01	11	B	10.50		Brown sandy slightly silty GRAVEL (Class 1A)
CP02	2	B	5.10		Brown very sandy very clayey GRAVEL (Class 2C)

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

Mirfiled ATC

Contract No:
PSL24/0062
Client Ref:
23109

SUMMARY OF LABORATORY HAND VANES

(BS1377 : PART 7 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content %	Peak Shear Strength kPa	Residual Shear Strength kPa	Remarks
CP01	2	U	6.00		32	38		

* This test is out of our UKAS scope

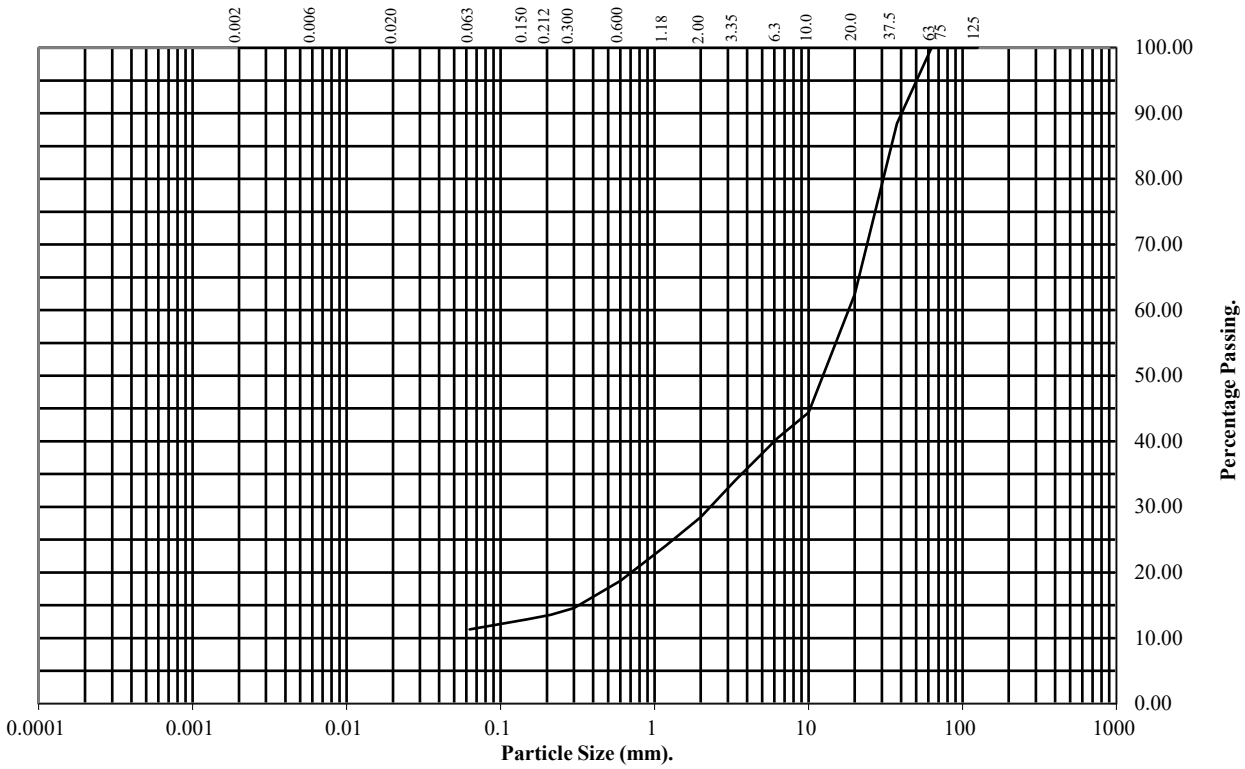
PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY	**Mirfiled ATC**	**Contract No:**
		PSL24/0062
		Client Ref:
		23109

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**CP01**	**Top Depth (m):**	**9.00**
Sample Number:	**7**	**Base Depth(m):**	
Sample Type:	**B**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	88
20	62
10	44
6.3	40
3.35	34
2	28
1.18	24
0.6	19
0.3	15
0.212	14
0.15	13
0.063	11

Soil Fraction	Total Percentage
Cobbles	0
Gravel	72
Sand	17
Silt/Clay	11

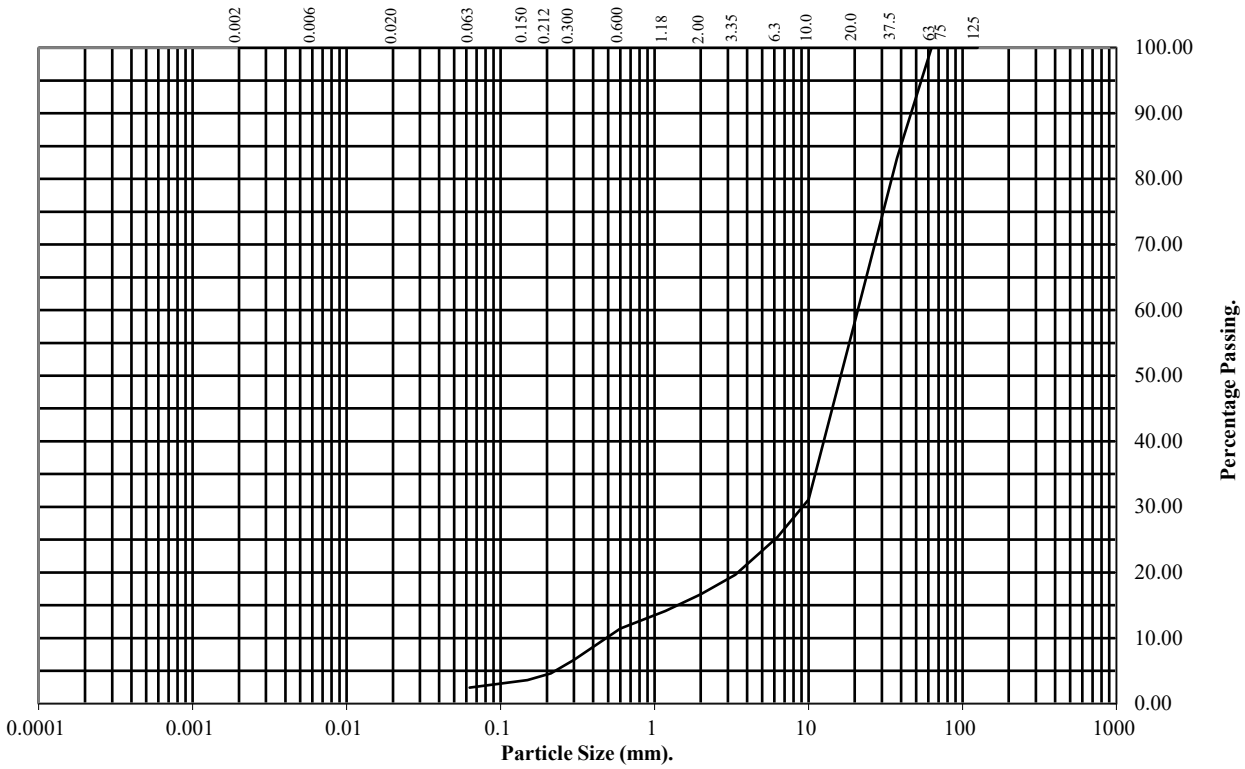
Remarks:
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**CP01**	**Top Depth (m):**	**10.50**
Sample Number:	**11**	**Base Depth(m):**	
Sample Type:	**B**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	83
20	58
10	31
6.3	25
3.35	20
2	17
1.18	14
0.6	11
0.3	7
0.212	5
0.15	4
0.063	2

Soil Fraction	Total Percentage
Cobbles	0
Gravel	83
Sand	15
Silt/Clay	2

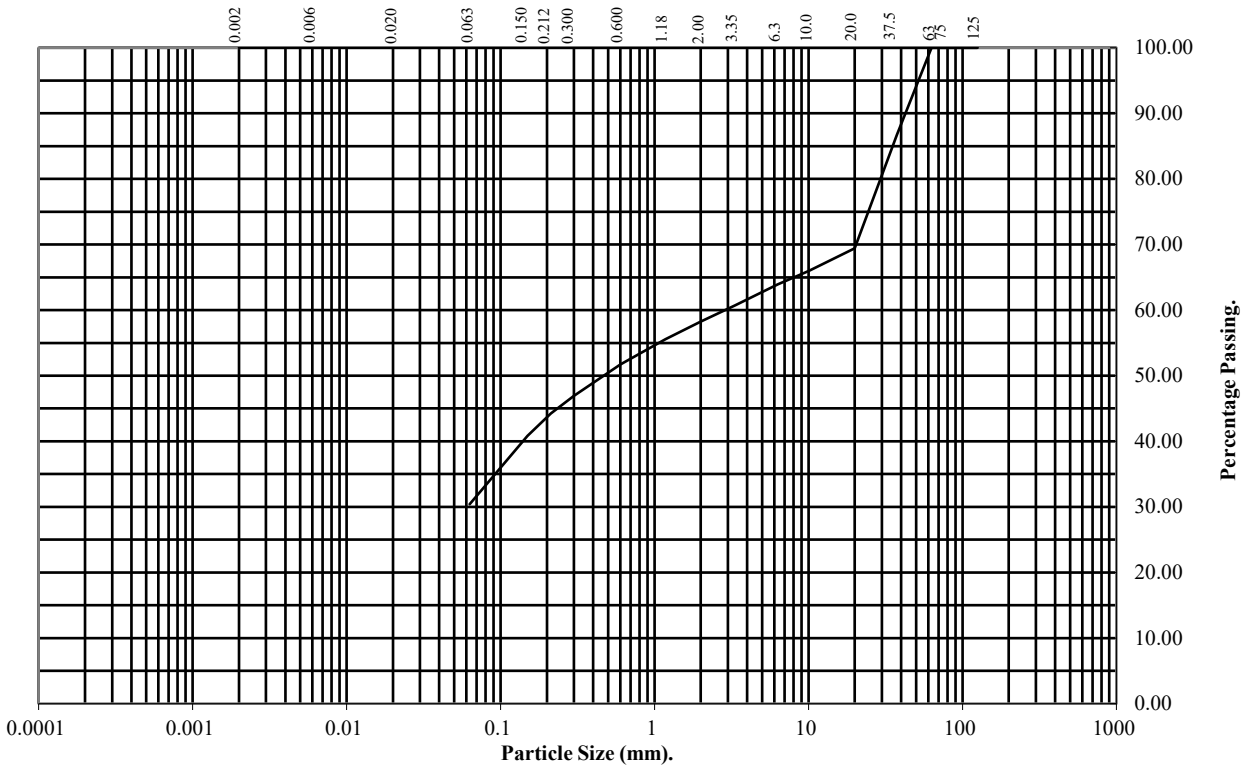
Remarks:
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**CP02**	**Top Depth (m):**	**5.10**
Sample Number:	**2**	**Base Depth(m):**	
Sample Type:	**B**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	87
20	69
10	66
6.3	64
3.35	61
2	58
1.18	56
0.6	52
0.3	47
0.212	44
0.15	41
0.063	30

Soil Fraction	Total Percentage
Cobbles	0
Gravel	42
Sand	28
Silt/Clay	30

Remarks:
See Summary of Soil Descriptions

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

Mirfiled ATC

Contract No:
PSL24/0062
Client Ref:
23109

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

Professional Soils Laboratory
5/7 Hexthorpe Road
Hexthorpe
Doncaster
DN4 0AR

Analytical Test Report: L24/00462/PSL - 24-40897

Your Project Reference:	**PSL24/0062 Mirfiled ATC**		
Your Order Number:	PSL24/0062	Samples Received / Instructed:	19/01/2024 / 19/01/2024
Report Issue Number:	1	Sample Tested:	19/01 to 25/01/2024
Samples Analysed:	3 soil samples	Report issued:	25/01/2024

Signed

James Gane
Analytical Services Manager
CTS Group

Notes:

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 30.10.2023

Issued by: J. Gane

Issue No: 4

Rev No: 5

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/00462/PSL - 24-40897

Project Reference - PSL24/0062 Mirfiled ATC

Analytical Test Results - Chemical Analysis

Lab Reference			336650	336651	336652
Client Sample ID			-	-	-
Client Sample Location			CP01	CP02	CP02
Client Sample Type			B	B	U
Client Sample Number			11	2	4
Depth - Top (m)			10.50	5.10	6.00
Depth - Bottom (m)			10.50	5.10	6.00
Date of Sampling			-	-	-
Time of Sampling			-	-	-
Sample Matrix			Sand	Clay	Clay
Determinant	**Units**	**Accreditation**			
Water soluble sulphate (as SO_4)	(mg/l)	u	510	100	180
pH Value	pH Units	MCERTS	8.1	8.0	7.7

7 - 11 Harding Street
Leicester
LE1 4DH

L24/00462/PSL - 24-40897

Project Reference - PSL24/0062 Mirfiled ATC

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
336650	-	CP01	B	11	Brown very gravelly silty sand	-	-	100
336651	-	CP02	B	2	Brown gravelly sandy clay	-	-	100
336652	-	CP02	U	4	Brown gravelly sandy clay	-	-	100

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/00462/PSL - 24-40897

Project Reference - PSL24/0062 Mirfiled ATC

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
336650	-	CP01	B	11	
336651	-	CP02	B	2	
336652	-	CP02	U	4	

7 - 11 Harding Street
Leicester
LE1 4DH

L24/00462/PSL - 24-40897

Project Reference - PSL24/0062 Mirfiled ATC

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis

7 - 11 Harding Street
Leicester
LE1 4DH

L24/00462/PSL - 24-40897

Project Reference - PSL24/0062 Mirfiled ATC

Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided
C - Received in inappropriate container
H - Contains headspace
T - Temperature on receipt exceeds storage temperature
R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whilst in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
336650	-	CP01	B	11		A
336651	-	CP02	B	2		A
336652	-	CP02	U	4		A

Appendix D
Geochemical Testing Results

SOCOTEC

Environmental Chemistry

Certificate of Analysis

Client: PWA Geo-Environmental

Project: 23122705

Quote: BEC230228988 V2.1

Project Ref: 23109

Site: Mirfield ATC

Contact: Theo Wood

Address: Summit House
Riparian Way, The Crossings Cross Hills
Keighley
West Yorkshire
BD20 7BW

E-Mail: TheoW@pwageo.co.uk

Phone: 07889 569357

No. Samples Received: 8

Date Received: 23/12/2023

Analysis Date: 10/01/2024

Date Issued: 10/01/2024

Report Type: Final Version 01

This report supersedes any versions previously issued by the laboratory

Reported by Customer Service Co-Ordinator
Julie Dickinson
01283 554496

Client: PWA Geo-Environmental
Project Name: 23109-Mirfield ATC
Project No: 23122705
Date Issued: 10/01/2024

Samples Analysed

Text ID	Sample Reference	Sampling Date	Sample Type	Sample Description
23122705-001	HP01-7-ES-0.10	21/12/2023 00:00:00	SOLID	Soil Sample
23122705-002	HP02-6-ES-0.20	20/12/2023 00:00:00	SOLID	Soil Sample
23122705-003	HP03-8-ES-0.20	20/12/2023 00:00:00	SOLID	Soil Sample
23122705-004	HP04-4-ES-0.10	19/12/2023 00:00:00	SOLID	Soil Sample
23122705-005	HP05-5-ES-0.15	20/12/2023 00:00:00	SOLID	Soil Sample
23122705-006	HP06-3-ES-0.10	19/12/2023 00:00:00	SOLID	Soil Sample
23122705-007	HP07-2-ES-0.10	19/12/2023 00:00:00	SOLID	Soil Sample
23122705-008	HP08-1-ES-0.10	19/12/2023 00:00:00	SOLID	Soil Sample

Client: PWA Geo-Environmental
Project Name: 23109-Mirfield ATC
Project No: 23122705
Date Issued: 10/01/2024

1252

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	001	002	003	004	005	006	007
Sample ID					001	002	003	004	005	006	007
Customer ID					HP01-7-ES-0.10	HP02-6-ES-0.20	HP03-8-ES-0.20	HP04-4-ES-0.10	HP05-5-ES-0.15	HP06-3-ES-0.10	HP07-2-ES-0.10
Sample Type					SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
Sampling Date					21/12/2023	20/12/2023	20/12/2023	19/12/2023	20/12/2023	19/12/2023	19/12/2023
Arsenic as As	ICPMSS	0.3	mg/kg^	UM	14.2	26.2	36.7	26.0	42.3	25.3	18.9
Cadmium as Cd	ICPMSS	0.2	mg/kg^	UM	0.9	0.8	0.8	0.6	1.1	1.8	0.4
Copper as Cu	ICPMSS	1.6	mg/kg^	UM	50.2	75.7	91.4	58.0	93.7	86.4	46.4
Lead as Pb	ICPMSS	0.7	mg/kg^	UM	884.8	271.7	252.8	168.5	533.9	124.6	150.9
Mercury as Hg	ICPMSS	0.5	mg/kg^	UM	<0.5	<0.5	<0.5	<0.5	0.6	0.5	<0.5
Nickel as Ni	ICPMSS	2	mg/kg^	UM	22.9	30.4	29.0	32.4	54.5	35.5	33.7
Selenium as Se	ICPMSS	0.5	mg/kg^	UM	<0.5	<0.5	<0.5	<0.5	1.0	<0.5	<0.5
Total Chromium as Cr	ICPMSS	1.2	mg/kg^	UM	33.9	48.2	42.9	30.6	66.1	119.4	27.8
Zinc as Zn	ICPMSS	16	mg/kg^	UM	796.1	442.7	596.9	246.5	659.3	532.2	303.8
Acenaphthene	PAHMSUS	0.08	mg/kg^	UM	<0.13	0.11	0.11	<0.11	0.20	0.19	0.13
Acenaphthylene	PAHMSUS	0.08	mg/kg^	U	<0.13	0.11	0.11	<0.11	0.18	0.20	0.12
Anthracene	PAHMSUS	0.08	mg/kg^	U	0.48	0.64	0.69	0.40	0.72	0.60	0.42
Benzo[a]anthracene	PAHMSUS	0.08	mg/kg^	UM	1.44	1.69	2.17	1.20	2.45	1.44	0.90
Benzo[a]pyrene	PAHMSUS	0.08	mg/kg^	UM	1.86	2.04	2.99	1.58	2.77	1.97	1.02
Benzo[b]fluoranthene	PAHMSUS	0.08	mg/kg^	UM	2.26	2.49	3.76	1.83	3.33	2.30	1.20
Benzo[g,h,i]perylene	PAHMSUS	0.08	mg/kg^	UM	1.15	1.12	2.01	0.89	1.52	1.18	0.51
Benzo[k]fluoranthene	PAHMSUS	0.08	mg/kg^	UM	1.03	1.15	1.52	0.95	1.57	1.10	0.64
Chrysene	PAHMSUS	0.08	mg/kg^	UM	1.43	1.63	2.13	1.25	2.41	1.50	0.94
Dibenzo[a,h]anthracene	PAHMSUS	0.08	mg/kg^	UM	0.31	0.35	0.53	0.26	0.45	0.33	0.16

Client: PWA Geo-Environmental
Project Name: 23109-Mirfield ATC
Project No: 23122705
Date Issued: 10/01/2024

Analysis Results

				Sample ID	008
				Customer ID	HP08-1-ES-0.10
				Sample Type	SOLID
				Sampling Date	19/12/2023
Analysis	Method Code	MDL	Units	Accred.	
Arsenic as As	ICPMSS	0.3	mg/kg^	UM	18.0
Cadmium as Cd	ICPMSS	0.2	mg/kg^	UM	0.4
Copper as Cu	ICPMSS	1.6	mg/kg^	UM	44.2
Lead as Pb	ICPMSS	0.7	mg/kg^	UM	142.3
Mercury as Hg	ICPMSS	0.5	mg/kg^	UM	<0.5
Nickel as Ni	ICPMSS	2	mg/kg^	UM	32.1
Selenium as Se	ICPMSS	0.5	mg/kg^	UM	<0.5
Total Chromium as Cr	ICPMSS	1.2	mg/kg^	UM	26.4
Zinc as Zn	ICPMSS	16	mg/kg^	UM	287.4
Acenaphthene	PAHMSUS	0.08	mg/kg^	UM	0.47
Acenaphthylene	PAHMSUS	0.08	mg/kg^	U	0.28
Anthracene	PAHMSUS	0.08	mg/kg^	U	0.84
Benzo[a]anthracene	PAHMSUS	0.08	mg/kg^	UM	3.31* B
Benzo[a]pyrene	PAHMSUS	0.08	mg/kg^	UM	3.28
Benzo[b]fluoranthene	PAHMSUS	0.08	mg/kg^	UM	3.86
Benzo[g,h,i]perylene	PAHMSUS	0.08	mg/kg^	UM	1.96
Benzo[k]fluoranthene	PAHMSUS	0.08	mg/kg^	UM	1.37
Chrysene	PAHMSUS	0.08	mg/kg^	UM	2.59
Dibenzo[a,h]anthracene	PAHMSUS	0.08	mg/kg^	UM	0.47

Client: PWA Geo-Environmental
Project Name: 23109-Mirfield ATC
Project No: 23122705
Date Issued: 10/01/2024

1252

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001	002	003	004	005	006	007
					Customer ID	HP01-7-ES-0.10	HP02-6-ES-0.20	HP03-8-ES-0.20	HP04-4-ES-0.10	HP05-5-ES-0.15	HP06-3-ES-0.10	HP07-2-ES-0.10
					Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
					Sampling Date	21/12/2023	20/12/2023	20/12/2023	19/12/2023	20/12/2023	19/12/2023	19/12/2023
Fluoranthene	PAHMSUS	0.08	mg/kg^	UM		3.71	4.21	5.07	3.13	5.74	3.76	2.53
Fluorene	PAHMSUS	0.08	mg/kg^	UM		<0.13	0.14	0.12	<0.11	0.15	0.17	0.12
Indeno[1,2,3-cd]pyrene	PAHMSUS	0.08	mg/kg^	UM		1.11	1.15	1.69	0.89	1.48	1.12	0.50
Naphthalene	PAHMSUS	0.08	mg/kg^	UM		0.17	0.17	0.21	0.15	0.32	0.30	0.16
Phenanthrene	PAHMSUS	0.08	mg/kg^	UM		1.08	1.50	1.53	0.91	1.78	1.49	1.08
Pyrene	PAHMSUS	0.08	mg/kg^	UM		3.27	3.60	4.46	2.80	5.05	3.22	2.13
Total PAH 16	PAHMSUS	1.28	mg/kg^	U		19.7	22.1	29.1	16.6	30.1	20.9	12.6
Total Moisture at 35°C	CLANDPREP	0.1	%	N		35.9	23.3	26.1	26.7	27.1	33.8	30.5
Colour of Material	CLANDPREP		-	N		Black	Brown	Black	Brown	Brown	Brown	Brown
Major Constituents	CLANDPREP		-	N		SILT	SILT	SILT	SILT	SILT	SILT	SILT
Minor Constituents	CLANDPREP		-	N		Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	Gravel
Miscellaneous Constituents	CLANDPREP		-	N		Organic Matter	Organic Matter	Wood	Organic Matter	Organic Matter	Organic Matter	Organic Matter
Asbestos Identification	SUB020		-	N		NAIIS	NAIIS	NAIIS	NAIIS	NAIIS	NAIIS	NAIIS

Client: PWA Geo-Environmental
Project Name: 23109-Mirfield ATC
Project No: 23122705
Date Issued: 10/01/2024

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID: 008 Customer ID: HP08-1-ES-0.10 Sample Type: SOLID Sampling Date: 19/12/2023
Fluoranthene	PAHMSUS	0.08	mg/kg^	UM	5.69
Fluorene	PAHMSUS	0.08	mg/kg^	UM	0.35
Indeno[1,2,3-cd]pyrene	PAHMSUS	0.08	mg/kg^	UM	2.06
Naphthalene	PAHMSUS	0.08	mg/kg^	UM	0.69
Phenanthrene	PAHMSUS	0.08	mg/kg^	UM	3.38
Pyrene	PAHMSUS	0.08	mg/kg^	UM	4.93
Total PAH 16	PAHMSUS	1.28	mg/kg^	U	35.5
Total Moisture at 35°C	CLANDPREP	0.1	%	N	28.9
Colour of Material	CLANDPREP		-	N	Brown
Major Constituents	CLANDPREP		-	N	SILT
Minor Constituents	CLANDPREP		-	N	Gravel
Miscellaneous Constituents	CLANDPREP		-	N	Organic Matter
Asbestos Identification	SUB020		-	N	NAIIS

working for a healthy and sustainable world

CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: SOCOTEC UK Ltd
Environmental Chemistry
PO Box 100
Burton upon Trent
Staffordshire
DE15 0XD

CONTRACT NO: S38061-20

DATE OF ISSUE: 10.01.24

DATE SAMPLES RECEIVED: 03.01.24

DATE ANALYSIS COMPLETED: 10.01.24

DESCRIPTION: Eight soil/loose aggregate samples.

ANALYSIS REQUESTED: Qualitative analysis of samples for determination of presence/type of asbestos.

METHODS:

Our method involves initial examination of the samples followed by detailed analysis of representative sub-samples. Each sub-sample was analysed qualitatively for asbestos by polarised light and dispersion staining as described by the Health and Safety Executive in HSG 248.

RESULTS:

Initial Screening

No asbestos was detected in any of the soil samples by stereo-binocular and polarised light microscopy.

A summary of the results is given in Table 1.

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CONTRACT NO: S38061-20
DATE OF ISSUE: 10.01.24

RESULTS: (cont.)

Table 1: Qualitative Results

SOCOTEC Job I.D: 23122705

IOM sample number	SOCOTEC Sample ID	Client Sample ID	ACM type detected	PLM result
S38061-66	23122705-001	HP01-7-ES-0.10	-	No Asbestos Detected
S38061-67	23122705-002	HP02-6-ES-0.20	-	No Asbestos Detected
S38061-68	23122705-003	HP03-8-ES-0.20	-	No Asbestos Detected
S38061-69	23122705-004	HP04-4-ES-0.10	-	No Asbestos Detected
S38061-70	23122705-005	HP05-5-ES-0.15	-	No Asbestos Detected
S38061-71	23122705-006	HP06-3-ES-0.10	-	No Asbestos Detected
S38061-72	23122705-007	HP07-2-ES-0.10	-	No Asbestos Detected
S38061-73	23122705-008	HP08-1-ES-0.10	-	No Asbestos Detected

Our detection limit for this method is 0.001%.

COMMENTS:

IOM Consulting cannot accept responsibility for samples that have been incorrectly collected or despatched by external clients.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

AUTHORISED BY: .....
D Third
Laboratory Analyst

Client:	PWA Geo-Environmental
Project Name:	23109-Mirfield ATC
Project No:	23122705
Date Issued:	10/01/2024

Deviating Sample Report

All samples received in an appropriate condition with no deviancies noted with the samples.

Analysis Method

Method Code	Method Description	Analysis Method
CLANDPREP	DW35 - CLand Prep and Dry Weight Correction to 35°C	As Received
CLANDPREP	Solid Material Description	As Received
ICPMSS	Arsenic in Solids by ICPMS	Air Dried & Ground
ICPMSS	Cadmium in Solids by ICPMS	Air Dried & Ground
ICPMSS	Chromium in Solids by ICPMS	Air Dried & Ground
ICPMSS	Copper in Solids by ICPMS	Air Dried & Ground
ICPMSS	Lead in Solids by ICPMS	Air Dried & Ground
ICPMSS	Mercury in Solids by ICPMS	Air Dried & Ground
ICPMSS	Nickel in Solids by ICPMS	Air Dried & Ground
ICPMSS	Selenium in Solids by ICPMS	Air Dried & Ground
ICPMSS	Zinc in Solids by ICPMS	Air Dried & Ground
PAHMSUS	16 PAHs by GCMS	As Received
SUB020	Asbestos Stage 1: Screen & ID	

Result Report Notes

Letters alongside results signify that the result has associated report notes.
The report notes are as follows:

Letter	Note
A	Due to the matrix of the sample the laboratory has had to deviate from our standard protocols to be able to process the sample and provide a result. Where applicable the accreditation has been removed and this should be taken into consideration when utilising the data.
B	The QC associated with this result has not wholly met the QMS requirements, the accreditation has therefore been removed. However, the Laboratory has confidence in the performance of the method as a whole and that the integrity of the data has not been significantly compromised.
C	Due to matrix interference, the internal standard and/or surrogate has not met the QMS requirements. This should be taken into consideration when utilising the data.
D	A non-standard volume or mass has been used for this test which has resulted in a raised detection limit.
E	Due to the parameter value being beyond our calibration range (and following the maximum size of dilution allowed, where applicable), the result cannot be quantified and as such the result will appear as a greater than symbol (>) with the accreditation removed. This data should be used for indicative purposes only.
F	Based on the sample history, appearance and smell a dilution was applied prior to testing. Unfortunately, the result is either above (>) or below (<) our calibration range. Results above our calibration range have accreditation removed. The data should be used for indicative purposes only.
G	The day 5 oxygen reading was below the capability of the instrument to detect, and therefore the calculated BOD has been reported unaccredited for guidance purposes only.

Client:	PWA Geo-Environmental
Project Name:	23109-Mirfield ATC
Project No:	23122705
Date Issued:	10/01/2024

HWOL Acronym Key

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e everything extracted by the solvent(s)
CU	Clean up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
+	Operator to indicate cumulative e.g. EH_CU+HS_1D_Total

Additional Information

This report refers to samples as received. SOCOTEC UK Ltd takes no responsibility for accuracy or competence of sampling by others.

Results within this report relate only to the samples tested.

The accreditation codes are as follows:

U = UKAS accredited analysis
M = MCERT accredited analysis
N = Unaccredited analysis

Any units marked with ^ signify results are reported on a dry weight basis of 35°C.

All Air Dried and Ground Samples (ADG) are oven dried at less than 35°C.

This report shall not be reproduced except in full, without written approval of the laboratory.

Opinions and interpretations given are outside the scope of our UKAS accreditation.

Any samples marked with * are not covered by our scope of UKAS accreditation. If applicable, further report notes have been added.

Any solid samples where the Major Constituents are not one of the following (Sand, Silt, Clay, Made Ground) are not one of our accredited matrix types.

Any samples marked with ‡ have had MCERTS accreditation removed for this result

Any samples marked with a tick in the deviant table is deviant for the specific reason.

Any samples reported as IS, NA, ND mean the following:

IS = Insufficient Sample to complete analysis
NA = Sample is not amenable for the required analysis
ND = Results cannot be determined

Items listed with a 'SUB' method code prefix have been carried out by an external subcontracted laboratory.

Our deviating sample report does not include deviancy information for Subcontracted analysis. Please see the report from the subcontracted lab for information regarding any deviancies for this analysis.

Summaries of analysis methods are available upon request.

End of Certificate of Analysis

Appendix E
Historic Bore Holes

Borehole Record

BH No			CP1
Contract No			C541
Method:	Cable percussive drilling using a Dando 150 - 150mm diameter	Site	Mirfield ATC
Date			28/10/22
Scale			1:50
Client	John Hill Associates	Logged By	AS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Records				
			MADE GROUND: Tarmacadam	0.10		
			MADE GROUND: Yellowish cream clayey sandy subangular fine to coarse GRAVEL sized fragments of limestone and sandstone (Type 1 Fill)	0.60		
SPT D	1.0-1.45	N=1 (1,1/0,0,0,1)	MADE GROUND: Dark brown localy black slightly clayey very gravelly fine to coarse SAND of ash locally a very sandy gravel with a low cobble content. Gravel is subangular fine to coarse of clinker, brick, sandstone and limestone. Cobbles are subangular fine to coarse of brick and sandstone.			
SPT D	2.0-2.45	N=3 (0,1/2,0,1,0)	From 1.80m: becoming clayey			
SPT D	3.0-3.45	N=5 (2,2/1,1,1,2)				
SPT D	4.0-4.45	N=6 (16,6/1,2,1,2)		4.30		
SPT D	5.0-5.45	N=23 (2,5/7,6,5,5)	Firm, yellowish brown gravelly very sandy CLAY with a low cobble content. Sand is fine to coarse, gravel is subangular to rounded fine to coarse of quartzite and sandstone. Cobbles are subangular of sandstone.			
SPT D	6.0-6.45	N=27 (16,9/8,6,6,7)				
B	6.0-7.0					
SPT D	7.0-7.45	N=16 (5,4/4,5,4,3)				
SPT D	8.0-8.45	N=21 (5,5/6,5,5,5)		8.30		
SPT D	9.0-9.45	N=16 (6,6/6,4,3,3)	Medium dense, light brown sandy subangular to rounded fine to coarse GRAVEL of quartzite and sandstone with a low cobble content. Sand is fine to coarse. Cobbles are subrounded to rounded of quartzite			
B	9.0-10.0					

Remarks

Monitoring well installed to 4m bgl. Borehole backfilled with arisings and bentonite below well
Failed U100 - 5.00-5.45m - High granular content
No groundwater encountered

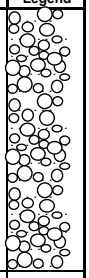
Sample Types

D - Disturbed
U - Undisturbed
W - Water

G&M CONSULTING

Borehole Record

				BH No	CP1
				Contract No	C541
Method:	As Sheet 1	Site	Mirfield ATC	Date	28/10/22
				Scale	1:50
		Client	John Hill Associates	Logged By	AS

Sample Details						
Type	Depth To-from (m)	Records	Description	Depth (m)	Level (mAOD)	Legend
CPT	10.0-10.45	N=14 (2,4/3,3,4,4)	Medium dense, light brown sandy subangular to rounded fine to coarse of quartzite and sandstone with a low cobble content. Sand is fine to coarse, cobbles are subrounded to rounded of quartzite			
B	10.0-11.0					
CPT	11.0-11.45	N=23 (8,11/7,6,5,5)				
			Borehole complete at 11.45m			

Remarks

Sample Types
D - Disturbed
U - Undisturbed
W - Water

Appendix F

Dynamic Cone Penetrometer Results

Appendix G
Risk Evaluation

Risk Evaluation

To ensure consistency in our qualitative method for risk evaluation we have used the classification scheme presented CIRIA C552 Contaminated Land Risk Assessment – A Guide to Good Practice, 2001. The overall risk rating for any potential contaminant linkage is set out in **Table I** and based upon a combination of the:

- Magnitude of the potential consequence (severity) of risk occurring (defined in **Table II**); and
- Magnitude of the probability (likelihood) of the risk occurring (defined in **Table III**).

The definition of the overall risk rating and likely action required is defined in **Table IV**.

Table I: Comparison of consequence against likelihood

		Consequence (severity)			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High likelihood**	Very high risk	High risk	Moderate risk	Moderate/ low risk
	Likely	High risk	Moderate risk	Moderate/ low risk	Low risk
	Low likelihood	Moderate risk	Moderate/ low risk	Low risk	Very low risk
	Unlikely	Moderate/ low risk	Low risk	Very low risk	Very low risk

Table II: Classification of Consequence (Severity)

Class[n]	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in significant harm. Short term risk of pollution of sensitive water resource. Catastrophic damage to buildings/property. A short term risk to a particular ecosystem, or organism forming part of such ecosystem.	• High concentrations of cyanide on the surface of an informal recreation area. • Major spillage of contaminants into controlled water. • Explosion, causing building collapse (can also equate to a short term human health risk if buildings are occupied).
Medium	Chronic damage to human health. Pollution of sensitive water resources. A significant change in a particular ecosystem, or organism forming part of such an ecosystem.	• Concentrations of a contaminant from site exceed the generic, or site specific assessment criteria. • Leaching of contaminants from site to an aquifer. • Death of a species within a designated nature reserve.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/ structures/ services or the environment.	• Pollution of non-classified groundwater. • Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by PPE). Easily repairable effects of damage to buildings, structures and services.	• The presence of contaminants at such concentrations that PPE is required during site works. • The loss of plants in a landscaping scheme. • Discoloration of concrete.

Table III: Classification of Likelihood (Probability)

Class[n]	Definition
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are in the right place, which means that it is probable that an event will occur.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over longer period such event would take place and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Table IV: Classification of risks and likely action required

Class[n]	Definition
Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realized, is likely to result in a substantial liability. Urgent investigation and remediation works are likely to be required.
High risk	Harm is likely to arise to a receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the longer term.
Moderate risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realized, would at worst normally be mild.
Very low risk	There is a low possibility that harm could arise to a receptor. In the vent of such harm being realized it is not likely to be severe.

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Report No: C541
Date: November 2022

GEOENVIRONMENTAL APPRAISAL
of land at
MIRFIELD AIR TRAINING CORPS, HUDDERSFIELD ROAD, MIRFIELD, WEST YORKSHIRE

Prepared for

John Hill Associates

Prepared by
G&M Consulting Ltd, The Chestnuts, Brackenhill Road, Haxey, Doncaster DN9 2LR

REPORT NUMBER:	C541	**REPORT STATUS:**	Final
REPORT TYPE:	Geoenvironmental Appraisal		
REPORT DATE:	November 2022		
SITE:	Land at Mirfield Air Training Corps, Huddersfield Road, Mirfield, West Yorkshire		
PREPARED FOR:	John Hill Associates		
PREPARED BY:	A Swinbourne BSc. (Hons) FGS, MIEnvSc, ACIEH.		
REVIEWED BY:	G Swinbourne BSc. (Hons) MSc. DIC, FGS		

Contents

APPENDICES

GEOENVIRONMENTAL APPRAISAL
of land at
MIRFIELD AIR TRAINING CORPS, HUDDERSFIELD ROAD, MIRFIELD, WEST YORKSHIRE

1.0 INTRODUCTION.

G&M Consulting Ltd (G&M) was commissioned by John Hill Associates to undertake a geoenvironmental appraisal, for land at Mirfield Air Training Corps, Huddersfield Road, Mirfield, West Yorkshire.

It is understood that it is proposed to redevelop the existing facilities at the site, and that this report has been prepared in support of the planning and costing submissions.

At the time of writing of this report, no development layout is available for inspection. It is however understood that any proposed buildings will be of modular construction and single story. It is unclear at this at this stage whether any areas of proposed soft landscaping are proposed.

The aims of this investigation are as follows;

- To determine the land use history of the site from an inspection of available historical Ordnance Survey (OS) plans;
- To determine the environmental setting of the site, including the details of the geology, hydrogeology and hydrology;
- To determine the shallow ground conditions beneath the site;
- To establish if shallow mine workings are likely present beneath the site;
- To determine the nature and degree of any possible near surface ground and groundwater contamination; and,
- To provide recommendations on measures to deal with any contamination present on site, if encountered.
- To provide geotechnical data, for foundation design.

The investigation has been undertaken in phases, the initial phase is a desk study and the second phase is an intrusive ground investigation which is based on the findings of the desk study element of the work.

The desk-based part of the investigation, included the review and assessment of information provided by GroundSure Limited (GroundSure), British Geological Survey (BGS), The Coal Authority (CA), Building Research Establishment (BRE) and The Environment Agency (EA) and Zetica UXO.

The fieldwork for the intrusive investigation was undertaken on the 13th and 28th October 2022 and comprised the excavation of five trial pits and the drilling of one cable percussive borehole with the installation of a combined gas and groundwater monitoring well. Following completion of the fieldwork selected soil samples were scheduled for a range of chemical and geotechnical laboratory tests. At the time of writing of this report, monitoring of the ground gas installation is underway.

1.1 Limitations.

This investigation report, which is designed to meet the requirements of all relevant current guidance, presents the factual information available during this appraisal, interpretation of the data obtained and recommendations relevant to the defined objectives.

The comments and opinions presented in this report are based on the findings of a review of available information and ground conditions encountered during the intrusive investigation work. There may be other conditions prevailing on the site which have not been disclosed by this investigation and which

have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation. Any diagram or opinion of the possible configuration of ground conditions between exploratory holes is conjectural and given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

This report is intended for the sole use of John Hill Associates or their client. No other third party may rely upon or reproduce the contents of this report without the written authorisation of the report author. If any unauthorised third party comes into possession of this report they rely on it at their own risk and the author does not owe them any Duty of Care or Skill.

2.0 SITE DESCRIPTION.

2.1 Site Location.

The site lies on the northern side of the Calder valley and is located to the south of the A644 Huddersfield Road, approximately 5 km, south west of Dewsbury town centre West Yorkshire, at National Grid Reference SE 193 202. A site location plan is shown on Drawing No. C541/1, presented in Appendix A of this report.

2.2 Site Features.

The site is accessed directly off Huddersfield Road, which runs to the north of the site, through a set of double palisade gates. The central part of the site, once through the gates, is a flat lying area comprising an area of tarmac, with two single story buildings (presumed to be used by the ATC). Access to the rear of the site is between these two buildings onto an area of rough well kept grass, which forms the brow of a slope. This slope drops towards the southern boundary of the site, by approximately 4m on to what is presumed to be the flood plain of the River Calder. Between the toe of the slope and the southern boundary of the site, is a strip of relatively flat ground, comprising rough vegetation and gravel, and approximately 3m wide. This strip of flat ground extends around the south eastern portion of the site, the levels then climb back upto to the height of the main part of the site, through a series of ‘steps’ cut into the existing ground surface.

The slope was covered in rough vegetation with evidence of blocks of concrete and brickwork. Inspection of the composition of the slope indicated its make-up to include a significant amount of made ground

The site is secured to all boundaries by a tall palisade fence. The site is bounded to the south by light industrial units and to the west by a set of private garages and east by residential properties. The ground levels adjacent to the western boundary were noted to be similar to the main part of the site, whereas the levels on the eastern boundary were noted to be similar to the levels at the toe of the slope.

A set of photographs taken as part of the walk-over survey are available for inspection, from G&M if required.

3.0 SITE HISTORY.

In order to investigate the history of the site, extracts of OS plans dated from 1855 have been examined. These were obtained as part of the GroundSure Report, a copy of which is presented in Appendix B of this report. It is not the intention of this report to describe, in detail, all the changes that have occurred on or adjacent to the site, only those pertinent to the proposed development. This approach is intended to reduce uncertainty in the desk study review process to an acceptable level in line with BS10175:2011+A2:2017.

Date (Scale)	Site Usage	Surrounding Area Usage
1855 (1:10,560) County Series	• Site shown to be undeveloped	• Huddersfield Road shown adjacent to northern boundary • Sandstone quarry shown approximately 100m to the north • Calder & Hebble Navigation River shown approximately 100m to the south
1892 (1:10,560) & 1888 (1:2,500) County Series	• Site shown to be developed with a number of unlabelled buildings in the eastern part of the site	• Sands Mill (Woollen) shown approximately 70m to the south west • Railway line shown approximately 250m to the south
1907 (1:2,500) & 1905 (1:10,560) County Series	• Earthworks shown to the west of the site shown extending onto the western boundary of the site	• Earthworks structures shown adjacent to western boundary of the site (areas of bunding) • Railway line shown approximately 60m to the south
1931 (1:10,560) & 1922 & 1933 (1:2,500) County Series	• No significant change	• Further earthworks shown to the west of the site
1938 & 1948 (1:10,560) County Series	• No significant change.	• No significant change
1957 & 1958 (National Grid) (County Series) & 1951-1956 (1:10,560) Provisional	• Buildings on site appear to be residential	• Further earthworks shown approximately 20m to the south east (appears to be bunding). Area labelled 'Battyeford' • Small unlabeled buildings shown adjacent to western boundary of the site
1965-1967 (1:10,560) Provisional	• No significant change	• No significant change
1974-1975 (1:10,000) National Grid	• No significant change	• Railway approximately 60m to the south, now shown as 'dismantled' •
1977-1982 (1:2,500) & 1981-1985 (1:10,000) National Grid	• Buildings no longer shown on site	• Probable industrial units shown approximately 50m to the south west • Garage shown approximately 60m to the east of the site
1990-1993 & 1993-1994 (1:1,250) National Grid	• Building labelled 'club' shown to the centre of the site	• Garage to the east no longer shown • Scrap yard shown approximately 50m to the south of the site
2001 (1:10,000) National Grid 2003 (1:1,250) LandLine	• No significant change	• No significant change
2010 & 2022 (1:10,000) National Grid	• 2nd building shown on site (map dated 2022)	• No significant change

4.0 ENVIRONMENTAL SETTING.

4.1 Published Geology

Information on the geology of the site was obtained from the following sources published by the British Geological Survey (BGS):

- BGS maps (England & Wales 1:50,000 Scale, Sheet 77 – Huddersfield – Solid and Drift Editions 2003).

- BGS online Geoindex - http://mapapps2.bgs.ac.uk/geoindex/home.html
- The BGS Lexicon of Named Rock Units, which provides typical descriptions for most geological units (www.bgs.ac.uk/lexicon).

The site is shown to be underlain by the following descending sequence of strata:

SUMMARY OF EXPECTED SITE GEOLOGY	
Geological Unit Name	**Description**
Made Ground	
Filled area shown on the BGS map within the GroundSure report	Area of landfill shown on site
Superficial Deposits	
None	
Alluvium immediately to the south associated with the River Calder	Clay, silt, sand and gravel
Bedrock	
Pennine Lower Coal Measures Formation	Sandstone, siltstone and mudstone with subordinate beds of coal, ironstone and seatearth. Clifton Rock, named sandstone unit within the PLCM directly underlying the site.

4.2 GroundSure GeoInsight

The GroundSure report contains a GeoInsight report, this presents the published geology, as detailed above together with a risk assessment on potential geological hazards. All risks identified as less than moderate are not discussed further. All identified natural hazard risks at the site are deemed to be low, very low or negligible, with the exception of Compressible Deposits, which are deemed to be moderate.

4.3 Hydrology

According to the GroundSure report, the risk posed to the site by groundwater flooding is '*Low*', *(within 50m)'.*

The highest risk posed to the site from *'Surface Water Flooding'* according to the GroundSure Report is highlighted to be *'1 in 30 year, 0.1m-0.3m (within 50m)'.*

According to the GroundSure report, the closest identified surface water feature is 111m to the south west and shown as the River Calder.

The site is identified to lie within the catchment of '*Calder from River Colne to River Chald'* in the operational catchment of '*Calder Lower'.*

The southern boundary of the site is shown to lie within a Flood Zone 3 area.

The site is not shown to be within a *"Nitrate Sensitive Area"* or a *"Nitrate Vulnerable Zone".*

4.4 Hydrogeology

Information provided by the EA indicates that the underlying bedrock (Pennine Lower Coal Measures) is classified as a 'Secondary A', aquifer which is defined as having;

'Permeable layers capable of supporting water supplies at a local level rather than strategic scale, and in some cases forming an important source to base flow to rivers. These are generally aquifers formerly classified as minor aquifers'.

The site is not shown to be within a Source Protection Zone.

4.5 Mining and Quarrying

According to the CA interactive map (http:/mapaps2.bgs.co.uk/coalauthority/home.html) the site is not positioned within a 'development high risk area'.

Inspection of the OS Plans does not indicate evidence of quarrying on site, or in the immediate vicinity of the site.

4.6 Radon

The GroundSure report contains information on Radon Affected Areas as defined by the Health Protection Agency (HPA) and indicates that the site is within an area where less than 1% of properties are affected by Radon, and therefore:

- **"No** radon protection measures are necessary**".**

5.0 REGULATORY REVIEW

A GroundSure report was commissioned in order to review the environmental regulatory information for the site and the immediate surrounding area, a copy of which is presented in Appendix B of this report.

5.1 Discharge Consents to Controlled Waters

The GroundSure report shows that there are no discharge consents within 250 m of the site.

5.2 Water Abstractions

There are no groundwater or surface water abstractions within 250 m of the site.

5.3 Waste Disposal and Landfill Sites.

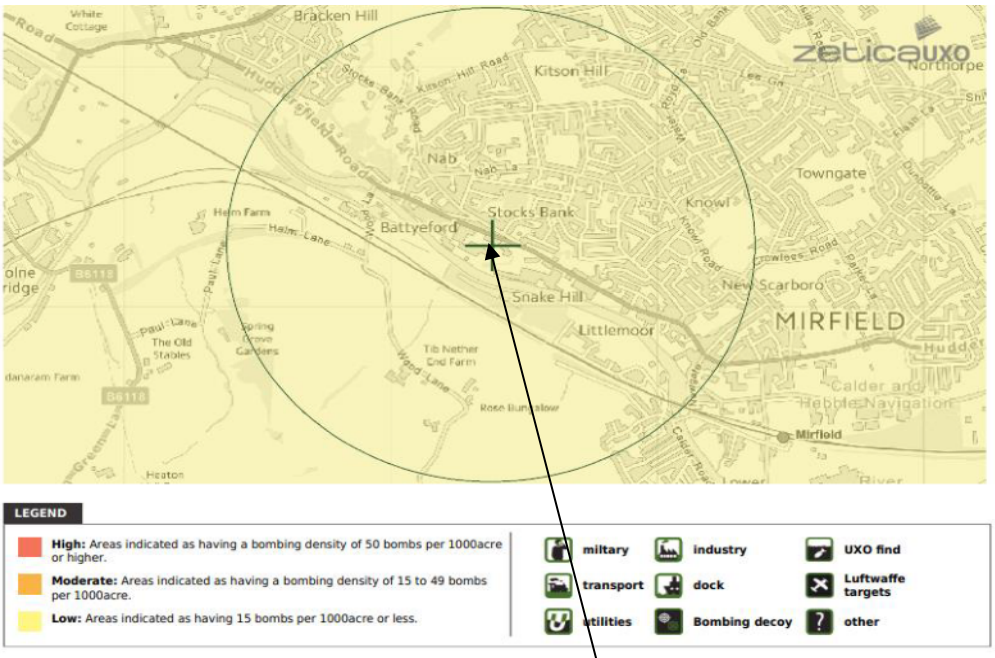
Historical Land Uses	• Various records, noted as 'unspecified heap' on OS maps dated 1938, 1966-1975 and 1985. Noted as 'unspecified ground workings' on OS map dated 1951
Local Authority Landfill	• None recorded within 250m of the site
Environment Agency Registered Landfill Sites:	• None recorded within 250m of the site
Operational Landfill Sites:	• None recorded within 250m of the site
Environment Agency Historic Landfill Sites:	• One shown on the site. Site Ref 4700/0181. License Holder shown as Messers J W Blackburn. Waste type is shown as inert, commercial. 1st recorded 01.01.1944
BGS/DoE Landfill	• None recorded within 250m of the site.
Registered Waste Treatment/Transfer or Disposal Sites:	• Scrap yard shown on site on the OS plan dated 1994. (This is considered to be a mapping error, and the scrap yard was located adjacent to the southern boundary of the site) • SS Motor Spares (metal recycling site shown 30m east of the site)

5.4 Miscellaneous

Integrated Pollution Controls (IPC) and Integrated Pollution and Prevention Controls (IPPC)	• There are no IPC authorisations within 500m of the site. • There are no IPPC authorisations within 500m of the site.
Licensed Industrial Activities (Part A(1))	• None shown within 250m of the site
Pollution Incidents	• 1No recorded within 250m of the site. Shown 179m to the south east; incident date is given as 13/08/01. Pollutant type is given as 'biodegradable Materials & Wastes'. Shown as a Land impact and Air impact – Category 3 (Minor)
Petrol and Fuel Sites	• 2No recorded within 250m of the site, shown 38m to the east on the OS plan dated 1982 and 129m east on the OS plans dated 1972-1983. Both site are now no longer shown
Historical Tanks	• 5No recorded within 250m of the site. The closest is shown 14m to the south as an 'unspecified tank' on the OS plan dated 1933.
Current Industrial Sites Data	• The GroundSure report states that there are 19 recent industrial sites within 250m, the closest of which is shown 19m south west of the site and is noted to be a 'vehicle parts & Accessories'
Other	• There is not in an area of Special Scientific Interest (SSSI). • There are no Special Areas of Conservation (SAC) or Special Protection Areas (SPA) within 250m of the site.

5.5 Unexploded Ordnance

Area shown to be within a low-risk zone. The risk map taken from available information provided by Zetica Ltd, is shown below.



The Site

6.0 PRELIMINARY CONCEPTUAL SITE MODEL.

6.1 Introduction

The findings of the desk study have been used to identify and assess potential sources of contamination and to develop a preliminary conceptual model of the site in order to investigate potential pollution linkages and identify complete pollutant linkages that may require further investigation or analysis and/or remediation. This approach is in line with the principals of Land Contamination Risk Management (LCRM) - Environment Agency October 2020.

The scope of the model is intended primarily to identify potential impacts to human health and

environmental receptors from potential on-site and off-site contamination sources.

Source-Pathway-Receptor elements within the model are defined as follows:

Contaminant Source	Is a hazardous substance or agent, present at levels that have the potential to cause harm or damage a receptor.
Receptor	Is an entity (human, aquatic environment, flora and fauna etc) that is vulnerable to the adverse effects of the contaminant.
Pathway	Is the means by or through which a contaminant comes into contact with or otherwise effects, the receptor.

This relationship is termed a 'pollution linkage'. It should be recognised that for a health or environmental risk to exist, all three elements of the relationship or linkage must be present, for example;

- If there is no contaminant, or contaminants present at levels below those considered to be harmful or damaging to a receptor then there can be no adverse effect on a receptor.
- If there is no receptor present that can be adversely affected by a contaminant, no harm or damage can arise.
- Even where both a contaminant and a receptor are present, no harm or damage will occur if there is no pathway by or through which a linkage between the two can be established.

The findings in the desk study have been assessed below to determine the potential linkage(s) existing on the site, and the likelihood of the linkage being present and determining a consequent level of risk.

In assessing risk, the categorisation shown below has been developed. The table is intended to be an aid to assessing the degree of risk. It should be noted that in terms of the Environmental Protection Act 1990 there is no differing degree of risk. It is either 'significant' or not.

Term	Description
Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remedial action
High Risk	Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remedial action
Moderate Risk	It is possible that without appropriate remedial action harm could arise to a designated receptor. It is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild.
Low Risk	It is possible that harm could arise to a designated receptor from an identified hazard. It is likely that, at worst, if any harm was realised any effects would be mild.
Negligible Risk	The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.

6.2 Assessment of Potential Sources of Contamination

Potential sources of contamination have been assessed which include both current and historical on site sources together with those originating from off-site locations which may migrate onto the site through one of the recognised pathways.

An assessment has been made as follows;

Feature	Details	Discussion	Risk	Does Source Warrant further Assessment
On-Site	Made Ground/materials associated with former site uses	Historical evidence of landfilling associated with the site (possibly to form the site level profile). OS maps record 'unspecified ground workings' and 'unspecified heap' on the site. EA records landfilling with inert, commercial waste, dated 1944.	Moderate	Yes
On-Site	Ground Gas	Considering the historical uses of the site,	Low	Yes

		generation of ground gas associated with landfilling possible. However, given the age of the infill, first recorded as an 'unspecified heap) on the OS map dated 1938, and the fact that the site appears to have been licenced for 'inert, commercial' there is a likelihood that the materials are unlikely to be continuing to generate gas.		
Off- site	Made Ground/materials associated with former site uses	Historical and current industrial/commercial activity recorded/identified, particularly adjacent to the southern boundary of the site	Low	Yes

6.3 Potential Receptors

The following potential receptors have been identified for the site;

Receptor	Details
Human Receptors	Future site occupiers
	Construction workers
Controlled Waters	The site is underlain by Pennine Lower Coal Measures (Secondary A Aquifer)
Built Development	Building foundations/substructures and utility connects.

6.4 Potential Pathways

Taking into account the intended use of the site, the following potential pathways by which the above receptors and sources may be linked as follows;

Receptor	Pathway
Human (Future site users, construction workers)	Ingestion of soil/soil dust Dermal contact with soil/soil dust Indoor/outdoor inhalation of fugitive dust Indoor/outdoor inhalation of soil vapour
Controlled Waters	Percolation and mobilisation of contaminants within the soil into the groundwater through to the Secondary A aquifer River Calder approximately 100m to the south of the site
Built Development	Direct contact with aggressive ground conditions

6.5 Qualitative Risk Assessment

A preliminary qualitative risk assessment has been undertaken and involves assessing the likely probability and consequence of a pollutant linkage and determining a consequent level of risk. The purpose of this assessment is to develop the preliminary conceptual site model, as follows;

Preliminary Conceptual Site Model

Source	Risk	Potential Contaminants	Likely Exposure Pathway/s	Receptor/s	Probability Assessment**
Made Ground (On-site)	Moderate	Inorganic and organic contaminants	Skin contact Ingestion	End users (residential) and construction workers	**Likely –** historical records indicate landfill has taken place on site (possibly to form the site level profile of the site). Historical OS maps indicate 'unspecified heal' and 'unspecified ground workings' Records shown landfilling of 'inert, commercial', first recorded in 1944
			Leaching/migration of contaminants through soil	Controlled waters	
	Low	Ground Gas	Inhalation / explosions risk in confined spaces.	End users (residential	**Low Likelihood –** Rationale as above. However, landfilling first recorded on site on OS map dated 1938 and EA records

					show the deposition of 'inert, commercial' waste, first recorded in 1944. there is a likelihood that the materials are unlikely to be continuing to generate gas. Radon gas protection measures not required.
Made Ground (off site).	Low	Mobile inorganic/ organic contaminants associated with former off-site uses	Skin contact Ingestion Inhalation	End users (residential) and built Development	**Low Likelihood** – Historical and current industrial/commercial activity recorded/identified, particularly adjacent to the southern boundary of the site

** Definitions and Classifications of Risk Assessment Terminology presented in Appendix H of this report

The preliminary conceptual site model does indicate a number of potential complete pollutant linkages, associated with the former site uses, that require further investigation, analysis and risk assessment.

7.0 GROUND INVESTIGATION.

7.1 Design and Strategy.

The desk-based part of this investigation was used as the basis for the design of an appropriate intrusive ground investigation

The aim and purpose of the ground investigation was to verify the nature and depth of the shallow made ground, natural soils and groundwater and ground gas regimes across the site, to allow informed decisions on potential remediation options that might be required in order to break the direct contact exposure pathways.

7.2 Scope of Works.

The scope of the intrusive investigation is detailed below;

Exploratory Hole Type	Purpose
Trial Pits	To determine the general nature of shallow soils underlying the site, including the; • Nature, distribution and thickness of any potential made ground. • Nature, degree and extent of ground contamination. • Determination of the presence of shallow underlying natural ground • To help identify and inform suitable remedial options
Cable percussive borehole	• Determine the deeper geology beneath the site • To allow the installation of monitoring wells to determine of the presence of ground gas beneath the site • Assist in the determination of foundation options for the site

Fieldwork was undertaken on the 13th and 28th October 2022 and comprised;

- Excavation of five trial pits, referenced TP1 to TP5 inclusive, to depths of between 1.6 m to 3.9 m below ground level (bgl).
- Drilling of a single cable percussive borehole, referenced CP1, to a depth of 11.45 m bgl

The exploratory hole positions were set out and the fieldwork supervised by a G&M engineering geologist. The locations of the exploratory holes are shown on Drawing No C541/2, presented in Appendix A of this report.

The investigation was scoped using guidance presented in BS 10175:2011+A2:2017, CIRIA C665:2007,

the principals of Land Contamination Risk Management (LCRM) - Environment Agency October 2020 and BS EN 1997:2004 and 2007.

Prior to the commencement of any exploratory hole a scan was carried out for buried services using a combination of cable avoidance tool (CAT) and signal generator ('Genny').

The trial pits were excavated using a 6-tonne rated 360^{o} tracked machine.

A photographic record of the trial pits is presented in Appendix G of this report.

The cable percussive borehole was drilled using a Dando 2000 rig, utilising 150mm diameter drop tools and temporary casing. SPTs were carried out in the borehole using a separate hammer.

The hammer has been calibrated for efficiency. The calibration certificates are included in Appendix E of this report. The SPT 'N' values shown on the borehole logs and discussed in this report have not been corrected for hammer efficiency.

The combined gas and groundwater monitoring installation comprised 50 mm diameter HDPE pipe, consisting of a lower slotted section of casing surrounded by single size non-calcareous gravel. The well was installed to a depth of 4.0m m bgl. The upper section of the well was constructed from plain casing sealed with a bentonite/cement seal. A flush lockable security cover was concreted into place to complete the well installation at the ground surface.

7.3 Strata Description.

Depths and descriptions of strata encountered together with details of the samples recovered are presented on the exploratory hole record sheets presented in Appendix C of this report. Procedures and principles contained in BS EN ISO 14688-1 (2002), as amplified by BS 5930 (2015), were followed. The depths of strata on the record sheets are recorded from current ground levels at each location.

7.4 Sampling/In-situ Testing

Small disturbed samples of soil, for chemical analysis, were placed in amber glass jars as appropriate. Between boreholes, equipment was thoroughly cleaned and dried.

In accordance with best practice (BS10175:2013) samples were collected in appropriate containers, kept in a chilled cool box whilst on site, retained in a fridge (below 2^{o}C) until the day of collection, packed in a chilled cool box on the day of collection and transported in this to the laboratory.

Small disturbed samples of soil were taken for geotechnical testing and placed in plastic tubs, bulk samples of soil were also taken for geotechnical testing and placed into large plastic bags.

Standard Penetration Tests (SPT) were carried out in the borehole, in accordance with BS EN ISO 22476-3. Seating drives have been recorded in increments of 75 mm in accordance with recommended UK practice. The SPT results are shown on the borehole logs in Appendix C and on a summary plot in Appendix E of this report, where they have been converted to an undrained shear strength, refer to Section 8.3 of this report.

The undrained strength of the soils was measured during the fieldwork, where possible, using a hand shear vane.

7.5 Laboratory Testing

Selected soil samples were tested for a range of potential contaminants, under a sub-contract with i2 Analytical Ltd (i2), a UKAS/MCERTS accredited laboratory. The analytes tested are listed in Section 9.2 of this report. The results of soil analysis, as received from the laboratory, are presented in Appendix

D of this report.

Selected soil samples for geotechnical testing were delivered to Professional Soils Laboratory (PSL) an external accredited geotechnical laboratory. The results of soil analysis, as received from the laboratory, are presented in Appendix D of this report.

SUMMARY OF GEOTECHNICAL LABORATORY TESTING			
Number of tests	**Test**	**Test Method**	**Notes**
Classification Tests			
8	Moisture content	BS1377: Part 2.	-
4	Liquid and plastic (Atterberg) limits.	BS1377: Part 2.	-
Chemical Tests: Soil			
4	Water soluble sulphate and pH value.	In-house Method	-

8.0 GROUND CONDITIONS AND MATERIAL PROPERTIES

A complete record of all the strata encountered is given on the attached trial pit and borehole logs. From these it can be seen that the site is underlain by a variable thickness of made ground, which increases in thickness to the south, overlying superficial deposits, initially comprising soft and firm clay.

8.1 Made Ground

Made ground was encountered in all the exploratory holes. The base of the made ground was proven in TP4 and TP5 at a depth of 1.6 m bgl and in CP1 at a depth 4.3 m bgl. The base of the made ground was not proven in TP1, TP2 and TP3 which were terminated within the made ground at depths of between 1.6 m and 3.2 m bgl. The made ground generally comprises dark brown gravelly clayey fine to coarse sand which becomes slightly clayey and very gravelly in places, with some cobbles and boulders. The gravel content comprises fragments of brick, concrete, limestone, clinker, slate, and mudstone in various proportions across the site. The cobble and boulder size fragments comprise brick, concrete, and sandstone. In TP2 the made ground comprises very clayey gravel and in TP1 from 0.5 m to 1.0 m bgl slightly clayey gravel.

In TP2 fragments of metal, plastic and fiberglass were noted and at 2.5 m bgl possible fragments of asbestos. Fragments of plastic were also noted in TP3.

The made ground is presumed to be the landfill identified in the GroundSure report.

8.2 Superficial Deposits

TP4, TP5 and CP1 proved the base of the made ground and encountered the underlying superficial deposits.

In TP4 and TP5 the underlying superficial deposits comprised soft / firm light brown slightly sandy clay, which in TP5 was proved to a completion depth of 3.3 m bgl. In TP4 the clay is underlain at a depth of 3.7 m bgl by slightly clayey gravelly sand, the gravel comprising weakly cemented sub angular fragments of sandstone, which was proved to the completion depth of 3.9 m bgl.

In CP1 firm gravelly very sandy clay was proved to a depth of 8.3 m bgl, underlain by light brown sub

angular to rounded fine to coarse gravel, which was proved to completion depth of 11.45 m bgl.

Based on the results of the Atterberg limit tests discussed below the clay encountered in TP4 and TP5 is different to that encountered in CP1. It is assumed that the clay in the trial pits is derived locally from weathering of the underlying coal measure strata and that in the borehole is an alluvial deposit.

8.3 Geotechnical Properties

Atterberg limits were determined for the various clay samples recovered. These show the clays, from TP4 and TP5, assumed to be derived from the underlying coal measure rocks, to be generally of high plasticity with a liquid limit (LL) in the range, 55% to 60%, plastic limit (PL) in the range 25% to 26% and a plasticity index (PI) in the range 30% to 34%. The sample, taken from CP1 and presumed to be alluvium is shown to be of low plasticity with results of LL 31%, PL 17% and PI 14%, a second sample from the borehole proved to be non-plastic.

The modified plasticity index, which takes into account the percentage passing the 425um sieve, indicates the shallower clays, in the trial pits, to be of medium volume change potential.

The undrained shear strength (Cu) of the clays encountered in the TP4 and TP5 has been measured directly by hand shear vanes. The Cu has also been determined indirectly from the SPT N values in CP1 using the correlation proposed by Stroud where the undrained shear strength Cu = f x SPT N value, where f is a factor based on the plasticity index of the clay. For this site a value of f = 4.5 has been assumed.

Hand vanes undertaken within the clays exposed in TP4 and TP5 recorded undrained shear strengths within the range 22 kPa and 48 kPa, indicating low to medium strength. For design purposes it is suggested that an undrained shear strength of 25 kPa be assumed for this shallow clay.

SPTs in BH1 within the made ground returned N values of between 1 and 8, generally increasing with depth. The SPTs in the underlying clay were in the range 18 to 27 and in the deeper gravel 14 to 23 indicating medium dense conditions. A plot of SPT N values with depth is included in Appendix E.

Using Stroud's correlation, the SPTs indicate the clay encountered in CP1 to have an undrained shear strength of between 81 kPa and 120 kPa, high strength. This is based on a correlation and is not a direct measurement and should therefore be used as a guide only.

Water soluble sulphate (SO_4) and pH tests were carried out on three samples of made ground and two samples of the natural soils. These recorded concentrations of SO_4 of between 0.041 g/l and 1.9 g/l (41 mg/l and 1,900 mg/l), together with a pH of between 7.8 and 9.5 for the samples of made ground, and for the two natural soil samples a water soluble sulphate content of 0.06 g/l and 0.12 g/l (60 mg/l and 120 mg/l) and pH of 7.7 and 8.0.

8.4 Groundwater

Groundwater was not encountered in the trial pits whilst they were being excavated. Similarly groundwater was not encountered in the borehole whilst drilling.

Monitoring of the well installed in the borehole has been carried out as part of a number of return visits. No standing water has been recorded to date.

It should be borne in mind that water levels are likely to fluctuate with seasonal rainfall and may therefore be substantially higher at wetter times of year than those found during this investigation.

8.5 Visual / Olfactory Evidence of Contamination

The made ground was found to include varying proportions of brick, concrete, tile, slate and plastic,

which can produce elevated concentrations of certain toxic and phytotoxic contaminants.

No olfactory evidence of any contamination was noted during the fieldwork.

8.6 Ground Gas and Vapours

Ground gas monitoring has been carried out on two occasions to date, and the result are summarised below. Full details of the ground gas monitoring are presented in Appendix F of this report.

Well	Methane (range) % v/v	Methane (range) %LEL	Carbon Dioxide (range) %v/v*	Oxygen (range) %v/v	VOC (ppm)	Flow (range) l/hr*
CP1	ND	-	0.0-0.3	17.4-17.7	0	0

ND - Not Detected. * Peak reading

Barometric air pressure for the visits varied between 991 mb and 1006 mb

The scheduled programme of monitoring comprises six visits over a three month period. It is proposed to undertake four further monitoring visits, as far as possible/practicable, to coincide with worst case weather/environmental conditions identified in CIRIA C665. On completion of the monitoring, a full set of results will be issued in an addendum report.

9.0 RESULTS OF CHEMICAL TESTING

9.1 General

For this site, measured values were compared to Generic Assessment Criteria (GAC) derived for a residential with plant up take end use. (Considered the most conservative values)

Chemical analysis was undertaken on representative soil samples recovered from across the site. The determinands were selected to provide information on the distribution of potential contaminants. The general analytical suite was supplemented with additional analysis where former land usage, as determined from the desk study, or visual or olfactory observations suggested the presence of additional contaminants.

The majority of initial screening levels (GAC's) used in the production of this assessment have been taken from the guidelines introduced by:

- DEFRA C4SL's, DEFRA 2015.
- Joint Land Quality Management Ltd (LQM) and Chartered Institute of Environmental Health (CIEH), Generic Assessment Criteria for Human Health Risk Assessment, S4UL's, Land Quality Press 2015.

Usually statistical testing is undertaken for the Planning Scenario by the methods described in CL:AIRE "Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration", September 2020. This statistical testing is undertaken to determine whether there was sufficient evidence that the true mean concentration of each determinand was less than the relevant critical concentration for that component. However, given the fact that a proportion of the sampling was carried out on a targeted basis, detailed statistical assessment of the data has not been conducted, instead individual contaminant concentrations have been compared to their relevant assessment criteria.

9.2 Testing Schedule

Following completion of the fieldwork samples were selected for testing as follows;

Laboratory Analysis	Topsoil/Made Ground	Natural Soils
Total concentrations of arsenic, cadmium, chromium (Hexavalent), copper, lead, nickel, selenium, zinc, mercury	7	2
Water soluble sulphate, Ph	3	2
Phenol	5	1
Speciated PAH	9	1
Asbestos	6	-

9.3 Soil Analysis

The chemical analysis results and screening criteria are summarised below. The results for the natural soils have been combined for an initial assessment.

Summary of Total Soil Concentrations

Determinand	GAC (1% SOM) (mg/kg, unless otherwise stated)	No. of samples above screening value	No. of samples tested	Maximum concentration above GAC (mg/kg, unless otherwise stated)
Metals/Metalloids				
Arsenic	37 (2)	4	9	140 (TP1-0.4m)
Cadmium	11(1)	0	9	
Chromium (IV)	21 (2)	0	9	
Lead	200 (2)	4	9	740 (TP5-0.5m)
Mercury	40 (1)	0	9	
Selenium	250 (1)	0	9	
Copper	2400 (1)	0	9	
Nickel	180 (1)	0	9	
Zinc	3700 (1)	0	9	
Inorganics				
pH	<5	0	5	
Water Soluble Sulphate	0.5 g/l (3)	1	5	1.9g/l (TP2-1.0m)
Organics				
PAHs				
Acenaphthene	210(1)	0	10	
Anthracene	2400(1)	0	10	
Acenaphthylene	170(1)	0	10	
Benzo(a)anthracene	7.2(1)	2	10	18 (TP2-2.0m)
Benzo(b)fluoranthene	2.6(1)	4	10	17 (TP2-2.0m)
Benzo(k)fluoranthene	77(1)	0	10	
Benzo(g,h,i)perylene	320(1)	0	10	
Benzo(a)pyrene	5.0(2)	2	10	20 (TP2-2.0m)
Chrysene	15(1)	0	10	
Dibenz(a,h)anthracene	0.24(1)	4	10	2.9 (TP2-2.0m)
Fluoranthene	280(1)	0	10	
Fluorene	170(1)	0	10	
Indeno(1,2,3-cd)pyrene	27(1)	0	10	
Naphthalene	2.3(1)	0	10	
Pyrene	620(1)	0	10	
Phenanthrene	95(1)	0	10	
Other				
Monohydric Phenol	120(1)	0	6	
Asbestos	Fibres present	2	6	TP2-1.0m; Chrysotile,

Determinand	GAC (1% SOM) (mg/kg, unless otherwise stated)	No. of samples above screening value	No. of samples tested	Maximum concentration above GAC (mg/kg, unless otherwise stated)
				Amosite, Crocidolite TP2-3.0m; Amosite

[1] LQM/CIEH (2015) Generic Assessment Criteria for Human Health Risk Assessment. 2nd Ed. (for a sandy soil with 1% SOM and pH 7.0)
[2] DEFRA C4SL's, DEFRA 2015
[3] BRE (2005) Special Digest 1, 3rd Edition, Concrete in aggressive ground. Upper limits for DS-1 Design Sulphate Class concrete.

Elevated concentrations of Arsenic, Lead and PAH speciates were recorded in samples of the made ground soils.

Two of the samples submitted for asbestos screening recorded asbestos fibres. TP2 at 1.0m recorded Chrysotile, Amosite and Crocidolite and TP2 at 3.0m recorded Amosite

No samples of the natural soils were shown to be elevated above respective GAC levels

10.0 QUALITATIVE RISK ASSESSMENTAND REVISED CONCEPTUAL MODEL

Following the ground investigation and results of the chemical testing presented above, the preliminary conceptual site model presented in the Phase 1 desk study has been revised. The revised model has been developed for the proposed future land use (redevelopment of the site for use by the Air Training Corps).

Identified Contaminants of Concern

- Elevated levels of Arsenic and Lead within the made ground soils.
- Elevated levels of PAH speciates, within the made ground soils.
- Elevated levels of water soluble sulphate within the made ground soils.
- Occurrences of asbestos fibres within the made ground soils.
- Currently no elevated hazardous ground gas encountered across the site. (Four further visits planned to complete six visits over a nominal three month period).

Summary of Identified Pollutant Linkages

In summary, the revised conceptual site model has identified the following potential pollutant which could result in an unacceptable risk to the proposed end-use, denoted as a moderate or higher potential of significant pollutant linkage on the conceptual site model.

Source	Risk	Potential Contaminants	Exposure Pathway	Primary Receptor/s	Complete Pollutant Linkage
Made ground (on site)	Moderate/High	Inorganic/organic contaminants	Skin contact Ingestion	End users of site; Construction workers	**Yes**: made ground soils present on site recorded elevated levels of Arsenic, Lead and PAH Speciates. Asbestos fibres also recorded in made ground soils.
		Asbestos	Inhalation		
	Low	Ground gas	Migration (lateral and vertical) Inhalation,	Built development; End users of site	Further assessment required; monitoring ongoing (4 further visits to complete 6 visits over a three month period). Currently a complete

			explosion		pollutant linkage assumed until monitoring period completed and reported.
Made Ground (on site)	Moderate	Water Soluble Sulphate	Soil contact	Built Development	**Yes**: elevated water soluble sulphate in made ground. Appropriate concrete design required.

11.0 CONCLUSIONS AND RECOMMENDATIONS.

11.1 General

G&M Consulting Ltd (G&M) was commissioned by John Hill Associates to undertake a geoenvironmental appraisal, for land at Mirfield Air Training Corps, Huddersfield Road, Mirfield, West Yorkshire.

It is understood that it is proposed to redevelop the existing facilities at the site, and that this report has been prepared in support of the planning and costing submissions.

At the time of writing of this report, no development layout is available for inspection. It is however understood that any proposed buildings will be of modular construction and single story. It is unclear at this at this stage whether any areas of proposed soft landscaping are proposed, however, it is assumed the majority of the external area to the site will comprise hardstanding.

It has been assumed that ground levels will not change significantly from those described in this report, or that the proposed end use of the site will not change from that detailed above. If this is not the case, then amendments to the interpretation and conclusions in this report may be required.

11.2 Geotechnical Considerations

Introduction

At the time of writing detailed loads for the foundations are not known. It is understood that the proposed buildings are single storey and of the modular type and therefore considered likely to have low bearing pressure. The following assessment is therefore based on a line load of 30 kN per metre run.

It is also assumed that proposed finished development levels do not vary significantly from those at the time of the fieldwork, on site. If either of these assumptions are not the case significant alteration to these recommendations may be required.

Any proposed foundation option should be discussed with a structural engineer responsible for the design.

Foundations.

Given the assumed relatively likely light loading of the structure, there are a number of options for foundations which can be considered which would primarily be determined by cost and physical limitations of the site.

Made ground in general is not considered suitable for foundations, without first pretreatment, due to the potential for variability of content and strength and, on this site the variation in depth across the site from 1.6 m to 4.3 m bgl. The made ground is identifiable as landfill material, presumed to be inert, but containing some unsuitable materials including possible asbestos encountered at depth.

Generally, foundations taken to below made ground, would normally be done by trench fill or piled foundations. Given the thickness of made ground on this site trench fill would be unsuitable and therefore piled foundations would be the preferred option.

Shallow foundations, either pads or a raft, maybe feasible if the made ground is treated. This could be

done by excavating, sorting and removal of any deleterious materials and then recompacting suitable material to an agreed depth, with the inclusion of geotextile reinforcement, this option would require sufficient space for earthwork plant to operate and also the consideration of the possible presence of asbestos. Alternatively, the made ground could be treated using vibro techniques, which has the advantage that disturbed soils would not be brought to the surface. Again, sufficient space would be required for the plant to operate. The bearing capacity of treated made ground would be dependent on the treatment method used and subsequent validation.

If piled foundations are considered, then they should be taken into the underlying superficial deposits. Driven piles would be the preferred option, as these would not bring any surplus material to the surface. However, the vibration from these techniques should be considered with regard to any adjacent properties. Screw piles could also be considered as these would also minimise the amount of material brought to the surface.

The load capacity of piles is dependent on the type and method of installation and as such the advice of a specialist piling company should be sought with regard to the most suitable type of pile for the site and likely achievable loads.

The bearing capacity of soil below a foundation is a function of the undrained shear strength of the soil, together with the type of foundation, including its depth and width. The bearing capacity should therefore be checked once foundation designs are finalised.

Floor Slabs.
If a raft foundation is used this would also form the floor slab. If traditional deep or piled foundations are used then a suspended floor slab would be required to avoid any differential settlement between the slab and foundations.

All formation level soils should be proof-rolled, and all loose, soft, organic or otherwise unsuitable materials should be removed and replaced with a suitable, well-compacted granular fill. Hard spots such as old foundations should also be removed.

Excavations.
The shallow soils encountered at the site are considered suitable for excavation by standard mechanical plant such as a wheeled backhoe excavator to depths indicated by the termination depth of the exploratory holes.

The use of hydraulic or pneumatic breakers, may be required if obstructions or old foundations associated with former structures, are encountered.

Whilst ground water was not encountered in the trial pits, surface water run-off from rainfall may enter excavations, particularly given the location of the site adjacent to the valley side. Some dewatering may therefore be required within excavations.

It should be noted that groundwater levels may change due to seasonal or other variations. Advice on suitable dewatering techniques is given in CIRIA Report C515 *Groundwater Control – design and practice*.

All excavations should be planned and due consideration should be given to providing temporary support or suitable battering. Excavations should be regularly inspected by a competent person to ensure continued safety. Further advice on the safety of excavations is given in *Health and Safety in Construction*.

Buried Concrete.
This assessment of the potential for chemical attack on buried concrete is based on current guidance contained in BRE Special Digest 1 ('SD1', 2005) *Concrete in Aggressive Ground Part 1: Assessing the aggressive chemical environment.* Third Edition.

Water soluble sulphate (SO_4) and pH tests were carried out on three samples of made ground and two samples of the natural soils. These recorded concentrations of SO_4 of between 41 mg/l and 1,900 mg/l, together with a pH of between 7.8 and 9.5 for the samples of made ground and for the two samples of natural soils a water soluble sulphate content of 60 mg/l and 120 mg/l and pH of 7.7 and 8.0.

Based on the guidance in SD1, where there are less than five samples tested (on each type of material/soil/water present on site), the characteristic value for the pH is taken as the lowest value and that of the water soluble sulphate, the highest value.

Therefore, a characteristic value for pH of 7.8 is determined for the made ground and 7.7 for the natural soils. A characteristic value for water soluble sulphate of 1,900 mg/l is determined for the made ground and 120 mg/l for the natural soils.

Based on these characteristic values and Table C2 (SD1) for brownfield sites, a Design Sulphate Class for the made ground of DS-3 is indicated and for the natural soils DS-1.

11.3 Contamination Constraints to Development

Risk Evaluation for Proposed Land Use

The development proposals indicate the future end use of the site to be the redevelopment of the site by the Air Training Corps, for the same end use that the site is currently being used for. This is considered to represent a **medium/low** sensitivity end use.

Based on the source>pathway>receptor philosophy, and the chemical results obtained as part of this investigation, it is considered that the made ground tested generally pose a **moderate/high** risk to end users through ingestion, dermal contact or inhalation and that remedial action will be required to break this linkage.

If made ground is left beneath areas of proposed hardstand (building footprints, parade areas and car parking etc), it is considered to pose a **negligible** risk to end users, as pathways are severed due to capping by the hardstanding.

Due to the presence of contamination in the made ground and because of its unsuitability as a growing medium, if made ground is left on site in areas of proposed soft landscaping, there will be a need to be an import of clean cover soils. This is to provide a healthy medium for plant growth and to remove any remaining pathways for exposure of end users to residual contaminants. It is recommended that a minimum of 600mm of clean capping soils (including 150mm of topsoil) are placed. This thickness is subject to regulatory approval.

Controlled waters

Considering the fact that the made ground soils will be either removed or capped with hard stand or clean soils in any areas of soft landscaping (thereby effectively eliminating surface water infiltration and leachate generation), it is considered that the soils are considered to pose a **negligible/low** risk to controlled waters and that no further remediation is considered necessary, outside of that described.

Furthermore, no groundwater was encountered during the fieldwork, or in the subsequent monitoring visits.

Construction and Maintenance Workers

Contamination may pose a short-term (acute) or long-term (chronic) risk to workers during construction and maintenance. The potential risks must be specifically assessed as part of the health and safety evaluation for the works to be performed in accordance with prevailing legislation. Site practices must conform to the specific legislation requirements and follow appropriate guidance (e.g. HSE, 1991; CIRIA 1996).

On the basis of the results obtained, the revised conceptual model confirms potential moderate/high risks to construction workers from PAH speciates and asbestos fibres in the made ground soils. However, risks can be adequately mitigated by appropriate PPE and hygiene precautions and good working and soil management practices, including dampening down of soils. It is recommended that procedures outlined in the HSE document 'Protection of Workers and the General Public during Remediation of Contaminated Land' be followed.

Where necessary, groundworks will need to comply with Control of Asbestos Regulations 2012.

This report should be forwarded to any organisation undertaking ground works in order for them to assess the risk to their own personnel.

Adjacent Site Users
Provided that any soils are carefully excavated and standard dust control measures are adopted, including dampening down of soils, during the development works, then it is considered that there is a **low/negligible** short-term risk to adjacent site users.

Utilities
It is recommended that the results of the chemical testing and details of the proposed enabling works are provided to the appropriate utility companies to determine the necessity for service protection.

11.4 Ground Gas (Interim Results)

Gas monitoring has only been undertaken on two occasions to date, therefore the following comments are only a preliminary assessment. A full assessment will be made once monitoring is complete and an addendum report will be issued.

Guidance on the assessment of ground gas is given in CIRIA C665 (2007) *'Assessing Risks Posed by Hazardous Ground Gases to Buildings'* and BS8485:2015+A1:2019 *'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'*.

The gas monitoring carried out to date has recorded no methane and a peak carbon dioxide concentration of 0.3 % (CP1) and using the limit of detection of the monitoring equipment issued, a gas flow rate of 0.1l/hr (as no flows were recorded in any of the boreholes during the monitoring), derives a site GSV of 0.003 l/hr.

Based on the above GSV, the ground gas regime for the site would initially be assessed as Characteristic Situation CS1 – No special precautions.

A further assessment of the ground gas regime beneath the site, and the need, or otherwise for gas protection measures to the building, will be undertaken on completion of the monitoring period, following which an addendum assessment report will be issued.

According to the desk study basic radon protection measures are **not** required for the protection of the proposed buildings at this location.

11.5 Watching Brief during Development Works

It is possible that areas of contamination or made ground may be encountered during the development works, which have not been identified by this report. If any areas of noxious, odorous, fibrous or liquid etc. contamination are encountered, then works should stop immediately, the local authority informed and further advice sought from a suitably experienced and qualified consultant. It is recommended that a watching brief be maintained during the development work for this purpose.

11.6 Disposal of Unsuitable Soils.

Any unsuitable materials which are to be exported from site, should be despatched to a suitably licensed landfill facility, in accordance with the requirements of the Duty of Care (DoC) Regulations, April 2006 and where appropriate, the HWR, 2005 or any superseding legislation.

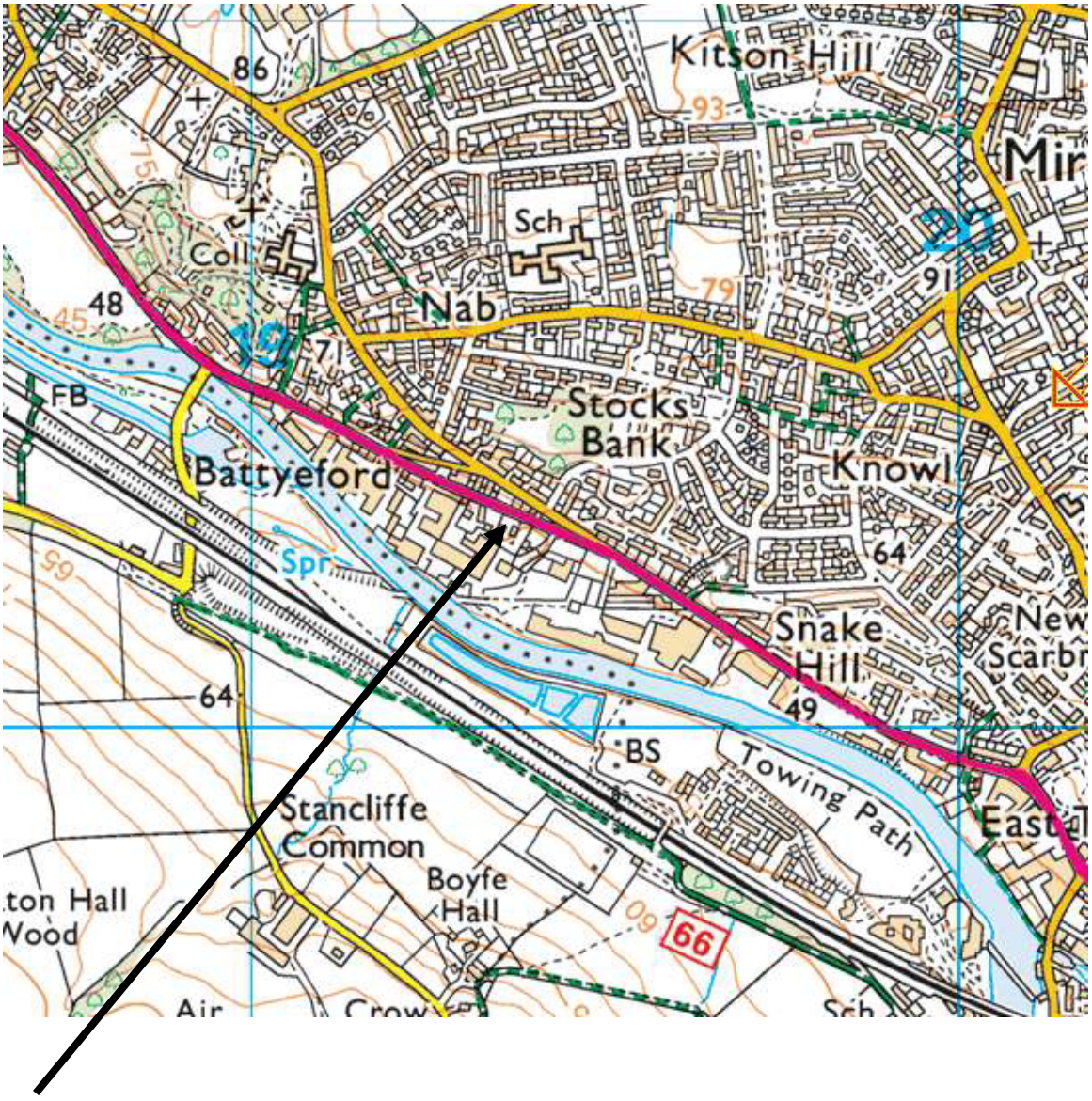
11.7 Regulatory Approval

The conclusions and recommendations presented above are considered practical based on the findings of this investigation, however, they cannot be guaranteed to gain regulatory approval, and therefore this report should be submitted to the regulators for their approval as part of any planning process.

The above recommendations comprise a general outline of possible or likely works. A remediation strategy report may be required by the regulatory authorities prior to development.

APPENDIX A

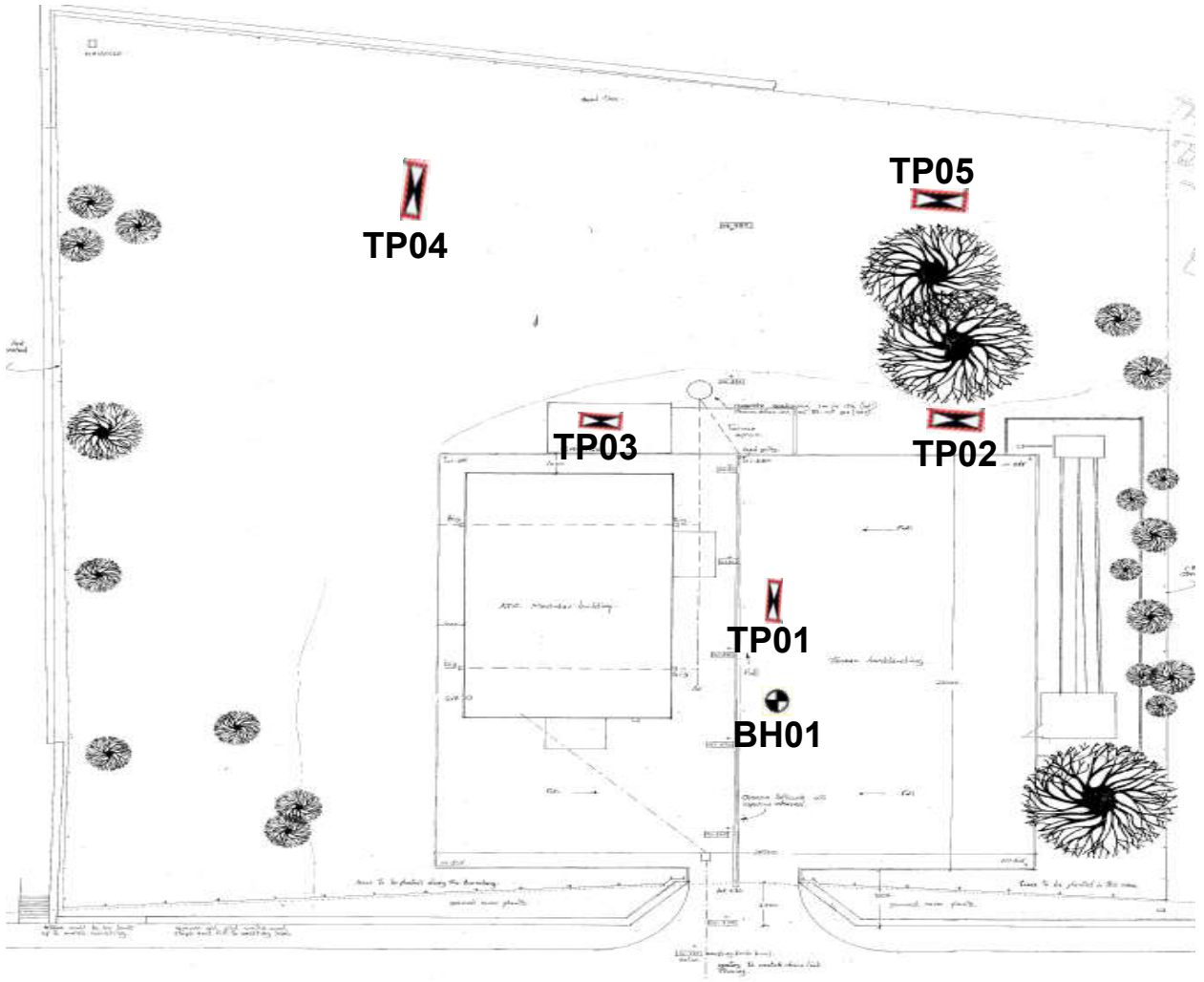
DRAWINGS



The Site

Site Location Plan **Drawing No C541/1**

G&M CONSULTING



Drawing: C541/1/2		Scale NTS	
Contract	C541 – Mirfield ATC	Drawn AS	Approved GS
		Drawing Name – Exploratory Hole Location Plan	
Client: John Hill Associates			

G&M CONSULTING

APPENDIX B

GROUNDSURE DOCUMENTS

Groundsure
LOCATION INTELLIGENCE

Enviro+Geo Insight

MIRFIELD AIR CADET CENTRE, HUDDERSFIELD ROAD, MIRFIELD, WF14 9DQ

Order Details

Date: 27/10/2022

Your ref: C541

Our Ref: GS-9159942

Site Details

Location: 419369 420275

Area: 0.18 ha

Authority: Kirklees Council

Contact us with any questions at:
info@groundsure.com
08444 159 000

Summary of findings

Page	Section	Past land use	On site	0-50m	50-250m	250-500m	500-2000m
13	1.1	Historical industrial land uses	4	6	46	71	-
18	1.2	Historical tanks	0	1	3	10	-
19	1.3	Historical energy features	0	0	4	6	-
20	1.4	Historical petrol stations	0	0	0	0	-
20	1.5	Historical garages	0	1	1	0	-
20	1.6	Historical military land	0	0	0	0	-
Page	Section	Past land use - un-grouped	On site	0-50m	50-250m	250-500m	500-2000m
21	2.1	Historical industrial land uses	6	7	72	102	-
28	2.2	Historical tanks	0	1	4	14	-
29	2.3	Historical energy features	0	0	6	12	-
30	2.4	Historical petrol stations	0	0	0	0	-
30	2.5	Historical garages	0	1	2	0	-
Page	Section	Waste and landfill	On site	0-50m	50-250m	250-500m	500-2000m
32	3.1	Active or recent landfill	0	0	0	1	-
33	3.2	Historical landfill (BGS records)	0	0	0	0	-
33	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
33	3.4	Historical landfill (EA/NRW records)	1	0	0	0	-
33	3.5	Historical waste sites	0	1	0	0	-
34	3.6	Licensed waste sites	0	1	3	1	-
35	3.7	Waste exemptions	0	0	0	3	-
Page	Section	Current industrial land use	On site	0-50m	50-250m	250-500m	500-2000m
37	4.1	Recent industrial land uses	0	2	17	-	-
39	4.2	Current or recent petrol stations	0	0	0	0	-
39	4.3	Electricity cables	0	0	0	0	-
39	4.4	Gas pipelines	0	0	0	0	-
39	4.5	Sites determined as Contaminated Land	0	0	0	0	-

40	4.6	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
40	4.7	Regulated explosive sites	0	0	0	0	-
40	4.8	Hazardous substance storage/usage	0	0	0	0	-
40	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-
40	4.10	Licensed industrial activities (Part A(1))	0	0	0	0	-
41	**4.11**	**Licensed pollutant release (Part A(2)/B)**	0	0	1	0	-
41	4.12	Radioactive Substance Authorisations	0	0	0	0	-
41	**4.13**	**Licensed Discharges to controlled waters**	0	0	0	4	-
42	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
42	4.15	Pollutant release to public sewer	0	0	0	0	-
43	4.16	List 1 Dangerous Substances	0	0	0	0	-
43	**4.17**	**List 2 Dangerous Substances**	0	0	0	1	-
43	**4.18**	**Pollution Incidents (EA/NRW)**	0	0	1	5	-
44	4.19	Pollution inventory substances	0	0	0	0	-
44	4.20	Pollution inventory waste transfers	0	0	0	0	-
45	4.21	Pollution inventory radioactive waste	0	0	0	0	-

Page	Section	Hydrogeology	On site	0-50m	50-250m	250-500m	500-2000m
46	**5.1**	**Superficial aquifer**	Identified (within 500m)				
48	**5.2**	**Bedrock aquifer**	Identified (within 500m)				
50	**5.3**	**Groundwater vulnerability**	Identified (within 50m)				
51	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
51	5.5	Groundwater vulnerability- local information	None (within 0m)				
52	**5.6**	**Groundwater abstractions**	0	0	0	0	4
53	**5.7**	**Surface water abstractions**	0	0	0	0	11
56	5.8	Potable abstractions	0	0	0	0	0
57	5.9	Source Protection Zones	0	0	0	0	-
57	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-

Page	Section	Hydrology	On site	0-50m	50-250m	250-500m	500-2000m
58	**6.1**	**Water Network (OS MasterMap)**	0	0	5	-	-

73	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
73	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
73	10.15	Nitrate Sensitive Areas	0	0	0	0	0
73	**10.16**	**Nitrate Vulnerable Zones**	0	0	0	0	1
75	**10.17**	**SSSI Impact Risk Zones**	1	-	-	-	-
76	10.18	SSSI Units	0	0	0	0	0
Page	Section	Visual and cultural designations	On site	0-50m	50-250m	250-500m	500-2000m
77	11.1	World Heritage Sites	0	0	0	-	-
77	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
77	11.3	National Parks	0	0	0	-	-
77	11.4	Listed Buildings	0	0	0	-	-
78	11.5	Conservation Areas	0	0	0	-	-
78	11.6	Scheduled Ancient Monuments	0	0	0	-	-
78	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations	On site	0-50m	50-250m	250-500m	500-2000m
79	**12.1**	**Agricultural Land Classification**	Grade 3 (within 250m)				
80	12.2	Open Access Land	0	0	0	-	-
80	12.3	Tree Felling Licences	0	0	0	-	-
80	12.4	Environmental Stewardship Schemes	0	0	0	-	-
80	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
81	**13.1**	**Priority Habitat Inventory**	0	0	6	-	-
82	13.2	Habitat Networks	0	0	0	-	-
82	13.3	Open Mosaic Habitat	0	0	0	-	-
82	13.4	Limestone Pavement Orders	0	0	0	-	-
Page	Section	Geology 1:10,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
83	**14.1**	**10k Availability**	Identified (within 500m)				
84	**14.2**	**Artificial and made ground (10k)**	1	2	8	13	-
86	**14.3**	**Superficial geology (10k)**	0	1	0	2	-

87	14.4	Landslip (10k)	0	0	0	0	-
88	14.5	Bedrock geology (10k)	1	1	3	14	-
89	14.6	Bedrock faults and other linear features (10k)	0	0	1	7	-
Page	Section	Geology 1:50,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
91	15.1	50k Availability	Identified (within 500m)				
92	15.2	Artificial and made ground (50k)	0	1	2	1	-
93	15.3	Artificial ground permeability (50k)	0	1	-	-	-
94	15.4	Superficial geology (50k)	0	1	0	1	-
95	15.5	Superficial permeability (50k)	Identified (within 50m)				
95	15.6	Landslip (50k)	0	0	0	0	-
95	15.7	Landslip permeability (50k)	None (within 50m)				
96	15.8	Bedrock geology (50k)	1	1	3	11	-
97	15.9	Bedrock permeability (50k)	Identified (within 50m)				
98	15.10	Bedrock faults and other linear features (50k)	0	0	1	6	-
Page	Section	Boreholes	On site	0-50m	50-250m	250-500m	500-2000m
99	16.1	BGS Boreholes	0	0	5	-	-
Page	Section	Natural ground subsidence					
101	17.1	Shrink swell clays	Very low (within 50m)				
102	17.2	Running sands	Low (within 50m)				
104	17.3	Compressible deposits	Moderate (within 50m)				
106	17.4	Collapsible deposits	Very low (within 50m)				
107	17.5	Landslides	Very low (within 50m)				
108	17.6	Ground dissolution of soluble rocks	Negligible (within 50m)				
Page	Section	Mining, ground workings and natural cavities	On site	0-50m	50-250m	250-500m	500-2000m
110	18.1	Natural cavities	0	0	0	0	-
111	18.2	BritPits	0	0	2	2	-
112	18.3	Surface ground workings	6	0	41	-	-
114	18.4	Underground workings	0	0	0	2	13
114	18.5	Historical Mineral Planning Areas	0	0	0	0	-

115	18.6	Non-coal mining	0	0	0	0	0
115	18.7	Mining cavities	0	0	0	0	0
115	18.8	JPB mining areas	None (within 0m)				
115	**18.9**	**Coal mining**	Identified (within 0m)				
116	18.10	Brine areas	None (within 0m)				
116	18.11	Gypsum areas	None (within 0m)				
116	18.12	Tin mining	None (within 0m)				
116	18.13	Clay mining	None (within 0m)				

Page	Section	Radon					
117	**19.1**	**Radon**	Less than 1% (within 0m)				
Page	Section	Soil chemistry	On site	0-50m	50-250m	250-500m	500-2000m
118	**20.1**	**BGS Estimated Background Soil Chemistry**	1	2	-	-	-
118	20.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
118	20.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-
Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
119	21.1	Underground railways (London)	0	0	0	-	-
119	21.2	Underground railways (Non-London)	0	0	0	-	-
120	21.3	Railway tunnels	0	0	0	-	-
120	21.4	Historical railway and tunnel features	0	0	0	-	-
120	21.5	Royal Mail tunnels	0	0	0	-	-
120	**21.6**	**Historical railways**	0	0	1	-	-
121	**21.7**	**Railways**	0	0	8	-	-
121	21.8	Crossrail 1	0	0	0	0	-
121	21.9	Crossrail 2	0	0	0	0	-
122	21.10	HS2	0	0	0	0	-

Recent aerial photograph

Capture Date: 30/05/2021

Site Area: 0.18ha

Recent site history - 2018 aerial photograph

Capture Date: 01/07/2018

Site Area: 0.18ha

Recent site history - 2012 aerial photograph

Capture Date: 26/03/2012

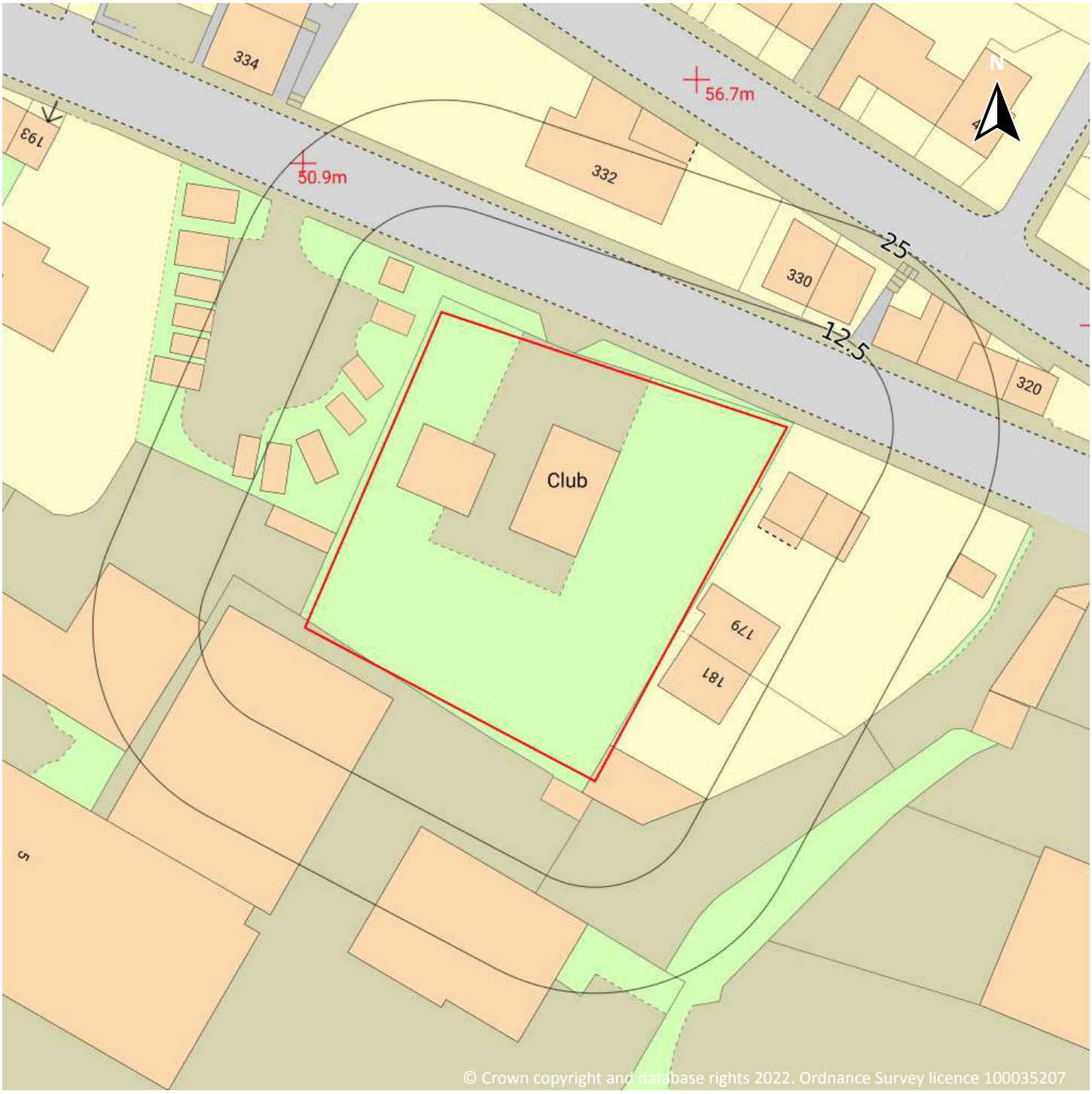
Site Area: 0.18ha

Recent site history - 1999 aerial photograph

Capture Date: 10/07/1999

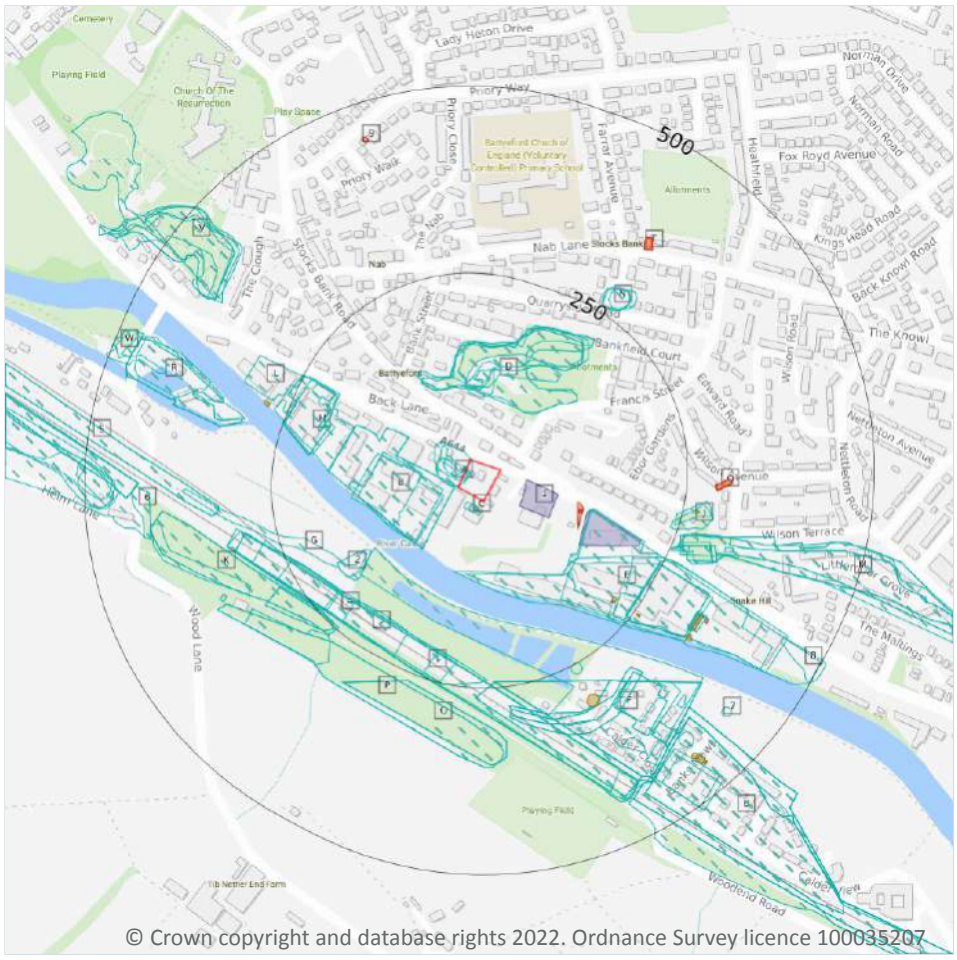
Site Area: 0.18ha

OS MasterMap site plan



Site Area: 0.18ha

1 Past land use



Site Outline

Search buffers in metres (m)

Historical industrial land uses

Historical tanks

Historical energy features

Historical garages

1.1 Historical industrial land uses

Records within 500m	127

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

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

ID	Location	Land use	Dates present	Group ID
A	**On site**	**Unspecified Ground Workings**	**1951**	**1412323**

ID	Location	Land use	Dates present	Group ID
A	**On site**	**Unspecified Heap**	**1938**	**1485519**
A	**On site**	**Unspecified Heap**	**1966 - 1975**	**1510118**
A	**On site**	**Unspecified Heap**	**1985**	**1512861**
B	5m W	Sands Mill	1948	1477489
B	5m W	Unspecified Mills	1892 - 1905	1484182
C	11m S	Unspecified Tank	1951	1515359
C	11m SW	Unspecified Tank	1938	1519479
B	21m W	Sands Mill	1931 - 1938	1499397
B	22m SW	Unspecified Mill	1966 - 1975	1478899
B	52m W	Sands Mill	1951	1511112
D	83m NE	Unspecified Quarry	1985	1531605
D	83m NE	Unspecified Disused Quarry	1966 - 1975	1551208
D	85m N	Refuse Heap	1892	1436665
D	95m N	Unspecified Quarry	1948	1468206
D	95m N	Unspecified Quarry	1905 - 1931	1476204
E	95m S	Unspecified Mills	1975 - 1985	1550698
D	98m N	Unspecified Quarry	1938	1540415
E	98m S	Unspecified Mill	1951	1421641
D	99m N	Unspecified Ground Workings	1951	1412324
D	104m N	Unspecified Quarry	1951	1522259
E	132m E	Unspecified Mills	1892 - 1948	1502249
F	136m SW	Unspecified Commercial/Industrial	1938	1493012
E	142m SE	Unspecified Mills	1966	1509495
G	144m SW	Unspecified Ground Workings	1951	1412268
2	151m SW	Unspecified Heap	1975 - 1985	1541442
H	160m NW	Unspecified Mill	1966 - 1985	1480920
H	184m W	Unspecified Mill	1948 - 1951	1460174
H	190m W	Unspecified Mill	1938	1471631

ID	Location	Land use	Dates present	Group ID
H	190m W	Unspecified Mill	1931	1477885
3	196m SW	Cuttings	1966 - 1985	1468941
4	200m SW	Cuttings	1951	1515646
I	201m SW	Cuttings	1938	1507090
I	204m SW	Cuttings	1905 - 1931	1474232
I	204m SW	Cuttings	1948	1524299
I	204m SW	Cuttings	1892	1525174
I	208m S	Cuttings	1966 - 1985	1537804
E	211m SE	Unspecified Mills	1951	1462939
G	211m SW	Cuttings	1975 - 1985	1510968
G	211m SW	Cuttings	1966	1533561
J	240m E	Unspecified Quarry	1966 - 1985	1546731
F	242m S	Unspecified Kiln	1956	1435438
F	242m S	Unspecified Commercial/Industrial	1988	1464025
F	242m S	Unspecified Commercial/Industrial	1975	1474238
F	242m S	Cuttings	1956 - 1965	1482386
F	242m S	Cuttings	1975 - 1988	1556393
E	242m SE	Unspecified Mills	1938	1493915
J	243m E	Unspecified Quarry	1951	1489611
E	244m SE	Unspecified Mills	1948	1472013
E	244m SE	Unspecified Mills	1905 - 1931	1538082
G	246m SW	Unspecified Heap	1966	1505772
G	246m SW	Unspecified Heap	1951	1528706
K	246m SW	Unspecified Heap	1985	1493535
K	246m SW	Unspecified Heap	1975	1540517
L	248m NW	Unspecified Mill	1966 - 1985	1533308
F	249m SE	Malt Kiln	1938	1423565
J	252m E	Railway Station	1948	1459891

ID	Location	Land use	Dates present	Group ID
J	252m E	Railway Station	1905 - 1931	1463671
M	257m E	Railway Sidings	1938	1461996
M	258m E	Railway Sidings	1966	1545531
M	258m E	Railway Sidings	1951	1555392
N	258m NE	Unspecified Pit	1931	1510463
N	258m NE	Unspecified Pit	1948	1520153
M	259m E	Railway Sidings	1905 - 1931	1480561
M	259m E	Railway Sidings	1948	1548100
N	259m NE	Unspecified Heap	1938	1530731
O	261m S	Unspecified Heap	1975 - 1988	1464949
O	261m S	Unspecified Heap	1956 - 1965	1478316
G	263m SW	Unspecified Heap	1966 - 1985	1495972
J	264m E	Railway Station	1938	1554891
N	264m NE	Unspecified Pit	1951	1478018
P	264m SW	Unspecified Heap	1948	1490867
P	264m SW	Unspecified Heap	1931	1517186
J	272m E	Railway Station	1951	1479300
F	276m S	Railway Sidings	1975	1463162
F	276m S	Railway Sidings	1956	1503376
F	276m S	Railway Sidings	1965	1541762
F	281m S	Railway Sidings	1948	1474518
F	281m S	Railway Sidings	1892 - 1931	1498539
R	300m W	Boat Building Yard	1931 - 1938	1539730
R	301m W	Unspecified Yard	1905	1458410
R	301m W	Unspecified Yard	1948	1517270
F	304m SE	Malt Kiln	1948	1505396
F	304m SE	Malt Kiln	1905 - 1931	1513894
K	307m SW	Unspecified Ground Workings	1951 - 1966	1479969

ID	Location	Land use	Dates present	Group ID
F	312m SE	Unspecified Works	1965	1438241
J	318m E	Railway Building	1951	1429020
E	322m SE	Unspecified Tanks	1948	1542479
E	322m SE	Unspecified Tanks	1931	1542722
S	322m W	Unspecified Pit	1966	1493132
S	322m W	Unspecified Pit	1975 - 1985	1544852
E	322m SE	Unspecified Tanks	1938	1476849
E	329m SE	Unspecified Tanks	1951	1425836
K	342m SW	Railway Building	1938	1429019
R	360m W	Boat Building Yard	1951	1505878
F	371m SE	Unspecified Heap	1988	1415196
F	373m SE	Unspecified Kiln	1956	1435440
F	377m SE	Malt Kiln	1948	1493949
F	377m SE	Malt Kiln	1905 - 1931	1529336
U	389m SE	Railway Sidings	1966	1458282
U	389m SE	Railway Sidings	1965	1458283
U	389m SE	Railway Sidings	1956	1459391
V	393m NW	Unspecified Ground Workings	1892	1412325
U	399m SE	Railway Sidings	1905	1485729
U	399m SE	Railway Sidings	1892	1508854
U	399m SE	Railway Sidings	1938 - 1948	1530666
U	399m SE	Railway Sidings	1931	1536916
5	400m NW	Unspecified Quarry	1951 - 1975	1530518
V	404m NW	Unspecified Quarry	1985	1493824
V	404m NW	Unspecified Quarry	1931 - 1948	1499997
V	404m NW	Unspecified Quarry	1905	1515516
F	409m SE	Unspecified Tank	1975	1433470
6	413m W	Refuse Heap	1892	1436664

ID	Location	Land use	Dates present	Group ID
S	413m W	Colliery	1892 - 1905	1461420
F	418m SE	Engine Shed	1905 - 1965	1526492
W	419m W	Unspecified Mill	1892	1421640
7	424m SE	Malt Kiln	1938	1423564
S	428m W	Railway Sidings	1948	1478929
S	428m W	Railway Sidings	1931	1517758
S	428m W	Railway Sidings	1892 - 1905	1526217
F	430m SE	Railway Building	1892	1429021
8	439m SE	Refuse Heap	1966	1436663
S	455m W	Unspecified Heap	1951	1495908
S	459m W	Refuse Heap	1892 - 1905	1496738
S	462m W	Unspecified Heap	1931 - 1948	1491614
S	463m W	Unspecified Heaps	1966 - 1985	1475129
W	468m NW	Cuttings	1966	1409837

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m	**14**

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

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

ID	Location	Land use	Dates present	Group ID
C	14m S	Unspecified Tank	1933	223709
E	215m SE	Tanks	1922 - 1933	249611
E	217m SE	Unspecified Tank	1957	238887
E	218m SE	Unspecified Tank	1957	234220

ID	Location	Land use	Dates present	Group ID
E	254m SE	Unspecified Tank	1893 - 1907	243655
E	257m SE	Unspecified Tank	1957	237415
J	268m E	Unspecified Tank	1907	223707
L	275m W	Tanks	1933	230754
F	296m SE	Unspecified Tank	1989	223708
E	326m SE	Tanks	1922 - 1933	234254
E	327m SE	Tanks	1922 - 1933	238159
F	439m SE	Unspecified Tank	1989	223706
F	446m SE	Tanks	1957	239069
F	456m SE	Tanks	1957	240190

This data is sourced from Ordnance Survey / Groundsure.

1.3 Historical energy features

Records within 500m	**10**

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

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

ID	Location	Land use	Dates present	Group ID
E	112m E	Electricity Substation	1996	135550
E	118m E	Electricity Substation	1983	132595
E	119m E	Electricity Substation	1972	145803
E	184m SE	Electricity Substation	1972 - 1996	141371
Q	288m E	Electricity Substation	1972 - 1983	145727
Q	289m E	Electricity Substation	1996	140972
E	337m SE	Electricity Substation	1996	129136
T	352m NE	Electricity Substation	1970	146455

ID	Location	Land use	Dates present	Group ID
T	353m NE	Electricity Substation	1981 - 1996	136051
9	447m N	Electricity Substation	1970 - 1994	144158

This data is sourced from Ordnance Survey / Groundsure.

1.4 Historical petrol stations

Records within 500m	0

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

This data is sourced from Ordnance Survey / Groundsure.

1.5 Historical garages

Records within 500m	2

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

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

ID	Location	Land use	Dates present	Group ID
1	38m E	Garage	1982	41106
E	129m E	Garage	1972 - 1983	44898

This data is sourced from Ordnance Survey / Groundsure.

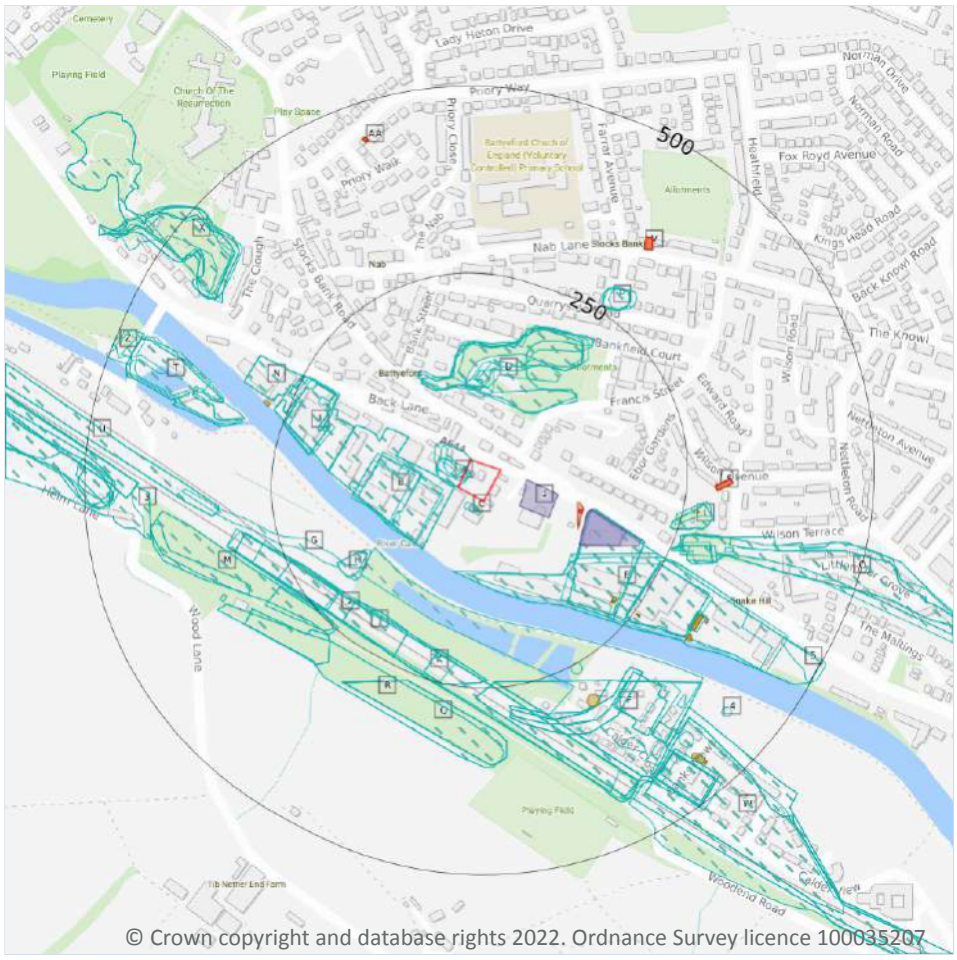
1.6 Historical military land

Records within 500m	0

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

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

2 Past land use - un-grouped



Site Outline

Search buffers in metres (m)

Historical industrial land uses

Historical tanks

Historical energy features

Historical garages

2.1 Historical industrial land uses

Records within 500m	187

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

Features are displayed on the Past land use - un-grouped map on **page 21**

ID	Location	Land Use	Date	Group ID
A	**On site**	**Unspecified Ground Workings**	**1951**	**1412323**
A	**On site**	**Unspecified Heap**	**1966**	**1510118**
A	**On site**	**Unspecified Heap**	**1985**	**1512861**

ID	Location	Land Use	Date	Group ID
A	**On site**	**Unspecified Heap**	**1975**	**1510118**
A	**On site**	**Unspecified Heap**	**1938**	**1485519**
A	**On site**	**Unspecified Heap**	**1938**	**1485519**
B	5m W	Sands Mill	1948	1477489
B	5m W	Unspecified Mills	1905	1484182
B	5m W	Unspecified Mills	1892	1484182
C	11m S	Unspecified Tank	1951	1515359
C	11m SW	Unspecified Tank	1938	1519479
B	21m W	Sands Mill	1938	1499397
B	22m SW	Unspecified Mill	1975	1478899
B	52m W	Sands Mill	1951	1511112
B	53m W	Unspecified Mill	1966	1478899
B	60m W	Sands Mill	1931	1499397
D	83m NE	Unspecified Quarry	1985	1531605
D	83m NE	Unspecified Disused Quarry	1975	1551208
D	85m NE	Unspecified Disused Quarry	1966	1551208
D	85m N	Refuse Heap	1892	1436665
D	95m N	Unspecified Quarry	1948	1468206
D	95m N	Unspecified Quarry	1905	1476204
D	95m N	Unspecified Quarry	1931	1476204
E	95m S	Unspecified Mills	1985	1550698
E	95m S	Unspecified Mills	1975	1550698
D	98m N	Unspecified Quarry	1938	1540415
E	98m S	Unspecified Mill	1951	1421641
D	99m N	Unspecified Ground Workings	1951	1412324
D	104m N	Unspecified Quarry	1951	1522259
E	132m E	Unspecified Mills	1948	1502249
E	132m E	Unspecified Mills	1905	1502249

ID	Location	Land Use	Date	Group ID
E	132m E	Unspecified Mills	1892	1502249
E	132m E	Unspecified Mills	1931	1502249
F	136m SW	Unspecified Commercial/Industrial	1938	1493012
E	136m SE	Unspecified Mills	1938	1502249
E	142m SE	Unspecified Mills	1966	1509495
G	144m SW	Unspecified Ground Workings	1951	1412268
H	151m SW	Unspecified Heap	1985	1541442
H	151m SW	Unspecified Heap	1975	1541442
I	160m NW	Unspecified Mill	1966	1480920
I	160m NW	Unspecified Mill	1985	1480920
I	160m NW	Unspecified Mill	1975	1480920
I	184m W	Unspecified Mill	1951	1460174
I	190m W	Unspecified Mill	1938	1471631
I	190m W	Unspecified Mill	1948	1460174
I	190m W	Unspecified Mill	1931	1477885
J	196m SW	Cuttings	1966	1468941
J	196m SW	Cuttings	1985	1468941
J	196m SW	Cuttings	1975	1468941
2	200m SW	Cuttings	1951	1515646
K	201m SW	Cuttings	1938	1507090
K	204m SW	Cuttings	1948	1524299
K	204m SW	Cuttings	1905	1474232
K	204m SW	Cuttings	1892	1525174
K	204m SW	Cuttings	1931	1474232
K	208m S	Cuttings	1966	1537804
K	208m S	Cuttings	1985	1537804
K	208m S	Cuttings	1975	1537804
E	211m SE	Unspecified Mills	1951	1462939

ID	Location	Land Use	Date	Group ID
G	211m SW	Cuttings	1985	1510968
G	211m SW	Cuttings	1975	1510968
G	211m SW	Cuttings	1966	1533561
L	240m E	Unspecified Quarry	1966	1546731
L	240m E	Unspecified Quarry	1985	1546731
L	240m E	Unspecified Quarry	1975	1546731
F	242m S	Unspecified Commercial/Industrial	1988	1464025
F	242m S	Cuttings	1988	1556393
F	242m S	Cuttings	1965	1482386
F	242m S	Cuttings	1956	1482386
F	242m S	Cuttings	1975	1556393
F	242m S	Unspecified Kiln	1956	1435438
F	242m S	Unspecified Commercial/Industrial	1975	1474238
E	242m SE	Unspecified Mills	1938	1493915
L	243m E	Unspecified Quarry	1951	1489611
E	244m SE	Unspecified Mills	1948	1472013
E	244m SE	Unspecified Mills	1905	1538082
E	244m SE	Unspecified Mills	1931	1538082
G	246m SW	Unspecified Heap	1951	1528706
G	246m SW	Unspecified Heap	1966	1505772
M	246m SW	Unspecified Heap	1985	1493535
M	246m SW	Unspecified Heap	1975	1540517
N	248m NW	Unspecified Mill	1966	1533308
N	248m NW	Unspecified Mill	1985	1533308
N	248m NW	Unspecified Mill	1975	1533308
F	249m SE	Malt Kiln	1938	1423565
L	252m E	Railway Station	1948	1459891
L	252m E	Railway Station	1905	1463671

ID	Location	Land Use	Date	Group ID
L	252m E	Railway Station	1931	1463671
O	257m E	Railway Sidings	1938	1461996
O	258m E	Railway Sidings	1951	1555392
O	258m E	Railway Sidings	1966	1545531
P	258m NE	Unspecified Pit	1948	1520153
P	258m NE	Unspecified Pit	1931	1510463
O	259m E	Railway Sidings	1948	1548100
O	259m E	Railway Sidings	1905	1480561
O	259m E	Railway Sidings	1931	1480561
P	259m NE	Unspecified Heap	1938	1530731
P	259m NE	Unspecified Heap	1938	1530731
Q	261m S	Unspecified Heap	1988	1464949
Q	261m S	Unspecified Heap	1965	1478316
Q	261m S	Unspecified Heap	1956	1478316
Q	261m S	Unspecified Heap	1975	1464949
G	263m SW	Unspecified Heap	1966	1495972
G	263m SW	Unspecified Heap	1985	1495972
G	263m SW	Unspecified Heap	1975	1495972
L	264m E	Railway Station	1938	1554891
P	264m NE	Unspecified Pit	1951	1478018
R	264m SW	Unspecified Heap	1948	1490867
R	264m SW	Unspecified Heap	1931	1517186
L	272m E	Railway Station	1951	1479300
F	276m S	Railway Sidings	1965	1541762
F	276m S	Railway Sidings	1956	1503376
F	276m S	Railway Sidings	1975	1463162
F	281m S	Railway Sidings	1948	1474518
F	281m S	Railway Sidings	1905	1498539

ID	Location	Land Use	Date	Group ID
F	281m S	Railway Sidings	1892	1498539
F	281m S	Railway Sidings	1931	1498539
T	300m W	Boat Building Yard	1938	1539730
T	301m W	Unspecified Yard	1948	1517270
T	301m W	Unspecified Yard	1905	1458410
T	301m W	Boat Building Yard	1931	1539730
F	304m SE	Malt Kiln	1948	1505396
F	304m SE	Malt Kiln	1905	1513894
F	304m SE	Malt Kiln	1931	1513894
M	307m SW	Unspecified Ground Workings	1951	1479969
M	307m SW	Unspecified Ground Workings	1966	1479969
F	312m SE	Unspecified Works	1965	1438241
L	318m E	Railway Building	1951	1429020
E	322m SE	Unspecified Tanks	1948	1542479
E	322m SE	Unspecified Tanks	1931	1542722
U	322m W	Unspecified Pit	1966	1493132
U	322m W	Unspecified Pit	1985	1544852
U	322m W	Unspecified Pit	1975	1544852
E	322m SE	Unspecified Tanks	1938	1476849
E	329m SE	Unspecified Tanks	1951	1425836
M	342m SW	Railway Building	1938	1429019
T	360m W	Boat Building Yard	1951	1505878
F	371m SE	Unspecified Heap	1988	1415196
F	373m SE	Unspecified Kiln	1956	1435440
F	377m SE	Malt Kiln	1948	1493949
F	377m SE	Malt Kiln	1905	1529336
F	377m SE	Malt Kiln	1931	1529336
W	389m SE	Railway Sidings	1965	1458283

ID	Location	Land Use	Date	Group ID
W	389m SE	Railway Sidings	1956	1459391
X	393m NW	Unspecified Ground Workings	1892	1412325
W	399m SE	Railway Sidings	1948	1530666
W	399m SE	Railway Sidings	1905	1485729
W	399m SE	Railway Sidings	1892	1508854
W	399m SE	Railway Sidings	1931	1536916
Y	400m NW	Unspecified Quarry	1951	1530518
Y	400m NW	Unspecified Quarry	1966	1530518
Y	400m NW	Unspecified Quarry	1975	1530518
W	401m SE	Railway Sidings	1938	1530666
X	404m NW	Unspecified Quarry	1985	1493824
X	404m NW	Unspecified Quarry	1948	1499997
X	404m NW	Unspecified Quarry	1905	1515516
X	404m NW	Unspecified Quarry	1931	1499997
F	409m SE	Unspecified Tank	1975	1433470
X	409m NW	Unspecified Quarry	1938	1499997
3	413m W	Refuse Heap	1892	1436664
U	413m W	Colliery	1905	1461420
U	413m W	Colliery	1892	1461420
F	418m SE	Engine Shed	1965	1526492
F	418m SE	Engine Shed	1956	1526492
Z	419m W	Unspecified Mill	1892	1421640
F	420m SE	Engine Shed	1938	1526492
F	422m SE	Engine Shed	1948	1526492
F	422m SE	Engine Shed	1905	1526492
F	422m SE	Engine Shed	1931	1526492
4	424m SE	Malt Kiln	1938	1423564
U	428m W	Railway Sidings	1948	1478929

ID	Location	Land Use	Date	Group ID
U	428m W	Railway Sidings	1905	1526217
U	428m W	Railway Sidings	1892	1526217
U	428m W	Railway Sidings	1931	1517758
F	430m SE	Railway Building	1892	1429021
5	439m SE	Refuse Heap	1966	1436663
U	455m W	Unspecified Heap	1951	1495908
U	459m W	Refuse Heap	1905	1496738
U	459m W	Refuse Heap	1892	1496738
U	462m W	Unspecified Heap	1948	1491614
U	462m W	Unspecified Heap	1931	1491614
U	463m W	Unspecified Heaps	1966	1475129
U	463m W	Unspecified Heaps	1985	1475129
U	463m W	Unspecified Heaps	1975	1475129
U	466m W	Unspecified Heap	1938	1491614
U	466m W	Unspecified Heap	1938	1491614
Z	468m NW	Cuttings	1966	1409837

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m	**19**

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

Features are displayed on the Past land use - un-grouped map on **page 21**

ID	Location	Land Use	Date	Group ID
C	14m S	Unspecified Tank	1933	223709
E	215m SE	Tanks	1922	249611
E	215m SE	Tanks	1933	249611
E	217m SE	Unspecified Tank	1957	238887

ID	Location	Land Use	Date	Group ID
E	218m SE	Unspecified Tank	1957	234220
E	254m SE	Unspecified Tank	1893	243655
E	254m SE	Unspecified Tank	1907	243655
E	257m SE	Unspecified Tank	1957	237415
E	257m SE	Unspecified Tank	1957	237415
L	268m E	Unspecified Tank	1907	223707
N	275m W	Tanks	1933	230754
F	296m SE	Unspecified Tank	1989	223708
E	326m SE	Tanks	1922	234254
E	326m SE	Tanks	1933	234254
E	327m SE	Tanks	1922	238159
E	327m SE	Tanks	1933	238159
F	439m SE	Unspecified Tank	1989	223706
F	446m SE	Tanks	1957	239069
F	456m SE	Tanks	1957	240190

This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m **18**

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

Features are displayed on the Past land use - un-grouped map on **page 21**

ID	Location	Land Use	Date	Group ID
E	112m E	Electricity Substation	1996	135550
E	118m E	Electricity Substation	1983	132595
E	119m E	Electricity Substation	1972	145803
E	184m SE	Electricity Substation	1972	141371
E	184m SE	Electricity Substation	1983	141371

ID	Location	Land Use	Date	Group ID
E	184m SE	Electricity Substation	1996	141371
S	288m E	Electricity Substation	1983	145727
S	289m E	Electricity Substation	1996	140972
S	289m E	Electricity Substation	1972	145727
E	337m SE	Electricity Substation	1996	129136
V	352m NE	Electricity Substation	1970	146455
V	353m NE	Electricity Substation	1996	136051
V	353m NE	Electricity Substation	1981	136051
V	353m NE	Electricity Substation	1984	136051
V	353m NE	Electricity Substation	1990	136051
AA	447m N	Electricity Substation	1994	144158
AA	447m N	Electricity Substation	1970	144158
AA	449m N	Electricity Substation	1984	144158

This data is sourced from Ordnance Survey / Groundsure.

2.4 Historical petrol stations

Records within 500m	0

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

This data is sourced from Ordnance Survey / Groundsure.

2.5 Historical garages

Records within 500m	3

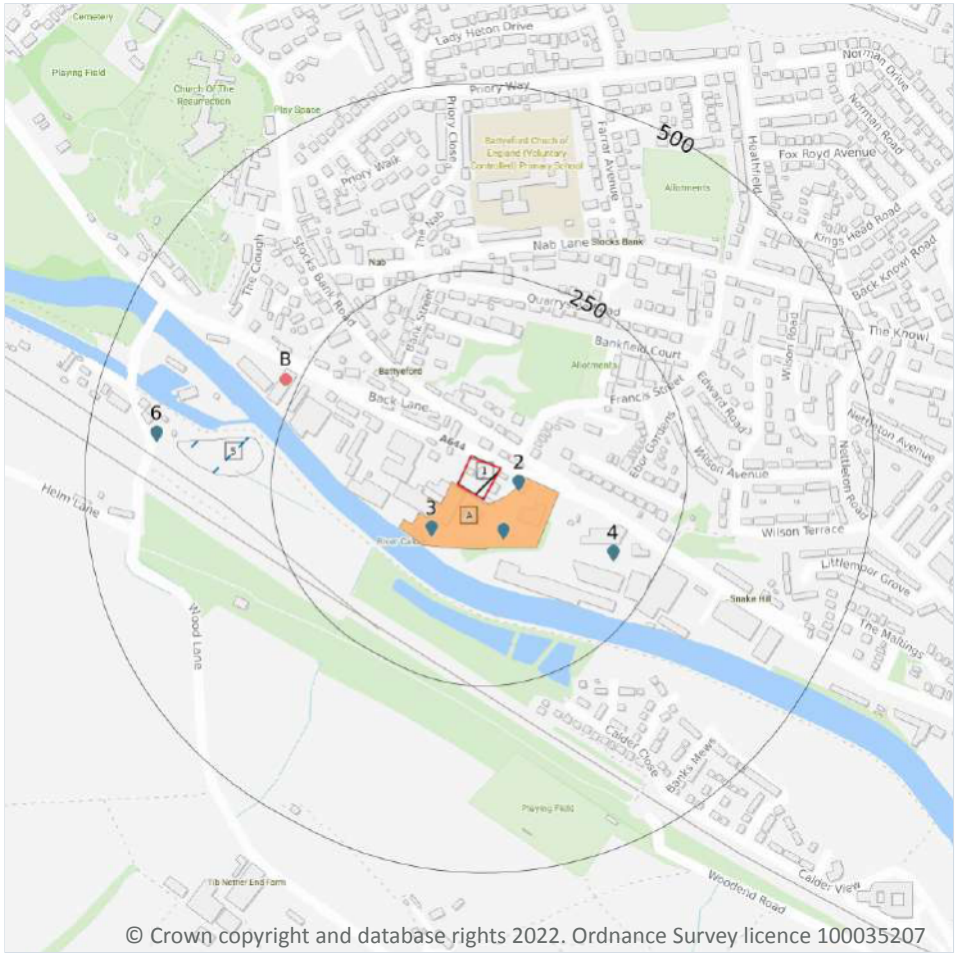
Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 21**

ID	Location	Land Use	Date	Group ID
1	38m E	Garage	1982	41106
E	129m E	Garage	1983	44898
E	131m E	Garage	1972	44898

This data is sourced from Ordnance Survey / Groundsure.

3 Waste and landfill



Site Outline

Search buffers in metres (m)

Active or recent landfill

Historical landfill (EA/NRW)

Historical waste sites

Licensed waste sites

Waste exemptions

3.1 Active or recent landfill

Records within 500m	1

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

Features are displayed on the Waste and landfill map on **page 32**

ID	Location	Details	
5	264m W	Operator: British Waterways Board Site Address: Land/premises At, Wood Lane, Battyeford, Mirfield, Dewsbury, West Yorkshire, WF14 0ED	WML Number: 61005 EPR Reference: BRI013 Landfill type: A06: Landfill taking other wastes Status: Closure IPPC Reference: - EPR Number: EA/EPR/XP3195ZS/A001

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

3.2 Historical landfill (BGS records)

Records within 500m	0

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

This data is sourced from the British Geological Survey.

3.3 Historical landfill (LA/mapping records)

Records within 500m	0

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

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

3.4 Historical landfill (EA/NRW records)

Records within 500m	1

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

Features are displayed on the Waste and landfill map on **page 32**

ID	Location	Details		
1	**On site**	**Site Address: Sandsfield, Huddersfield Road, Battyeford Licence Holder Address: Meadow Bank, Mirfield**	**Waste Licence: - Site Reference: 4700/0181 Waste Type: Inert, Commercial Environmental Permitting Regulations (Waste) Reference: - Licence Issue: - Licence Surrender: -**	**Operator: - Licence Holder: Messrs J W Blackburn First Recorded 01/01/1944 Last Recorded: -**

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

3.5 Historical waste sites

Records within 500m	1

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

Features are displayed on the Waste and landfill map on **page 32**

ID	Location	Address	Further Details	Date
A	**On site**	**Site Address: N/A**	**Type of Site: Scrap Yard** **Planning application reference: N/A** **Description: N/A** **Data source: Historic Mapping** **Data Type: Polygon**	**1994**

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

3.6 Licensed waste sites

Records within 500m	**5**

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

Features are displayed on the Waste and landfill map on **page 32**

ID	Location	Details		
2	30m E	Site Name: S S Motor Spares Site Address: Land/premises At, Huddersfield Road, Mirfield, Dewsbury, West Yorkshire, WF14 9DQ Correspondence Address: -	Type of Site: Metal Recycling Site (Vehicle Dismantler) Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SSM001 EPR reference: EA/EPR/XP3795ZN/A001 Operator: Charles W J Saunders Waste Management licence No: 61006 Annual Tonnage: 2500	Issue Date: 10/01/1991 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Expired
A	50m SE	Site Name: Ss Components Ltd Site Address: Land/premises At, Huddersfield Road, Mirfield, Mirfield, West Yorkshire, WF14 9DQ Correspondence Address: -	Type of Site: ELV Facility Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: 000219 EPR reference: EA/EPR/EP3192ZB/A001 Operator: Ss Components Ltd Waste Management licence No: 65414 Annual Tonnage: 2500	Issue Date: 16/03/2005 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued

ID	Location	Details		
3	68m SW	Site Name: Ss Components Ltd Site Address: Land/premises At, Huddersfield Road, Mirfield, Mirfield, West Yorkshire, WF14 9DQ Correspondence Address: -	Type of Site: ELV Facility Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: 000219 EPR reference: EA/EPR/EP3192ZB/A001 Operator: S S Components Ltd Waste Management licence No: 65414 Annual Tonnage: 2500	Issue Date: 16/03/2005 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued
4	186m SE	Site Name: Mirfield Motor Spares Ltd Site Address: 157, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DQ Correspondence Address: -	Type of Site: ELV Facility Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: 000169 EPR reference: EA/EPR/ZP3592ZX/A001 Operator: Mirfield Motor Spares Ltd Waste Management licence No: 65376 Annual Tonnage: 2500	Issue Date: 23/06/2004 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued
6	410m W	Site Name: Battyeford Lock Site Address: Land/premises At, Wood Lane, Battyeford, Mirfield, Dewsbury, West Yorkshire, WF14 0ED Correspondence Address: -	Type of Site: Landfill taking other wastes Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: BRI013 EPR reference: EA/EPR/XP3195ZS/A001 Operator: British Waterways Board Waste Management licence No: 61005 Annual Tonnage: 5000	Issue Date: 22/07/1991 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure

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

3.7 Waste exemptions

Records within 500m	**3**

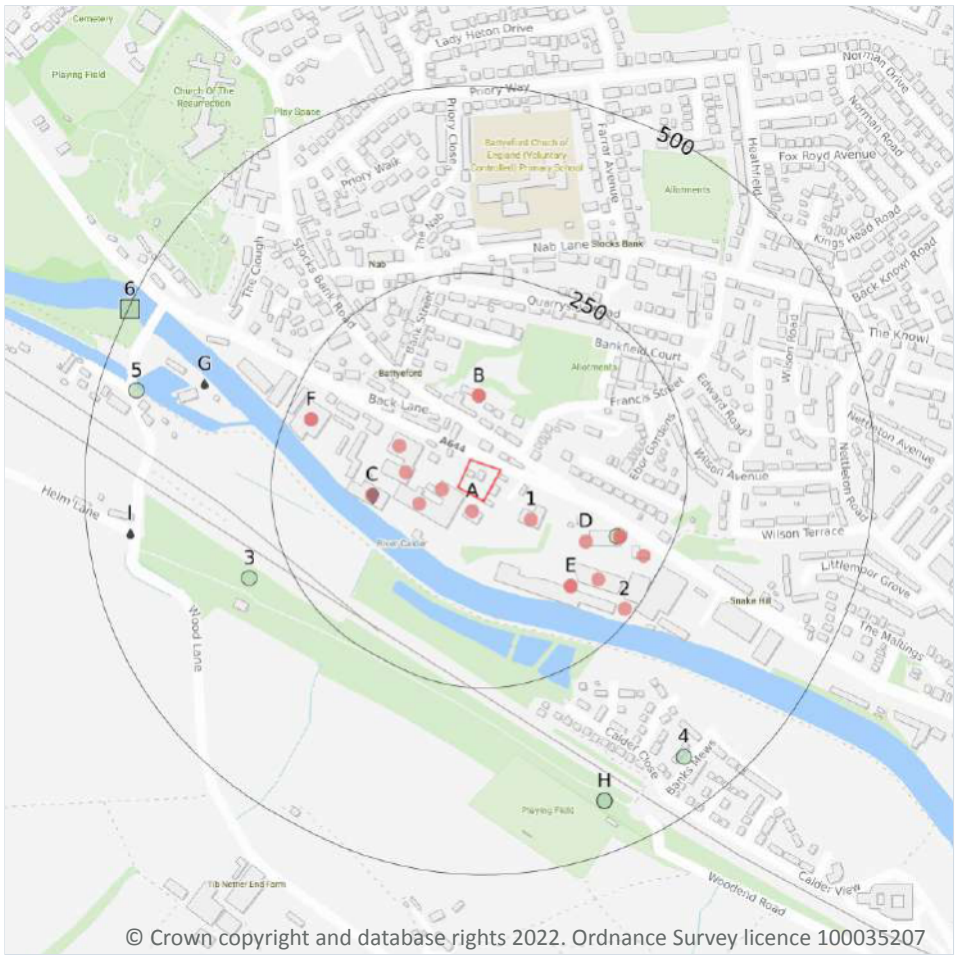
Activities involving the storage, treatment, use or disposal of waste that are exempt from needing a permit. Exemptions have specific limits and conditions that must be adhered to.

Features are displayed on the Waste and landfill map on **page 32**

ID	Location	Site	Reference	Category	Sub-Category	Description
B	269m NW	PERSEVERANCE MILLS, HUDDERSFIELD ROAD, MIRFIELD, WF14 9DL	WEX086606	Using waste exemption	Not on a farm	Use of waste in construction
B	269m NW	PERSEVERANCE MILLS, HUDDERSFIELD ROAD, MIRFIELD, WF14 9DL	WEX086606	Using waste exemption	Not on a farm	Incorporation of ash into soil
B	269m NW	PERSEVERANCE MILLS, HUDDERSFIELD ROAD, MIRFIELD, WF14 9DL	WEX086606	Using waste exemption	Not on a farm	Use of waste to manufacture finished goods

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

4 Current industrial land use



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Site Outline

Search buffers in metres (m)

Recent industrial land uses

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

Licensed Discharges to controlled waters

List 2 Dangerous Substances

Pollution Incidents (EA/NRW)

4.1 Recent industrial land uses

Records within 250m	19

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 37**

ID	Location	Company	Address	Activity	Category
A	19m SW	S S Components Ltd	Huddersfield Road, Mirfield, West Yorkshire, WF14 9DQ	Vehicle Parts and Accessories	Motoring
A	22m W	A & D Accident Repair Centre Ltd	Liversedge Mills, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DQ	Vehicle Repair, Testing and Servicing	Repair and Servicing

ID	Location	Company	Address	Activity	Category
A	57m W	J T F Fabrications	Unit 4 Sands Industrial Estate, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DQ	General Construction Supplies	Industrial Products
1	67m SE	Karwan Autos Ltd	189, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DQ	Secondhand Vehicles	Motoring
A	73m W	R K Fabrications UK Ltd	Unit 1, Liversedge Mills, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DQ	Metals Manufacturers, Fabricators and Stockholders	Industrial Products
B	86m N	Works	West Yorkshire, WF14	Unspecified Works Or Factories	Industrial Features
B	87m N	Sando's Ice Cream	Sandos Ice Cream 56, Stocks Bank Road, Mirfield, West Yorkshire, WF14 9PZ	Food and Beverage Industry Machinery	Industrial Products
A	94m NW	Hypergraph Laboratory Supplies	Sands Mill, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DQ	Medical Equipment, Supplies and Pharmaceuticals	Industrial Products
C	116m W	Caldercote Ltd	Unit 1 and 2 Sands Industrial Estate, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DQ	Industrial Coatings and Finishings	Industrial Products
D	146m SE	Visual Conservatories	159, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DQ	Conservatories	Consumer Products
E	163m SE	R T Cnc Services	Unit 7 Bankfield Business Park, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DQ	Cutting, Drilling and Welding Services	Construction Services
E	163m SE	Calder Gates	Unit 6 Bankfield Business Park, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DQ	Fences, Gates and Railings	Industrial Products
D	184m SE	Icarus Computers	159, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DQ	Electrical Equipment Repair and Servicing	Repair and Servicing
D	184m SE	Healthy Options Pet Food	159, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DQ	Animal Feeds, Pet Foods, Hay and Straw	Foodstuffs
E	185m SE	Pakprint Tapes Ltd	Unit 19 Bankfield Business Park, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DQ	Packaging	Industrial Products
F	217m NW	Kelcol Bedding Company Ltd	Wellington Mills, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DL	Beds and Bedding	Consumer Products
F	217m NW	D S M Group	Dsm Ropes and Twines, Wellington Mills, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DL	Ropes, Nets and Cordage	Industrial Products

ID	Location	Company	Address	Activity	Category
D	224m SE	Mirfield Motor Spares Ltd	157, Huddersfield Road, Mirfield, West Yorkshire, WF14 9DQ	Scrap Metal Merchants	Recycling Services
2	238m SE	Business Park	West Yorkshire, WF14	Business Parks and Industrial Estates	Industrial Features

This data is sourced from Ordnance Survey.

4.2 Current or recent petrol stations

Records within 500m	0

Open, closed, under development and obsolete petrol stations.

This data is sourced from Experian.

4.3 Electricity cables

Records within 500m	0

High voltage underground electricity transmission cables.

This data is sourced from National Grid.

4.4 Gas pipelines

Records within 500m	0

High pressure underground gas transmission pipelines.

This data is sourced from National Grid.

4.5 Sites determined as Contaminated Land

Records within 500m	0

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

This data is sourced from Local Authority records.

4.6 Control of Major Accident Hazards (COMAH)

Records within 500m	0

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

This data is sourced from the Health and Safety Executive.

4.7 Regulated explosive sites

Records within 500m	0

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

This data is sourced from the Health and Safety Executive.

4.8 Hazardous substance storage/usage

Records within 500m	0

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

This data is sourced from Local Authority records.

4.9 Historical licensed industrial activities (IPC)

Records within 500m	0

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

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

4.10 Licensed industrial activities (Part A(1))

Records within 500m	0

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

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

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

Records within 500m	1

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

Features are displayed on the Current industrial land use map on **page 37**

ID	Location	Address	Details	
C	116m W	Caldercote Ltd, Unit 2, Sands Industrial Estate, Huddersfield Road, Mirfield, WF14 9DQ	Process: Coating Processes Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified

This data is sourced from Local Authority records.

4.12 Radioactive Substance Authorisations

Records within 500m	0

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

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

4.13 Licensed Discharges to controlled waters

Records within 500m	4

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

Features are displayed on the Current industrial land use map on **page 37**

ID	Location	Address	Details	
G	366m W	BATTYE CUT, WOOD LANE, BATTYEFORD, MIRFIELD	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: C5171 Permit Version: 1 Receiving Water: LAND ADJACENT TO BATTYE CUT	Status: TRANSFERRED FROM COPA 1974 Issue date: 26/07/1988 Effective Date: 26/07/1988 Revocation Date: 25/07/2012

ID	Location	Address	Details	
G	366m W	BATTYE CUT, WOOD LANE, BATTYEFORD, MIRFIELD	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: C5171 Permit Version: 2 Receiving Water: LAND ADJACENT TO BATTYE CUT	Status: TRANSFERRED FROM COPA 1974 Issue date: 26/07/2012 Effective Date: 26/07/2012 Revocation Date: -
I	443m W	THE OLD SMITHY, HELME LANE, MIRFIELD	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: C5195 Permit Version: 1 Receiving Water: LAND ADJ TO PROPOSED DWELLING	Status: TRANSFERRED FROM COPA 1974 Issue date: 05/08/1988 Effective Date: 05/08/1988 Revocation Date: 25/07/2012
I	443m W	THE OLD SMITHY, HELME LANE, MIRFIELD	Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: C5195 Permit Version: 2 Receiving Water: LAND ADJ TO PROPOSED DWELLING	Status: TRANSFERRED FROM COPA 1974 Issue date: 26/07/2012 Effective Date: 26/07/2012 Revocation Date: -

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

4.14 Pollutant release to surface waters (Red List)

Records within 500m	0

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

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

4.15 Pollutant release to public sewer

Records within 500m	0

Discharges of Special Category Effluents to the public sewer.

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

4.16 List 1 Dangerous Substances

Records within 500m	0

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

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

4.17 List 2 Dangerous Substances

Records within 500m	1

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

Features are displayed on the Current industrial land use map on **page 37**

ID	Location	Name	Status	Receiving Water	Authorised Substances
6	498m NW	New List 2 Water Site 12	Active	River Calder	Tributyltin

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

4.18 Pollution Incidents (EA/NRW)

Records within 500m	6

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

Features are displayed on the Current industrial land use map on **page 37**

ID	Location	Details	
D	179m SE	Incident Date: 13/08/2001 Incident Identification: 23883 Pollutant: General Biodegradable Materials and Wastes Pollutant Description: Other General Biodegradable Material or Waste	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 3 (Minor)
3	304m SW	Incident Date: 14/08/2001 Incident Identification: 24009 Pollutant: Inert Materials and Wastes Pollutant Description: Construction and Demolition Materials and Wastes	Water Impact: Category 3 (Minor) Land Impact: Category 2 (Significant) Air Impact: Category 4 (No Impact)

ID	Location	Details	
H	432m S	Incident Date: 15/06/2001 Incident Identification: 9554 Pollutant: Inert Materials and Wastes Pollutant Description: Construction and Demolition Materials and Wastes	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
H	432m S	Incident Date: 15/06/2001 Incident Identification: 9554 Pollutant: Inert Materials and Wastes Pollutant Description: Construction and Demolition Materials and Wastes	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
4	434m SE	Incident Date: 18/06/2002 Incident Identification: 85776 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Smoke	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
5	449m W	Incident Date: 06/09/2002 Incident Identification: 105873 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Other Atmospheric Pollutant or Effect	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)

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

4.19 Pollution inventory substances

Records within 500m	**0**

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

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

4.20 Pollution inventory waste transfers

Records within 500m	**0**

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

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

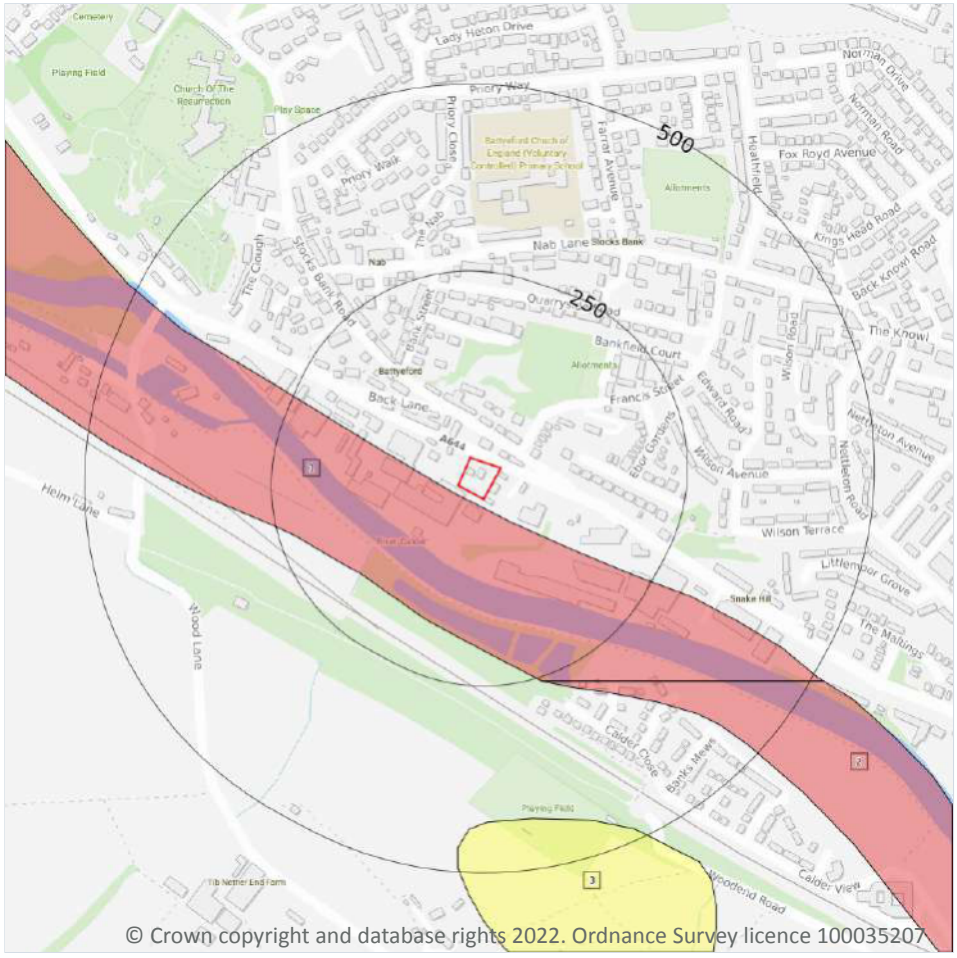
4.21 Pollution inventory radioactive waste

Records within 500m	0

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

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

5 Hydrogeology - Superficial aquifer



Site Outline

Search buffers in metres (m)

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

5.1 Superficial aquifer

Records within 500m	3

Aquifer status of groundwater held within superficial geology.

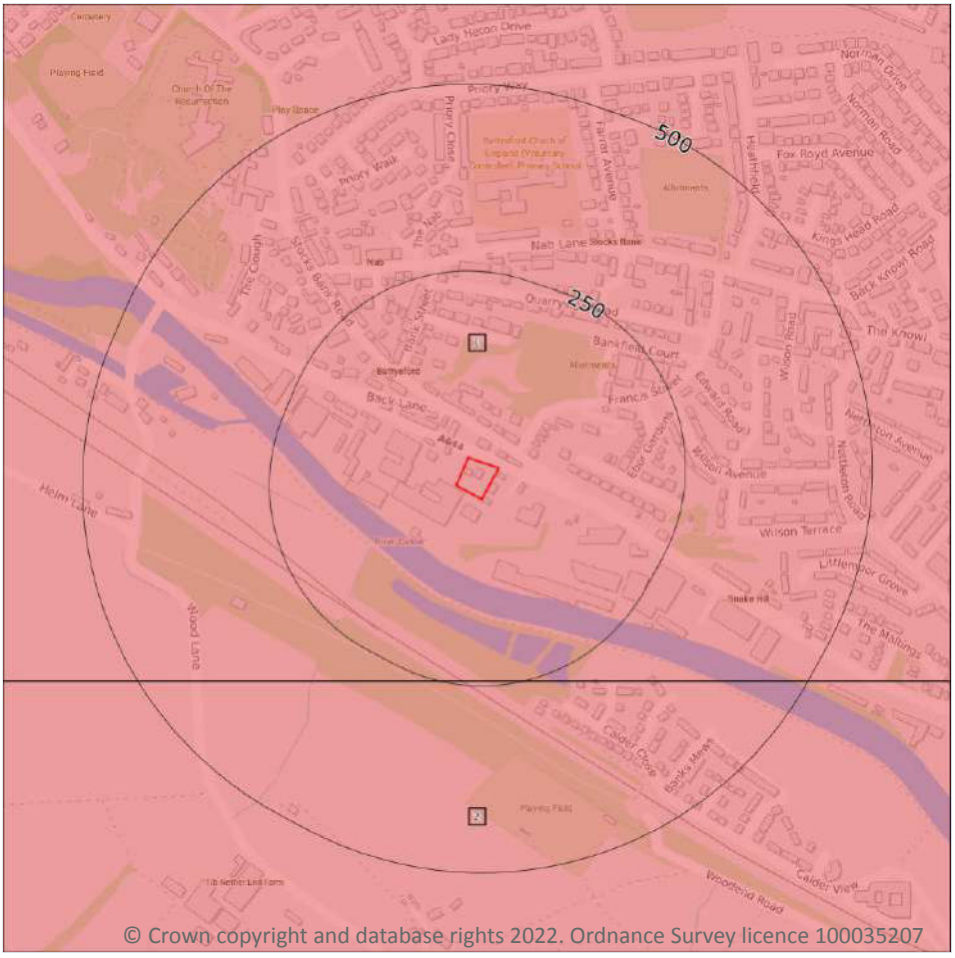
Features are displayed on the Hydrogeology map on **page 46**

ID	Location	Designation	Description
1	11m S	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	255m S	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

ID	Location	Designation	Description
3	431m S	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

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

Bedrock aquifer



Site Outline

Search buffers in metres (m)

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

5.2 Bedrock aquifer

Records within 500m **2**

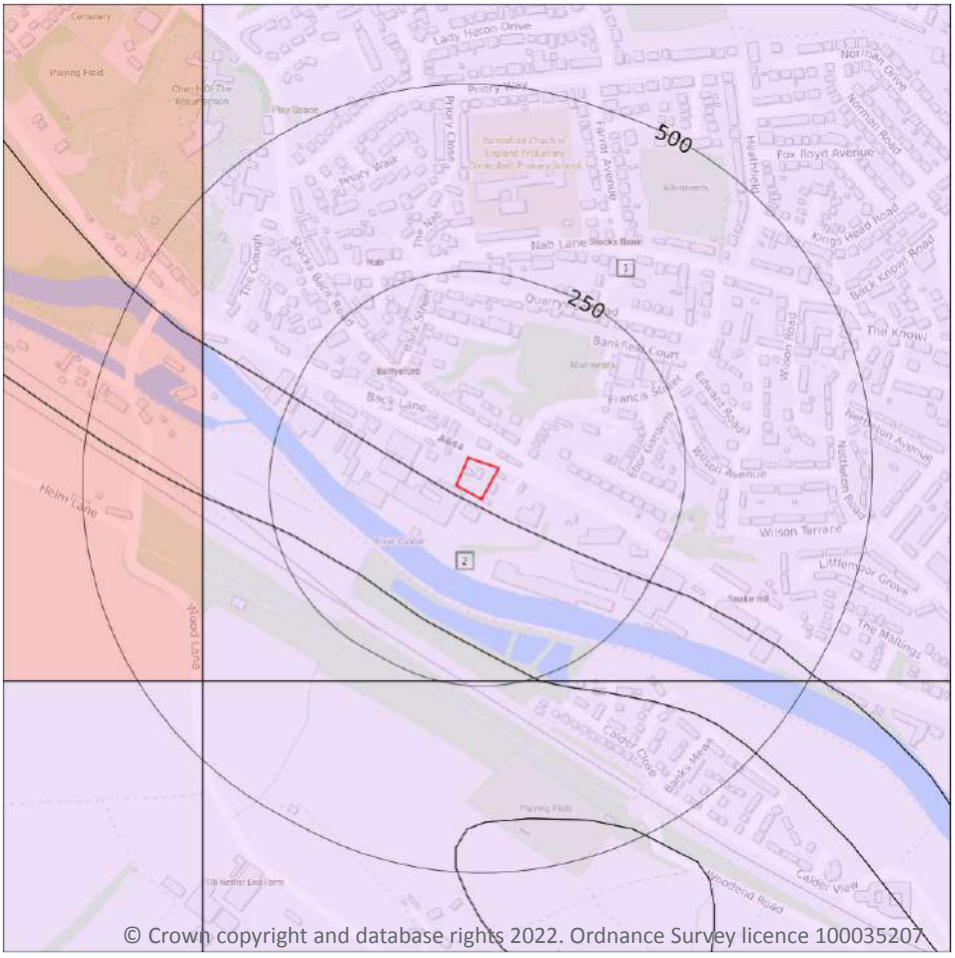
Aquifer status of groundwater held within bedrock geology.

Features are displayed on the Bedrock aquifer map on **page 48**

ID	Location	Designation	Description
1	**On site**	**Secondary A**	**Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers**
2	243m S	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

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

Groundwater vulnerability



Site Outline

Search buffers in metres (m)

Superficial vulnerability

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

Bedrock vulnerability

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

Other information

- Unproductive aquifer
- Soluble rock risk
- Local information

5.3 Groundwater vulnerability

Records within 50m	2

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

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

Features are displayed on the Groundwater vulnerability map on **page 50**

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
1	**On site**	**Summary Classification: Secondary bedrock aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer**	**Leaching class: Low Infiltration value: <40% Dilution value: 300-550mm/year**	**Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data**	**Vulnerability: Medium Aquifer type: Secondary Flow mechanism: Well connected fractures**
2	10m S	Summary Classification: Secondary bedrock aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: <40% Dilution value: 300-550mm/year	Vulnerability: Low Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Medium Aquifer type: Secondary Flow mechanism: Well connected fractures

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

5.4 Groundwater vulnerability- soluble rock risk

Records on site	**0**

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

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

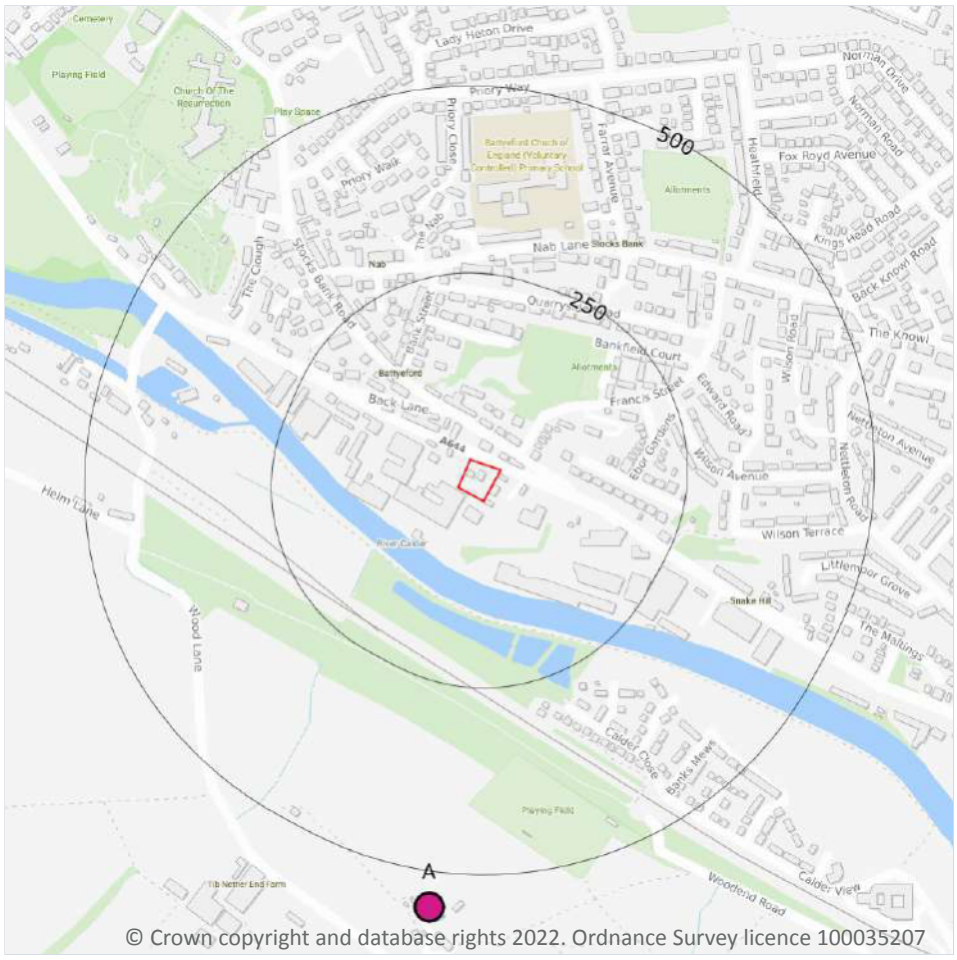
5.5 Groundwater vulnerability- local information

Records on site	**0**

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

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

Abstractions and Source Protection Zones



Site Outline

Search buffers in metres (m)

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

5.6 Groundwater abstractions

Records within 2000m	4

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

Features are displayed on the Abstractions and Source Protection Zones map on **page 52**

ID	Location	Details	
A	548m S	Status: Historical Licence No: 2/27/13/090 Details: General Farming & Domestic Direct Source: GROUNDWATERS Point: -- WELL Data Type: Point Name: DEWS Easting: 419300 Northing: 419700	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 17/03/1966 Expiry Date: - Issue No: 100 Version Start Date: 26/03/1974 Version End Date: -
A	548m S	Status: Historical Licence No: 2/27/13/090 Details: General Farming & Domestic Direct Source: GROUNDWATERS Point: WELL - COAL MEASURES - COLNSBRIDGE BRADLEY Data Type: Point Name: DEWS Easting: 419300 Northing: 419700	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 17/03/1966 Expiry Date: - Issue No: 100 Version Start Date: 26/03/1974 Version End Date: -
-	1916m W	Status: Historical Licence No: 2/27/12/186 Details: Boiler Feed Direct Source: GROUNDWATERS Point: BOREHOLE Data Type: Point Name: BOTTOMLEY & SON LIMITED Easting: 417500 Northing: 420800	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 28/04/1966 Expiry Date: - Issue No: 100 Version Start Date: 01/07/1998 Version End Date: -
-	1916m W	Status: Active Licence No: 2/27/12/186 Details: Boiler Feed Direct Source: GROUNDWATERS Point: BOREHOLE - COAL MEASURES - BRADLEY Data Type: Point Name: E BOTTOMLEY & SONS LTD Easting: 417500 Northing: 420800	Annual Volume (m^3): 109,090 Max Daily Volume (m^3): 1,364 Original Application No: 4308(2) Original Start Date: 28/04/1966 Expiry Date: - Issue No: 102 Version Start Date: 03/03/2008 Version End Date: -

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

5.7 Surface water abstractions

Records within 2000m	**11**

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

Features are displayed on the Abstractions and Source Protection Zones map on **page 52**

ID	Location	Details	
-	1214m NW	Status: Historical Licence No: 2/27/13/049 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: SURFACE WATER Point: NUNBROOK BECK Data Type: Point Name: JOHN COTTON (MIRFIELD) LTD Easting: 418300 Northing: 420900	Annual Volume (m^3): 57825 Max Daily Volume (m^3): 327.312 Original Application No: - Original Start Date: 20/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 20/01/1966 Version End Date: -
-	1214m NW	Status: Active Licence No: 2/27/13/049 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: SURFACE WATER Point: NUNBROOK BECK - MIRFIELD Data Type: Point Name: JOHN COTTON (MIRFIELD) LTD Easting: 418300 Northing: 420900	Annual Volume (m^3): 57,825 Max Daily Volume (m^3): 327.31 Original Application No: 726 Original Start Date: 20/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 20/01/1966 Version End Date: -
-	1459m W	Status: Historical Licence No: 2/27/13/071 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: SURFACE WATER Point: RIVER CALDER Data Type: Point Name: HOLLIDAY DYES & CHEMICALS LTD Easting: 417900 Northing: 420500	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 17/03/1966 Expiry Date: - Issue No: 100 Version Start Date: 01/03/1982 Version End Date: -
-	1459m W	Status: Historical Licence No: 2/27/13/071 Details: General use relating to Secondary Category (Medium Loss) Direct Source: SURFACE WATER Point: RIVER CALDER Data Type: Point Name: HOLLIDAY DYES & CHEMICALS LTD Easting: 417900 Northing: 420500	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 17/03/1966 Expiry Date: - Issue No: 100 Version Start Date: 01/03/1982 Version End Date: -

ID	Location	Details	
-	1656m W	Status: Historical Licence No: 2/27/12/267 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: SURFACE WATER Point: RIVER CALDER - DALTON WORKS HUDDERSFIELD Data Type: Point Name: ZENECA FINE CHEMICAL MANUFACTURING ORGANISATION Easting: 417700 Northing: 420500	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 24/02/1971 Expiry Date: - Issue No: 101 Version Start Date: 21/11/1999 Version End Date: -
-	1656m W	Status: Historical Licence No: 2/27/12/267 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: SURFACE WATER Point: RIVER CALDER - DALTON WORKS - HUDDERSFIELD Data Type: Point Name: ZENECA FINE CHEMICAL MANUFACTURING ORGANISATION Easting: 417700 Northing: 420500	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 24/02/1971 Expiry Date: - Issue No: 101 Version Start Date: 21/11/1999 Version End Date: -
-	1656m W	Status: Historical Licence No: 2/27/12/267 Details: Transfer between sources Direct Source: SURFACE WATER Point: RIVER CALDER - DALTON WORKS - HUDDERSFIELD Data Type: Point Name: ZENECA FINE CHEMICAL MANUFACTURING ORGANISATION Easting: 417700 Northing: 420500	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 24/02/1971 Expiry Date: - Issue No: 101 Version Start Date: 21/11/1999 Version End Date: -
-	1656m W	Status: Active Licence No: 2/27/13/201 Details: Transfer Between Sources (Pre Water Act 2003) Direct Source: SURFACE WATER Point: RIVER CALDER - DALTON WORKS - HUDDERSFIELD Data Type: Point Name: SYNGENTA LTD Easting: 417700 Northing: 420500	Annual Volume (m^3): 1,136,500 Max Daily Volume (m^3): 27,300 Original Application No: 5041 Original Start Date: 21/10/1999 Expiry Date: - Issue No: 102 Version Start Date: 01/04/2006 Version End Date: -

ID	Location	Details	
-	1767m SE	Status: Active Licence No: 2/27/13/050 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: SURFACE WATER Point: RIVER CALDER - HOLME BANK MILLS Data Type: Point Name: James Walker Textiles Ltd Easting: 420800 Northing: 419200	Annual Volume (m^3): 36,368 Max Daily Volume (m^3): 227.30 Original Application No: NPS/WR/001627 Original Start Date: 20/01/1966 Expiry Date: - Issue No: 101 Version Start Date: 15/06/2009 Version End Date: -
-	1916m W	Status: Historical Licence No: 2/27/12/185 Details: Boiler Feed Direct Source: SURFACE WATER Point: RIVER CALDER Data Type: Point Name: E BOTTOMLEY & SON LTD Easting: 417500 Northing: 420800	Annual Volume (m^3): 109090 Max Daily Volume (m^3): 1364 Original Application No: - Original Start Date: 28/04/1966 Expiry Date: - Issue No: 101 Version Start Date: 16/01/2006 Version End Date: -
-	1916m W	Status: Active Licence No: 2/27/12/185 Details: Boiler Feed Direct Source: SURFACE WATER Point: RIVER CALDER - BRADLEY Data Type: Point Name: E BOTTOMLEY & SONS LTD Easting: 417500 Northing: 420800	Annual Volume (m^3): 109,090 Max Daily Volume (m^3): 1,364 Original Application No: 4308 Original Start Date: 28/04/1966 Expiry Date: - Issue No: 102 Version Start Date: 03/03/2008 Version End Date: -

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

5.8 Potable abstractions

Records within 2000m	**0**

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

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

5.9 Source Protection Zones

Records within 500m	0

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

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

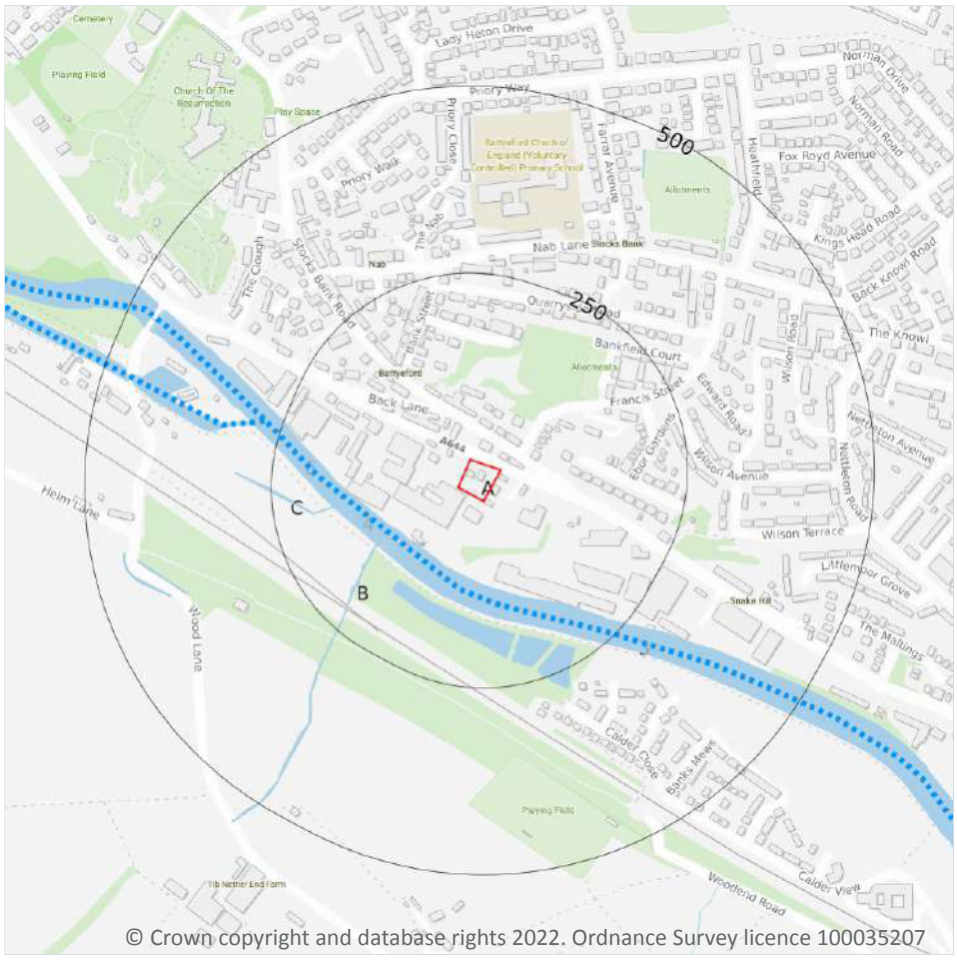
5.10 Source Protection Zones (confined aquifer)

Records within 500m	0

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

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

6 Hydrology



Site Outline

Search buffers in metres (m)

Water Network (OS MasterMap)

Surface water features (wider than 5m)

Surface water features (narrower than 5m)

WFD River, canal and surface water transfer water bodies

WFD Lake water bodies

WFD Transitional and coastal water bodies

WFD Surface water body catchments boundaries

WFD Groundwater body boundaries

6.1 Water Network (OS MasterMap)

Records within 250m	**5**

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

Features are displayed on the Hydrology map on **page 58**

ID	Location	Type of water feature	Ground level	Permanence	Name
3	111m SW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Calder

ID	Location	Type of water feature	Ground level	Permanence	Name
4	119m SW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Calder
B	119m SW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
6	159m W	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Calder
C	159m W	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-

This data is sourced from the Ordnance Survey.

6.2 Surface water features

Records within 250m	**6**

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

Features are displayed on the Hydrology map on **page 58**

This data is sourced from the Ordnance Survey.

6.3 WFD Surface water body catchments

Records on site	**1**

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

Features are displayed on the Hydrology map on **page 58**

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
A	**On site**	**River**	**Calder from River Colne to River Chald**	**GB104027062631**	**Calder Lower**	**Aire and Calder**

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

6.4 WFD Surface water bodies

Records identified	1

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

Features are displayed on the Hydrology map on **page 58**

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
2	105m SW	River	Calder from River Colne to River Chald	GB104027062631	Moderate	Fail	Moderate	2019

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

6.5 WFD Groundwater bodies

Records on site	1

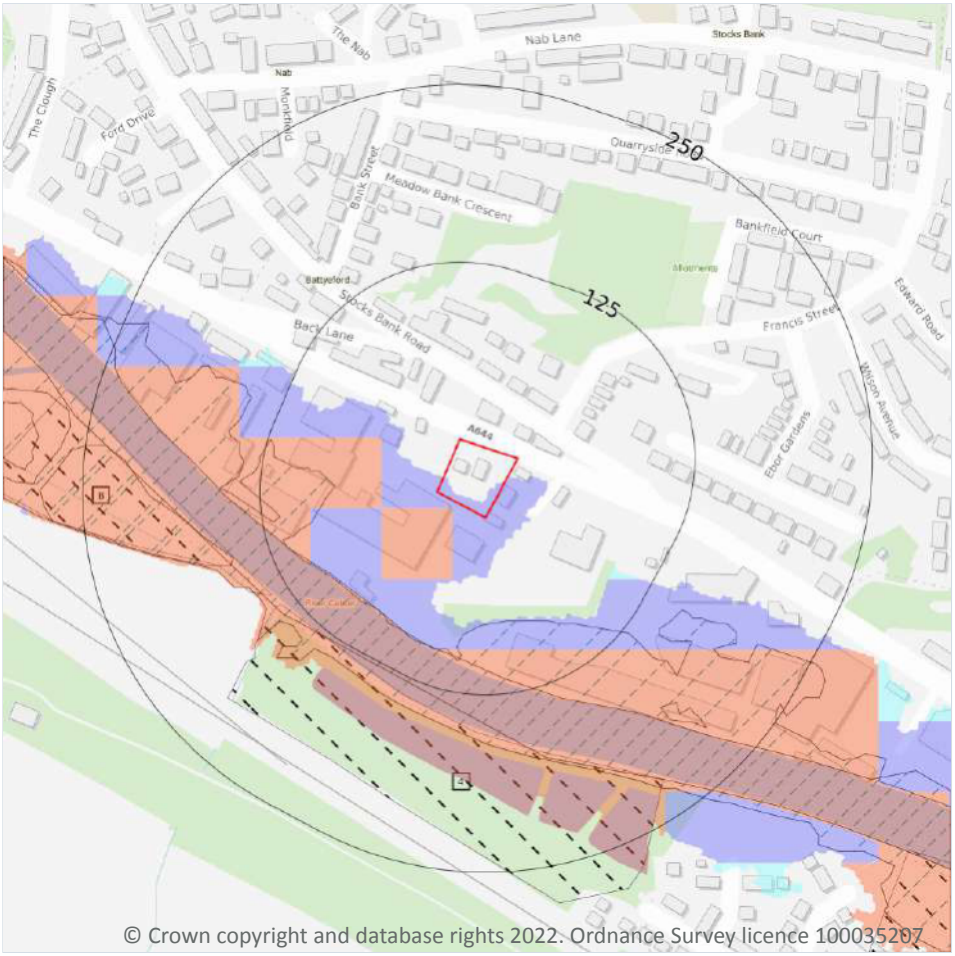
Groundwater bodies are also covered by the Directive and the same regime of objectives and reporting detailed in the previous section is in place. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each groundwater body listed.

Features are displayed on the Hydrology map on **page 58**

ID	Location	Name	Water body ID	Overall rating	Chemical rating	Quantitative	Year
A	**On site**	**Aire & Calder Carb Limestone / Millstone Grit / Coal Measures.**	**GB40402G700400**	**Poor**	**Poor**	**Good**	**2019**

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

7 River and coastal flooding



Site Outline

Search buffers in metres (m)

River and coastal flooding:

- High
- Medium
- Low
- Very Low
- Historical Flood Events
- Areas Used for Flood Storage
- Areas Benefiting from Flood Defences
- Flood Defences

7.1 Risk of flooding from rivers and the sea

Records within 50m	3

The chance of flooding from rivers and/or the sea in any given year, based on cells of 50m within the Risk of Flooding from Rivers and Sea (RoFRaS)/Flood Risk Assessment Wales (FRAW) models. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition. The risk categories for RoFRaS for rivers and the sea and FRAW for rivers are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance). The risk categories for FRAW for the sea are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 200 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 200 chance) or High (greater than or equal to 1 in 30 chance).

Features are displayed on the River and coastal flooding map on **page 61**

Distance	Flood risk category
On site	**Medium**
0 - 50m	High

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

7.2 Historical Flood Events

Records within 250m	**3**

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

Features are displayed on the River and coastal flooding map on **page 61**

ID	Location	Event name	Date of flood	Flood source	Flood cause	Type of flood
A	72m W	December 2015 Flood Event	2015-12-25 2015-12-29	Main river	Channel capacity exceeded (no raised defences)	Fluvial
A	92m SW	2020 February Flood Incident - Storm Ciara/dennis	2020-02-08 2020-03-19	Main river	Channel capacity exceeded (no raised defences)	Fluvial
B	151m W	River Calder. Brighouse To Dewsbury	2002-02-10 2002-02-13	Main river	Channel capacity exceeded (no raised defences)	Fluvial

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

7.3 Flood Defences

Records within 250m	**0**

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

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

7.4 Areas Benefiting from Flood Defences

Records within 250m	0

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

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

7.5 Flood Storage Areas

Records within 250m	2

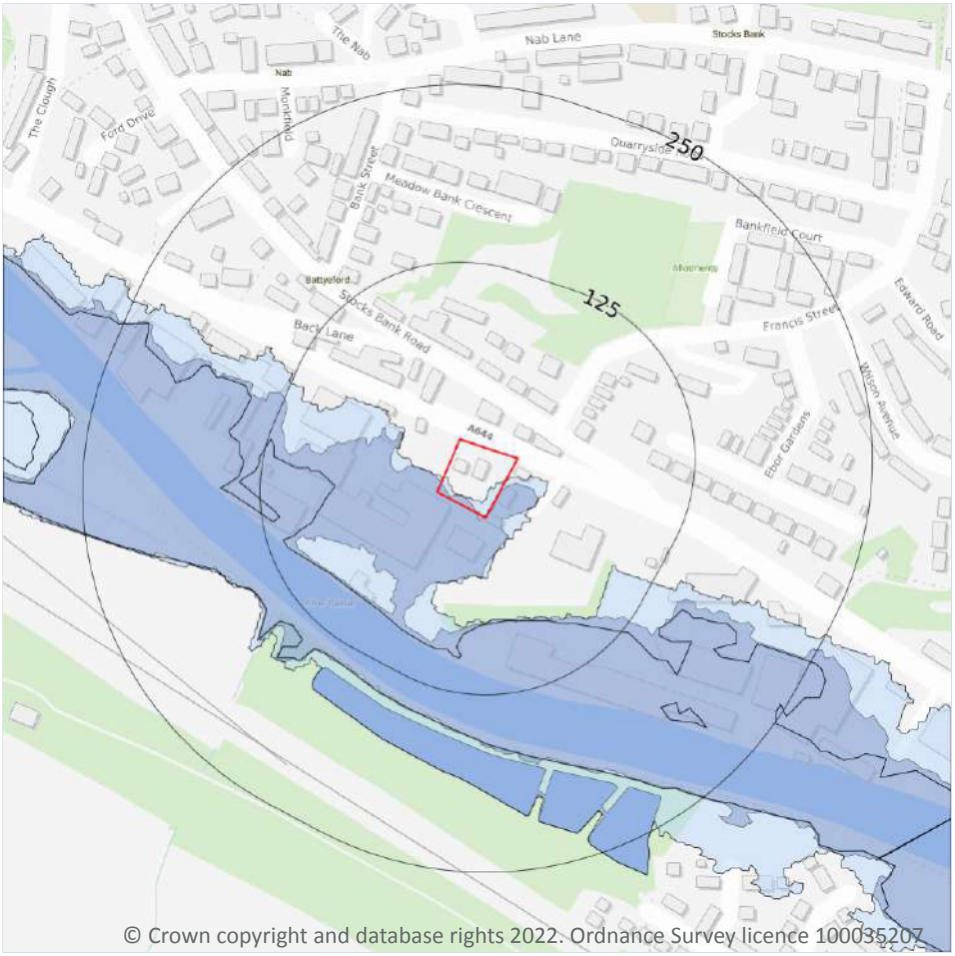
Areas that act as a balancing reservoir, storage basin or balancing pond to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel or to delay the timing of a flood peak so that its volume is discharged over a longer period.

Features are displayed on the River and coastal flooding map on **page 61**

ID	Location	Update
4	129m SW	Flood Storage Area
B	137m SW	Flood Storage Area

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

River and coastal flooding - Flood Zones



Site Outline

Search buffers in metres (m)

Flood zone 2

Flood zone 3

7.6 Flood Zone 2

Records within 50m	1

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

Features are displayed on the River and coastal flooding map on **page 61**

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

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

7.7 Flood Zone 3

Records within 50m	1

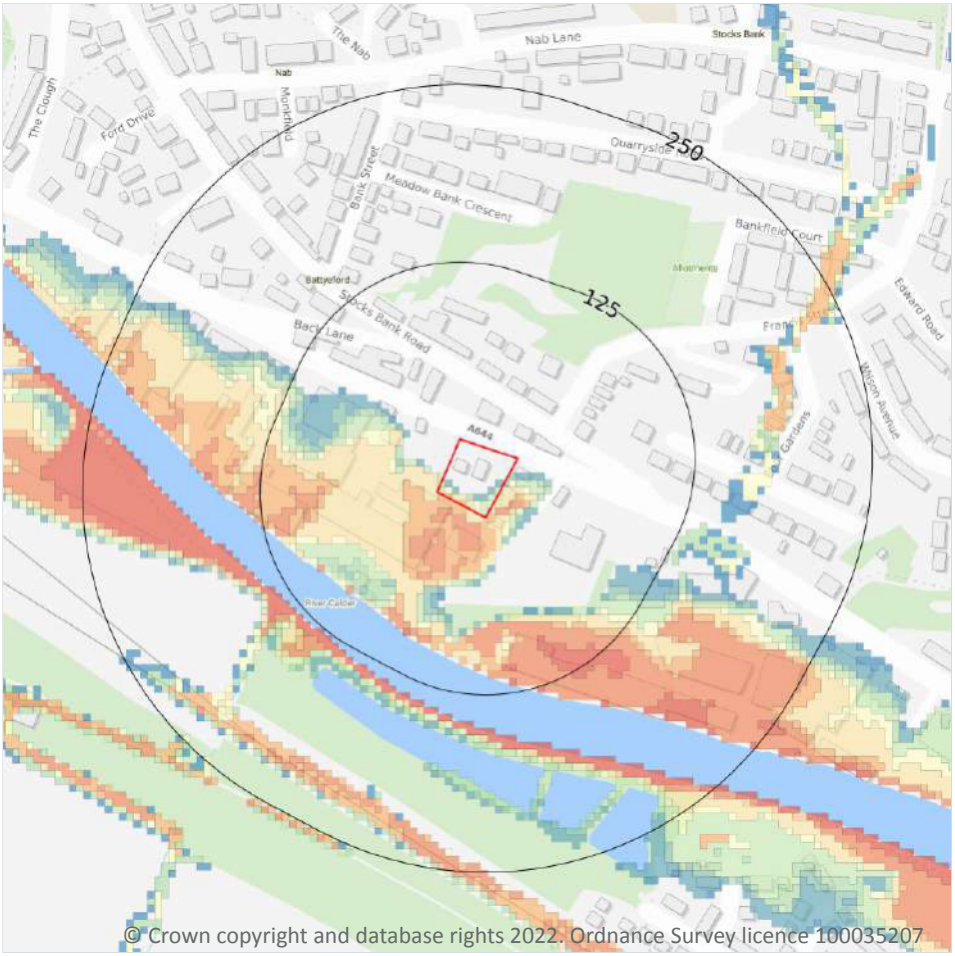
Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land with a 1 in 100 (1%) or greater chance of flooding each year from rivers or a 1 in 200 (0.5%) or greater chance of flooding each year from the sea.

Features are displayed on the River and coastal flooding map on **page 61**

Location	Type
On site	**Zone 3 - (Fluvial Models)**

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

8 Surface water flooding



Site Outline
Search buffers in metres (m)

1 in 1000 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 250 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 100 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 30 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

8.1 Surface water flooding

Highest risk on site	**1 in 30 year, 0.1m - 0.3m**
Highest risk within 50m	**1 in 30 year, 0.3m - 1.0m**

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

Features are displayed on the Surface water flooding map on **page 66**

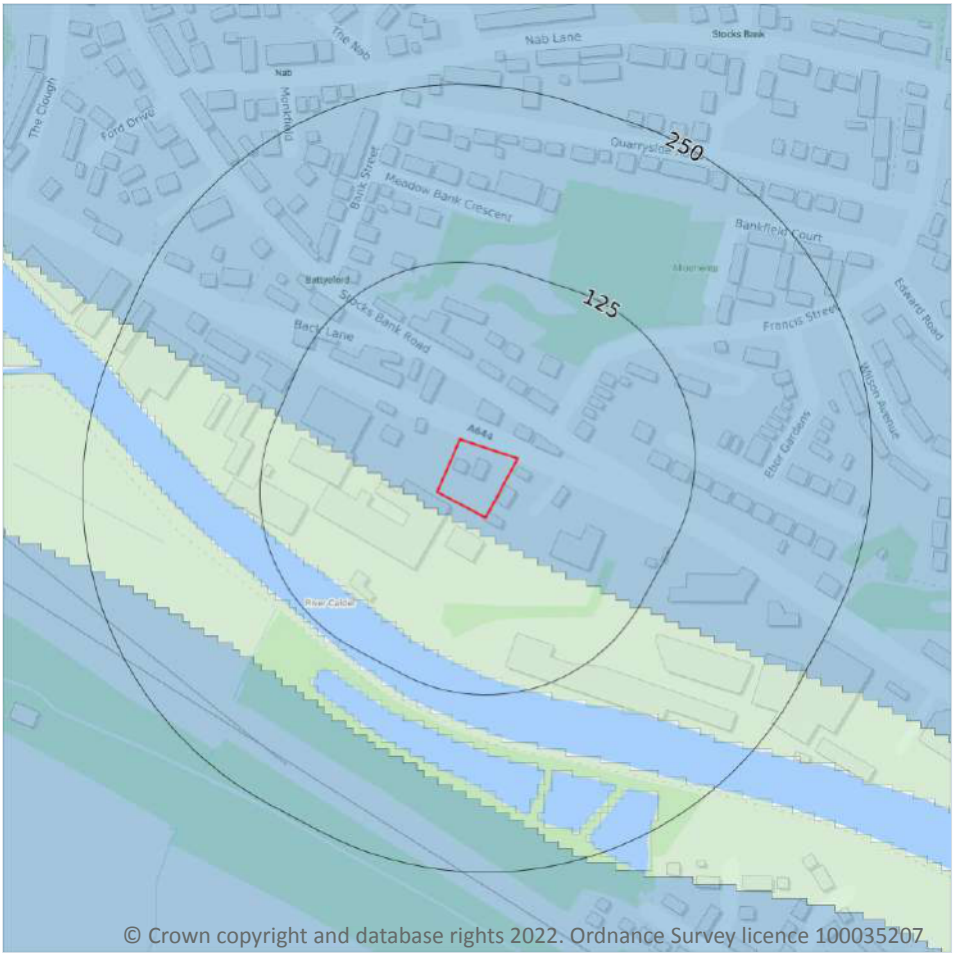
The data shown on the map and in the table above shows the highest likelihood of flood events happening at the site. Lower likelihood events may have greater flood depths and hence a greater potential impact on a site.

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

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

This data is sourced from Ambiental Risk Analytics.

9 Groundwater flooding



Site Outline

Search buffers in metres (m)

High

Moderate - High

Moderate

Low

Negligible

9.1 Groundwater flooding

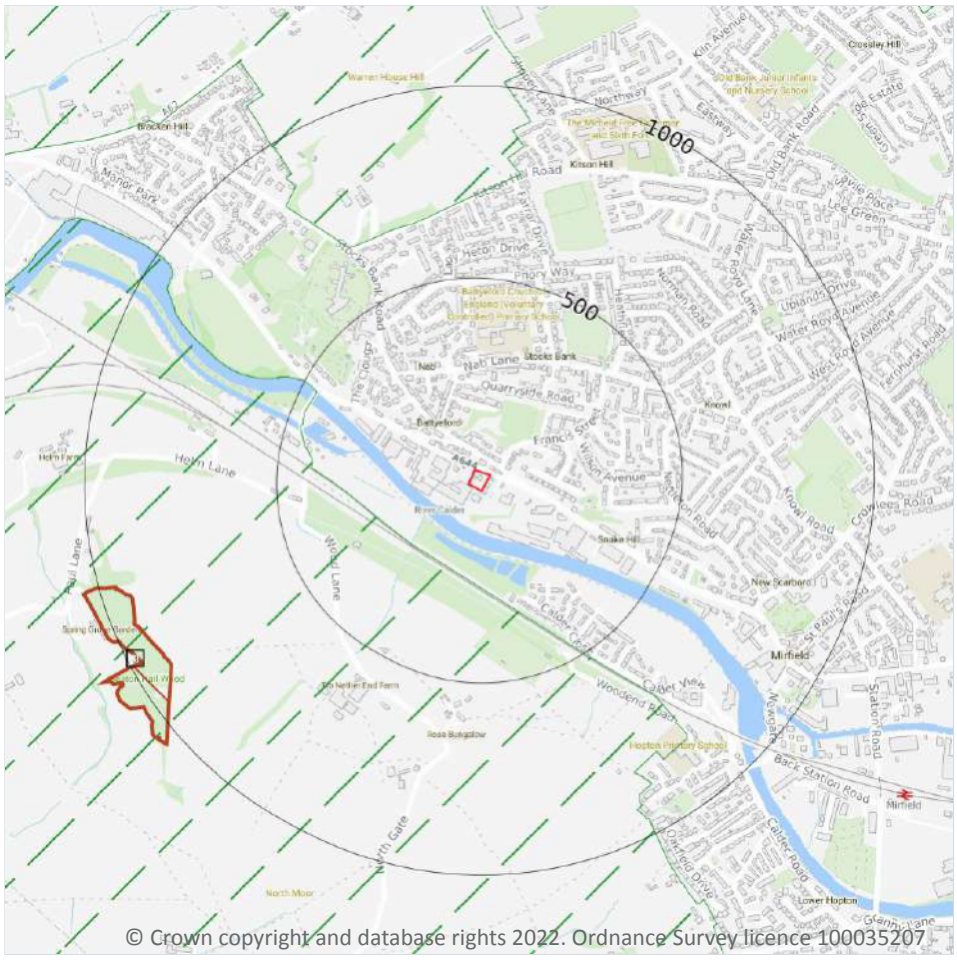
Highest risk on site	**Negligible**
Highest risk within 50m	**Low**

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

Features are displayed on the Groundwater flooding map on **page 68**

This data is sourced from Ambiental Risk Analytics.

10 Environmental designations



10.1 Sites of Special Scientific Interest (SSSI)

Records within 2000m	0

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

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

10.2 Conserved wetland sites (Ramsar sites)

Records within 2000m	0

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

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

10.3 Special Areas of Conservation (SAC)

Records within 2000m	0

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

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

10.4 Special Protection Areas (SPA)

Records within 2000m	0

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

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

10.5 National Nature Reserves (NNR)

Records within 2000m	0

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

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

10.6 Local Nature Reserves (LNR)

Records within 2000m	1

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

Features are displayed on the Environmental designations map on **page 69**

ID	Location	Name	Data source
-	1415m NE	Sunny Bank Ponds	Natural England

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

10.7 Designated Ancient Woodland

Records within 2000m	5

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

Features are displayed on the Environmental designations map on **page 69**

ID	Location	Name	Woodland Type
3	905m SW	Heaton Hall Wood	Ancient Replanted Woodland
-	1715m SE	Briery Bank	Ancient Replanted Woodland
-	1958m SE	Newhall Wood	Ancient Replanted Woodland
-	1964m S	Hepworth Wood	Ancient & Semi-Natural Woodland
-	1987m NW	Unknown	Ancient Replanted Woodland

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

10.8 Biosphere Reserves

Records within 2000m	0

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

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

10.9 Forest Parks

Records within 2000m	0

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

This data is sourced from the Forestry Commission.

10.10 Marine Conservation Zones

Records within 2000m	0

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

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

10.11 Green Belt

Records within 2000m	3

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

Features are displayed on the Environmental designations map on **page 69**

ID	Location	Name	Local Authority name
1	212m SW	South and West Yorkshire	Kirklees
2	659m NW	South and West Yorkshire	Kirklees
-	1318m W	South and West Yorkshire	Calderdale

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

10.12 Proposed Ramsar sites

Records within 2000m	0

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

This data is sourced from Natural England.

10.13 Possible Special Areas of Conservation (pSAC)

Records within 2000m	0

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

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

10.14 Potential Special Protection Areas (pSPA)

Records within 2000m	0

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

This data is sourced from Natural England.

10.15 Nitrate Sensitive Areas

Records within 2000m	0

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

This data is sourced from Natural England.

10.16 Nitrate Vulnerable Zones

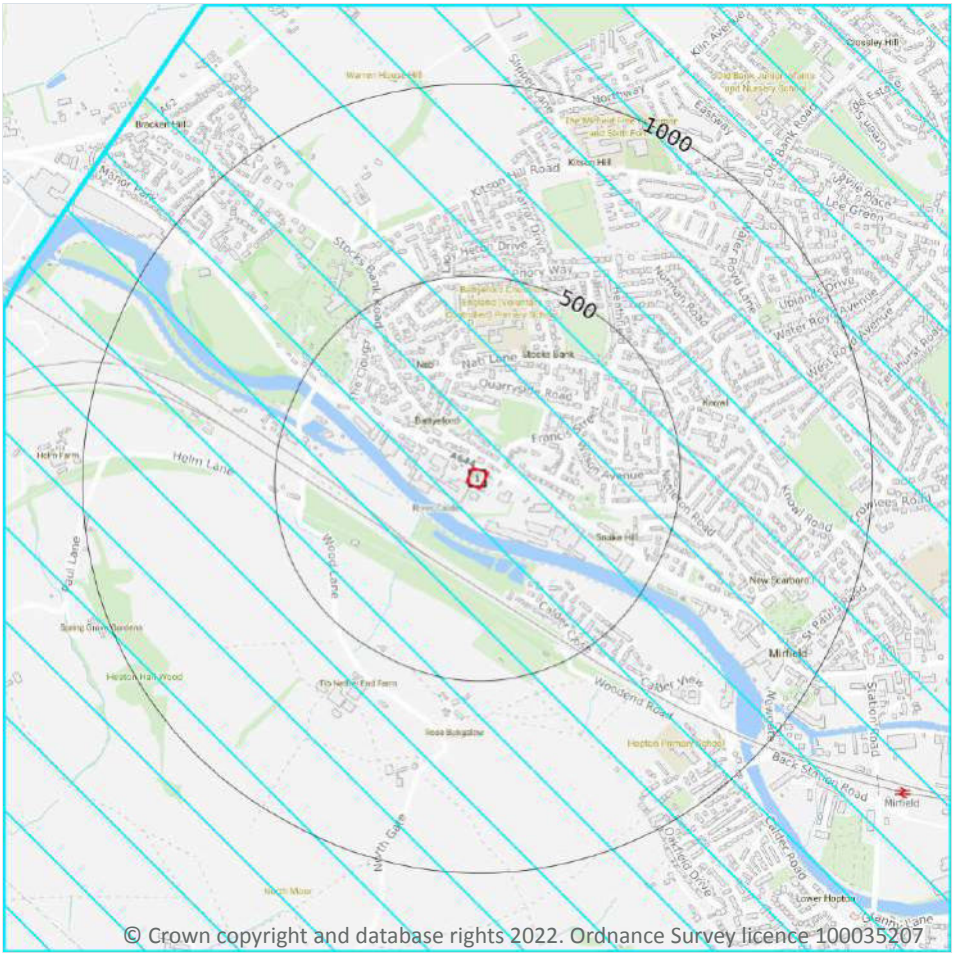
Records within 2000m	1

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

Location	Name	Type	NVZ ID	Status
1298m N	Spen Beck from Source to River Calder NVZ	Surface Water	271	Existing

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

SSSI Impact Zones and Units



Site Outline

Search buffers in metres (m)

SSSI Impact Risk Zones

SSSI Units

Not recorded

Favourable

Unfavourable - Recovering

Unfavourable - No change

Unfavourable - Declining

Partially destroyed

Destroyed

10.17 SSSI Impact Risk Zones

Records on site	1

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

Features are displayed on the SSSI Impact Zones and Units map on **page 75**

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

This data is sourced from Natural England.

10.18 SSSI Units

Records within 2000m	0

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

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

11 Visual and cultural designations

11.1 World Heritage Sites

Records within 250m	0

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

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

11.2 Area of Outstanding Natural Beauty

Records within 250m	0

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

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

11.3 National Parks

Records within 250m	0

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

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

11.4 Listed Buildings

Records within 250m	0

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

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

11.5 Conservation Areas

Records within 250m	0

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

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

11.6 Scheduled Ancient Monuments

Records within 250m	0

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

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

11.7 Registered Parks and Gardens

Records within 250m	0

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

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

12 Agricultural designations

Site Outline

Search buffers in metres (m)

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

12.1 Agricultural Land Classification

Records within 250m	2

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

Features are displayed on the Agricultural designations map on **page 79**

ID	Location	Classification	Description
1	**On site**	**Urban**	**-**
2	65m SW	Grade 3	Good to moderate quality agricultural land. Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.

This data is sourced from Natural England.

12.2 Open Access Land

Records within 250m	0

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

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

12.3 Tree Felling Licences

Records within 250m	0

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

This data is sourced from the Forestry Commission.

12.4 Environmental Stewardship Schemes

Records within 250m	0

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

This data is sourced from Natural England.

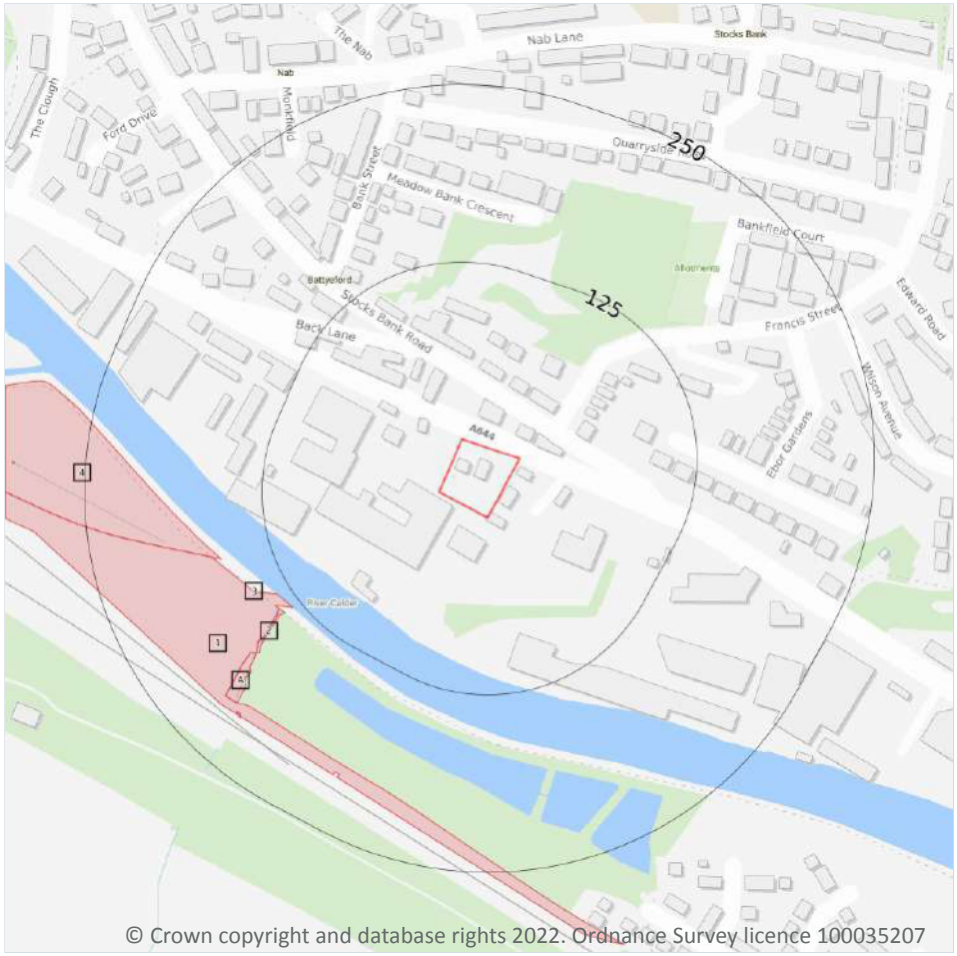
12.5 Countryside Stewardship Schemes

Records within 250m	0

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

This data is sourced from Natural England.

13 Habitat designations



Site Outline

Search buffers in metres (m)

Priority Habitat Inventory
Open Mosaic Habitat
Limestone Pavement Orders

Habitat Networks

Primary Habitat
Restorable Habitat
Associated Habitats
Habitat Restoration-Creation
Network Enhancement Zone 1
Network Enhancement Zone 2

13.1 Priority Habitat Inventory

Records within 250m	**6**

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

Features are displayed on the Habitat designations map on **page 81**

ID	Location	Main Habitat	Other habitats
1	131m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
2	138m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
3	147m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
4	161m W	No main habitat but additional habitats present	Additional: DWOOD (INV 50%)

ID	Location	Main Habitat	Other habitats
A	172m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
A	210m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)

This data is sourced from Natural England.

13.2 Habitat Networks

Records within 250m	**0**

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

This data is sourced from Natural England.

13.3 Open Mosaic Habitat

Records within 250m	**0**

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

This data is sourced from Natural England.

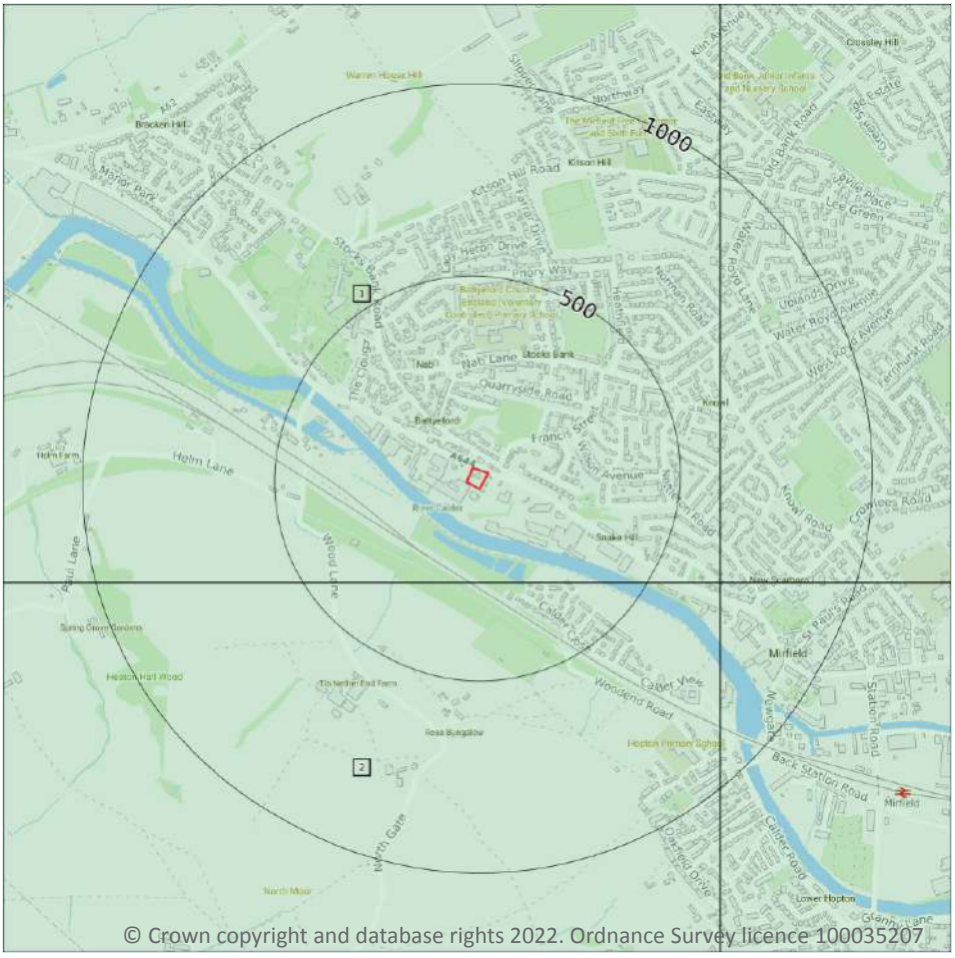
13.4 Limestone Pavement Orders

Records within 250m	**0**

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

This data is sourced from Natural England.

14 Geology 1:10,000 scale - Availability



Site Outline

Search buffers in metres (m)

- Full coverage
- Partial coverage
- No coverage

14.1 10k Availability

Records within 500m	2

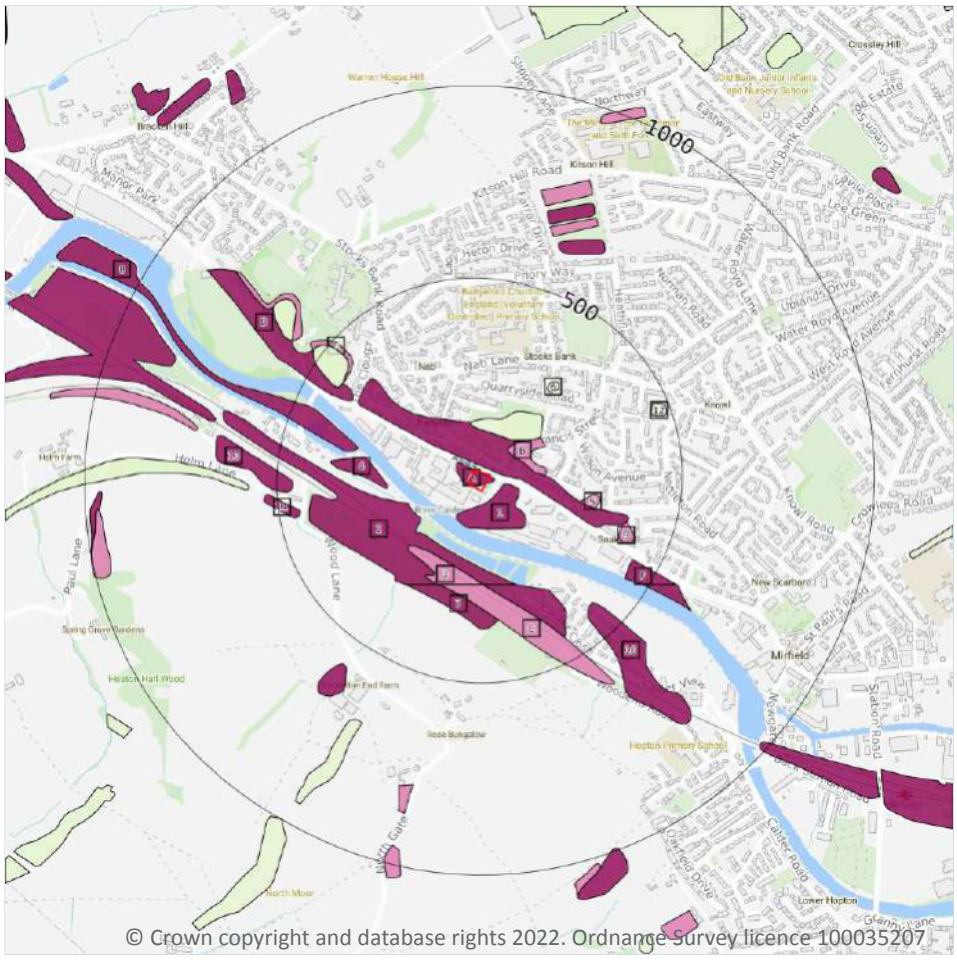
An indication on the coverage of 1:10,000 scale geology data for the site, the most detailed dataset provided by the British Geological Survey. Either 'Full', 'Partial' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:10,000 scale - Availability map on **page 83**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**Full**	**Full**	**Full**	**Full**	**SE12SE**
2	243m S	Full	Full	Full	Full	SE11NE

This data is sourced from the British Geological Survey.

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



Site Outline

Search buffers in metres (m)

- Reclaimed ground
- Made ground
- Worked ground
- Infilled ground
- Disturbed ground
- Landscaped ground

14.2 Artificial and made ground (10k)

Records within 500m	24

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

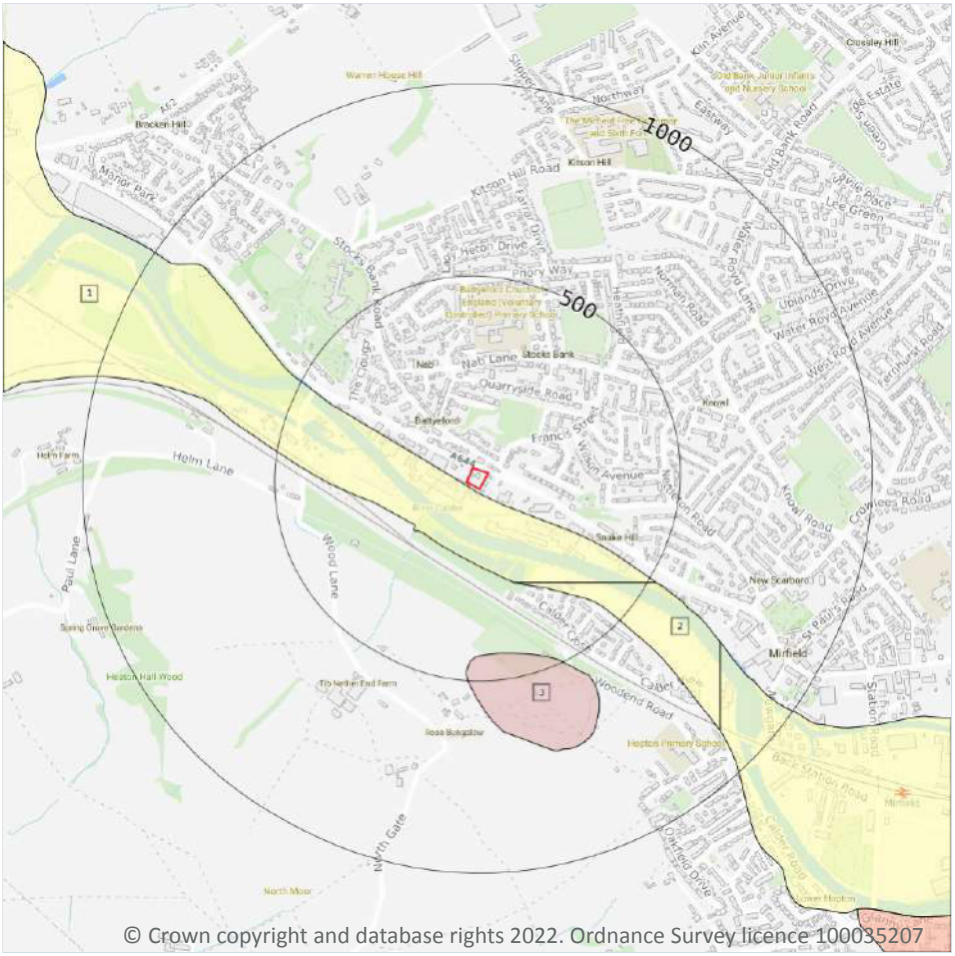
Features are displayed on the Geology 1:10,000 scale - Artificial and made ground map on **page 84**

ID	Location	LEX Code	Description	Rock description
A	**On site**	**MGR-ARTDP**	**Made Ground (Undivided)**	**Artificial Deposit**
A	12m NE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
1	32m SE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
B	77m NE	WGR-VOID	Worked Ground (Undivided)	Void

ID	Location	LEX Code	Description	Rock description
B	104m N	WMGR-ARTDP	Infilled Ground	Artificial Deposit
2	152m SW	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
3	203m SW	WGR-VOID	Worked Ground (Undivided)	Void
4	211m W	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
C	243m S	WGR-VOID	Worked Ground (Undivided)	Void
C	243m S	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
5	244m E	WGR-VOID	Worked Ground (Undivided)	Void
6	266m NE	WMGR-ARTDP	Infilled Ground	Artificial Deposit
7	268m S	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
8	303m W	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
D	367m NW	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
9	368m E	WGR-VOID	Worked Ground (Undivided)	Void
10	409m SE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
E	410m NW	WGR-VOID	Worked Ground (Undivided)	Void
E	411m NW	WMGR-ARTDP	Infilled Ground	Artificial Deposit
F	430m SE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
11	444m W	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
12	448m E	WMGR-ARTDP	Infilled Ground	Artificial Deposit
13	457m W	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
F	484m SE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Superficial



Site Outline

Search buffers in metres (m)

Landslip (10k)

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

14.3 Superficial geology (10k)

Records within 500m **3**

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

Features are displayed on the Geology 1:10,000 scale - Superficial map on **page 86**

ID	Location	LEX Code	Description	Rock description
1	8m SW	ALV-XCSV	Alluvium - Clay, Sand And Gravel	Clay, Sand And Gravel
2	259m S	ALV-XCSV	Alluvium - Clay, Sand And Gravel	Clay, Sand And Gravel
3	431m S	HEAD-XCZSV	Head - Clay, Silt, Sand And Gravel	Clay, Silt, Sand And Gravel

This data is sourced from the British Geological Survey.

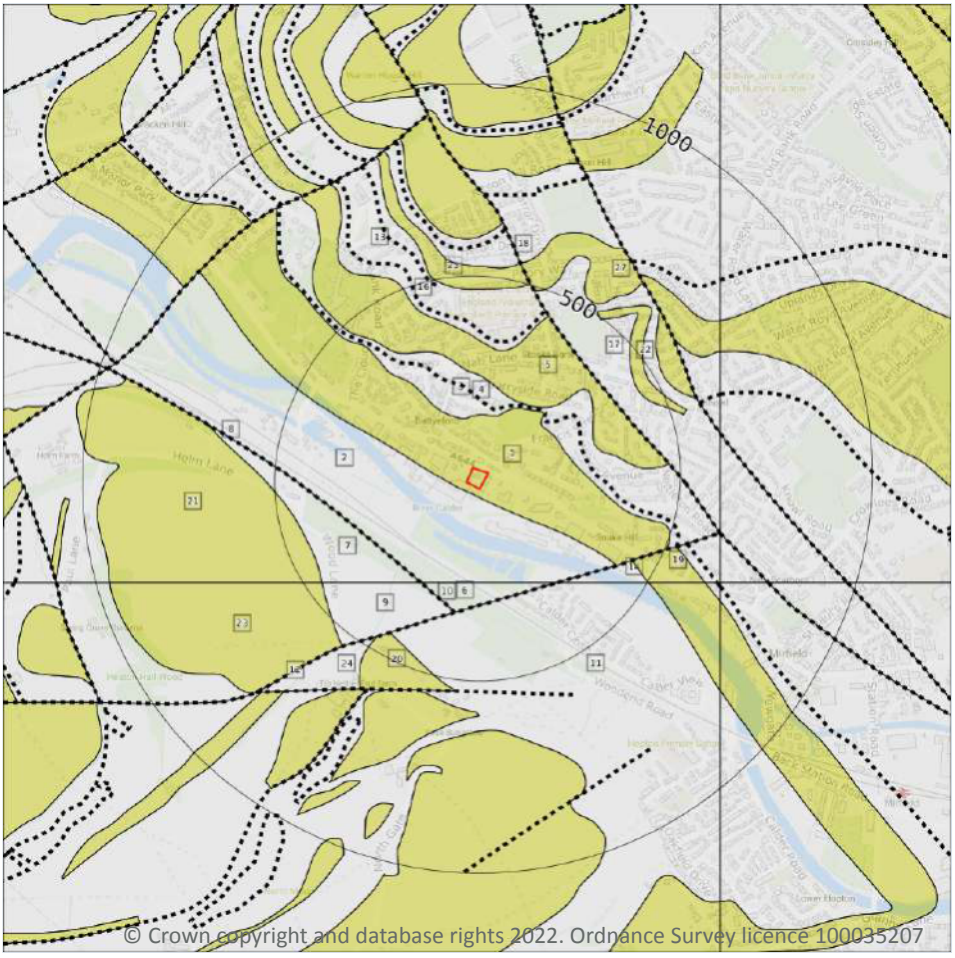
14.4 Landslip (10k)

Records within 500m	0

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

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Bedrock



Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (10k)

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

14.5 Bedrock geology (10k)

Records within 500m	19

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

Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 88**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**CLRK-SDST**	**Clifton Rock - Sandstone**	**Langsettian Sub-age**
2	20m S	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
3	130m N	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age

ID	Location	LEX Code	Description	Rock age
5	201m NE	STNR-SDST	Stanningley Rock - Sandstone	Langsettian Sub-age
6	243m S	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
7	276m SW	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
9	287m SW	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
11	291m S	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
13	314m N	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
14	317m SE	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
17	372m NE	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
19	439m SE	CLRK-SDST	Clifton Rock - Sandstone	Langsettian Sub-age
20	440m SW	CLRK-SDST	Clifton Rock - Sandstone	Langsettian Sub-age
21	440m SW	CLRK-SDST	Clifton Rock - Sandstone	Langsettian Sub-age
22	446m NE	PLCM-SDST	Pennine Lower Coal Measures Formation - Sandstone	Langsettian Sub-age
23	459m SW	CLRK-SDST	Clifton Rock - Sandstone	Langsettian Sub-age
24	465m SW	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
25	465m N	PLCM-SDST	Pennine Lower Coal Measures Formation - Sandstone	Langsettian Sub-age
27	489m N	PLCM-SDST	Pennine Lower Coal Measures Formation - Sandstone	Langsettian Sub-age

This data is sourced from the British Geological Survey.

14.6 Bedrock faults and other linear features (10k)

Records within 500m **8**

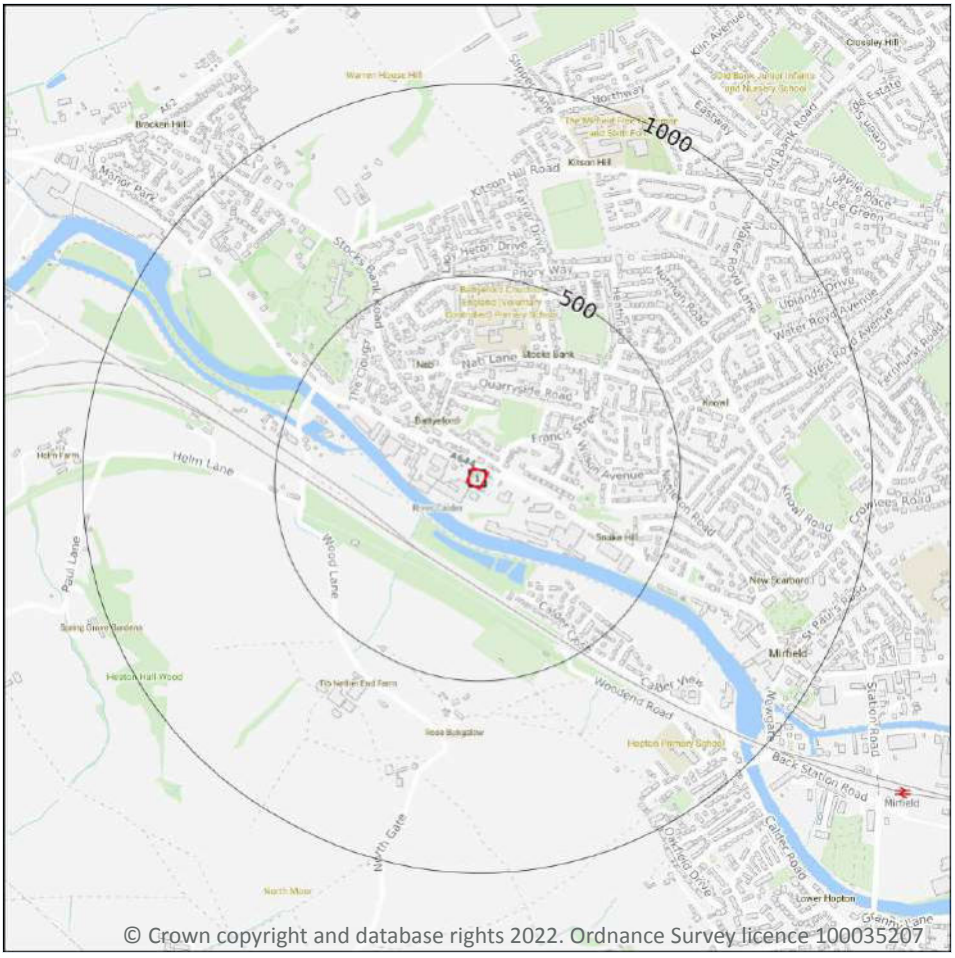
Linear features at the ground or bedrock surface at 1:10,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 88**

ID	Location	Category	Description
4	162m N	ROCK	Coal seam, inferred
8	276m SW	FAULT	Normal fault, inferred; crossmarks on downthrow side
10	287m SW	FAULT	Normal fault, inferred; crossmarks on downthrow side
12	291m S	FAULT	Normal fault, inferred; crossmarks on downthrow side
15	317m SE	FAULT	Normal fault, inferred; crossmarks on downthrow side
16	335m N	ROCK	Coal seam, inferred
18	372m NE	FAULT	Normal fault, inferred; crossmarks on downthrow side
26	485m N	ROCK	Coal seam, inferred

This data is sourced from the British Geological Survey.

15 Geology 1:50,000 scale - Availability



Site Outline

Search buffers in metres (m)

Geological map tile

15.1 50k Availability

Records within 500m	1

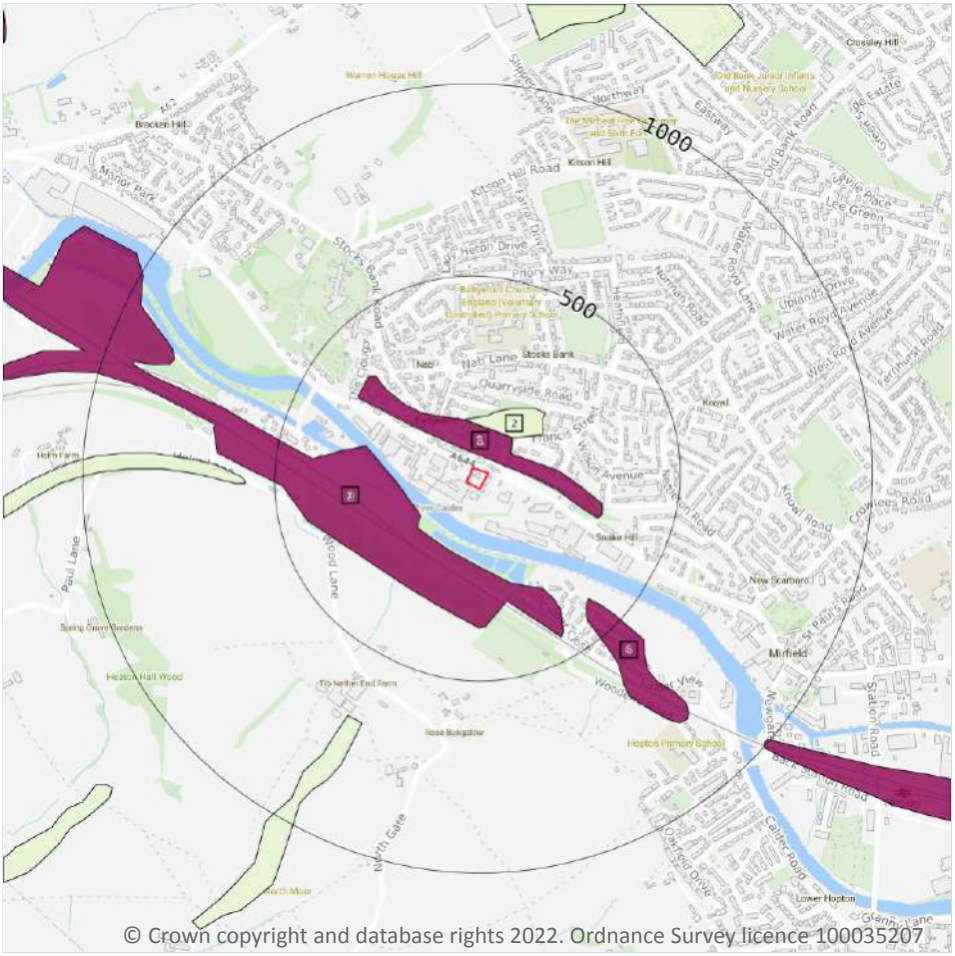
An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:50,000 scale - Availability map on **page 91**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**Full**	**Full**	**Full**	**Full**	**EW077_huddersfield_v4**

This data is sourced from the British Geological Survey.

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



15.2 Artificial and made ground (50k)

Records within 500m	4

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

Features are displayed on the Geology 1:50,000 scale - Artificial and made ground map on **page 92**

ID	Location	LEX Code	Description	Rock description
1	34m NE	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
2	108m NE	WMGR-ARTDP	INFILLED GROUND	ARTIFICIAL DEPOSIT
3	148m SW	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
4	403m SE	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

This data is sourced from the British Geological Survey.

15.3 Artificial ground permeability (50k)

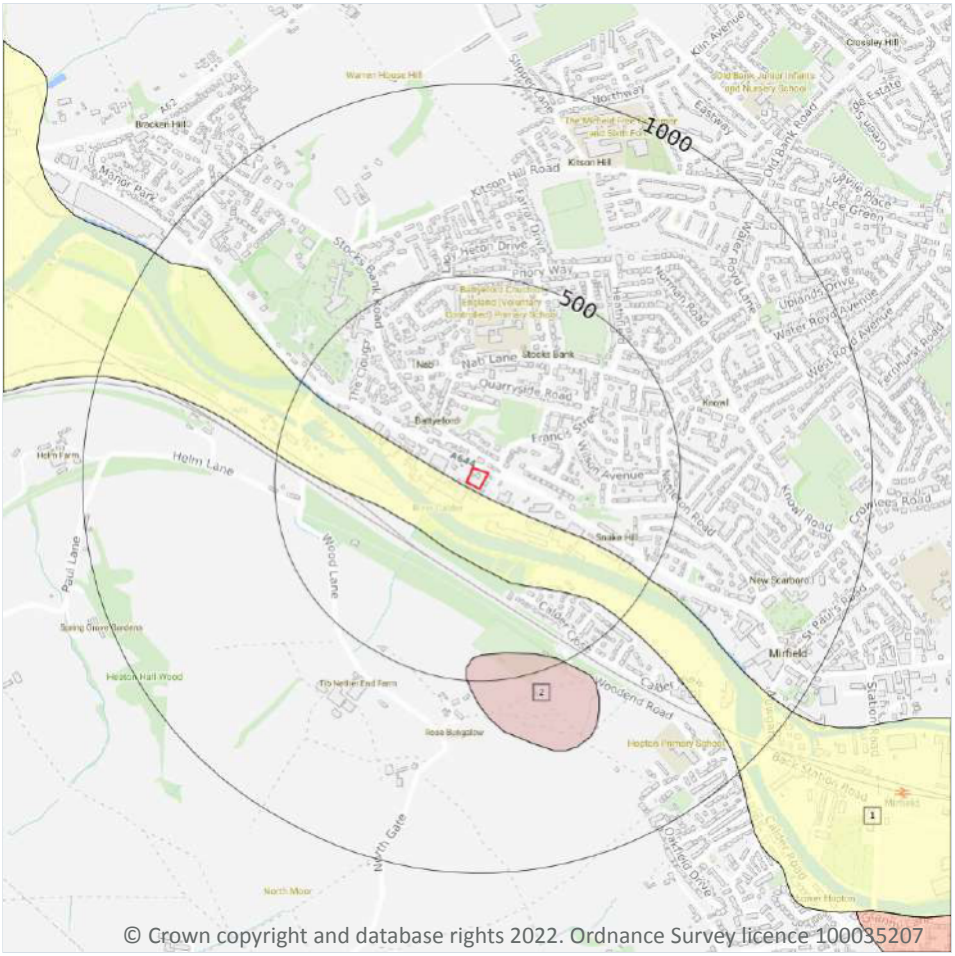
Records within 50m	**1**

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

Location	Flow type	Maximum permeability	Minimum permeability
34m NE	Mixed	Very High	Low

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Superficial



Site Outline

Search buffers in metres (m)

Landslip (50k)

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

15.4 Superficial geology (50k)

Records within 500m	2

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

Features are displayed on the Geology 1:50,000 scale - Superficial map on **page 94**

ID	Location	LEX Code	Description	Rock description
1	11m S	ALV-XCZSV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL
2	431m S	HEAD-XCZSV	HEAD	CLAY, SILT, SAND AND GRAVEL

This data is sourced from the British Geological Survey.

15.5 Superficial permeability (50k)

Records within 50m	**1**

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

Location	Flow type	Maximum permeability	Minimum permeability
11m S	Intergranular	High	Very Low

This data is sourced from the British Geological Survey.

15.6 Landslip (50k)

Records within 500m	**0**

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

This data is sourced from the British Geological Survey.

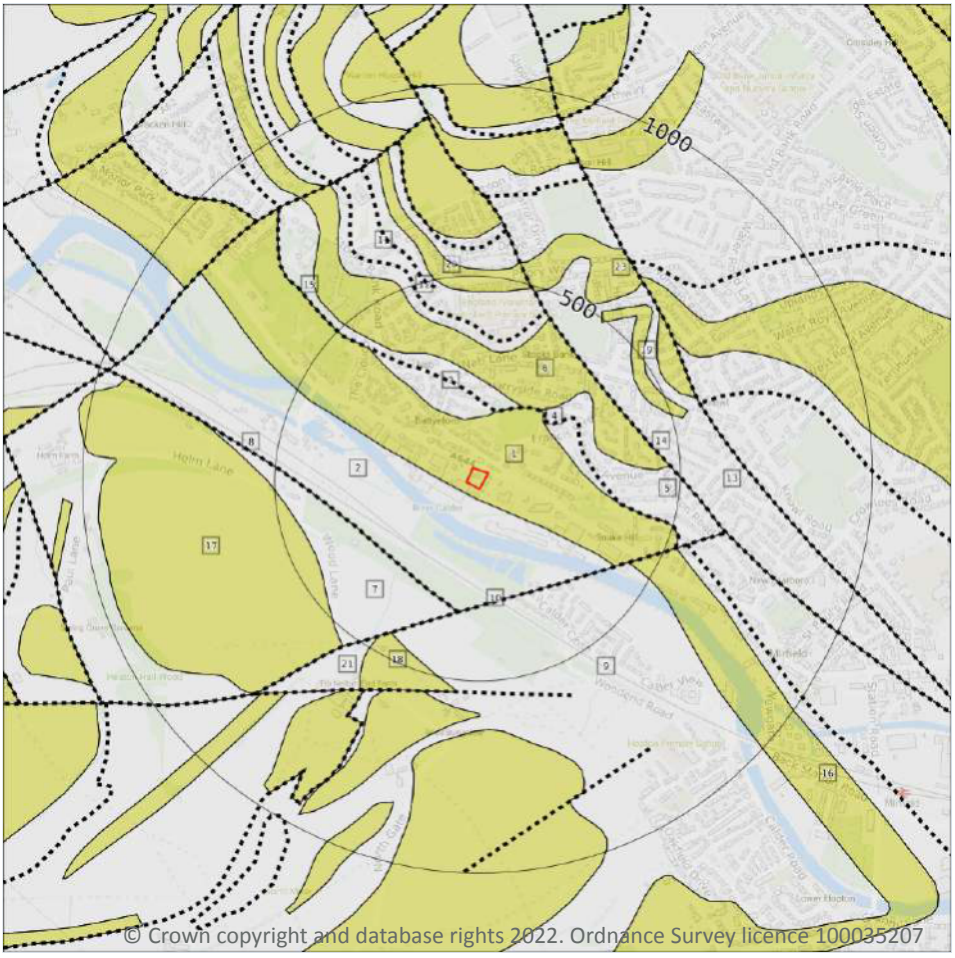
15.7 Landslip permeability (50k)

Records within 50m	**0**

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

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Bedrock



Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (50k)

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

15.8 Bedrock geology (50k)

Records within 500m	16

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

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 96**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**CLRK-SDST**	**CLIFTON ROCK - SANDSTONE**	**WESTPHALIAN**
2	26m S	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
3	128m N	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN

ID	Location	LEX Code	Description	Rock age
5	192m NE	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
6	195m NE	PLCM-SDST	PENNINE LOWER COAL MEASURES FORMATION - SANDSTONE	WESTPHALIAN
7	277m SW	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
9	293m S	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
11	309m N	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
13	371m NE	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
16	431m SE	CLRK-SDST	CLIFTON ROCK - SANDSTONE	WESTPHALIAN
17	436m SW	CLRK-SDST	CLIFTON ROCK - SANDSTONE	WESTPHALIAN
18	438m SW	CLRK-SDST	CLIFTON ROCK - SANDSTONE	WESTPHALIAN
19	449m NE	PLCM-SDST	PENNINE LOWER COAL MEASURES FORMATION - SANDSTONE	WESTPHALIAN
20	459m N	PLCM-SDST	PENNINE LOWER COAL MEASURES FORMATION - SANDSTONE	WESTPHALIAN
21	463m SW	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
23	487m N	PLCM-SDST	PENNINE LOWER COAL MEASURES FORMATION - SANDSTONE	WESTPHALIAN

This data is sourced from the British Geological Survey.

15.9 Bedrock permeability (50k)

Records within 50m **2**

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

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Fracture**	**High**	**Moderate**
26m S	Fracture	Moderate	Low

This data is sourced from the British Geological Survey.

15.10 Bedrock faults and other linear features (50k)

Records within 500m	**7**

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

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 96**

ID	Location	Category	Description
4	158m N	ROCK	Coal seam, inferred
8	277m SW	FAULT	Fault, inferred
10	293m S	FAULT	Fault, inferred
12	338m N	ROCK	Coal seam, inferred
14	371m NE	FAULT	Fault, inferred
15	415m NW	ROCK	Coal seam, inferred
22	480m N	ROCK	Coal seam, inferred

This data is sourced from the British Geological Survey.

16 Boreholes

Site Outline

Search buffers in metres (m)

Confidential

0 - 10m

10 - 30m

30m+

Unknown

16.1 BGS Boreholes

Records within 250m	5

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

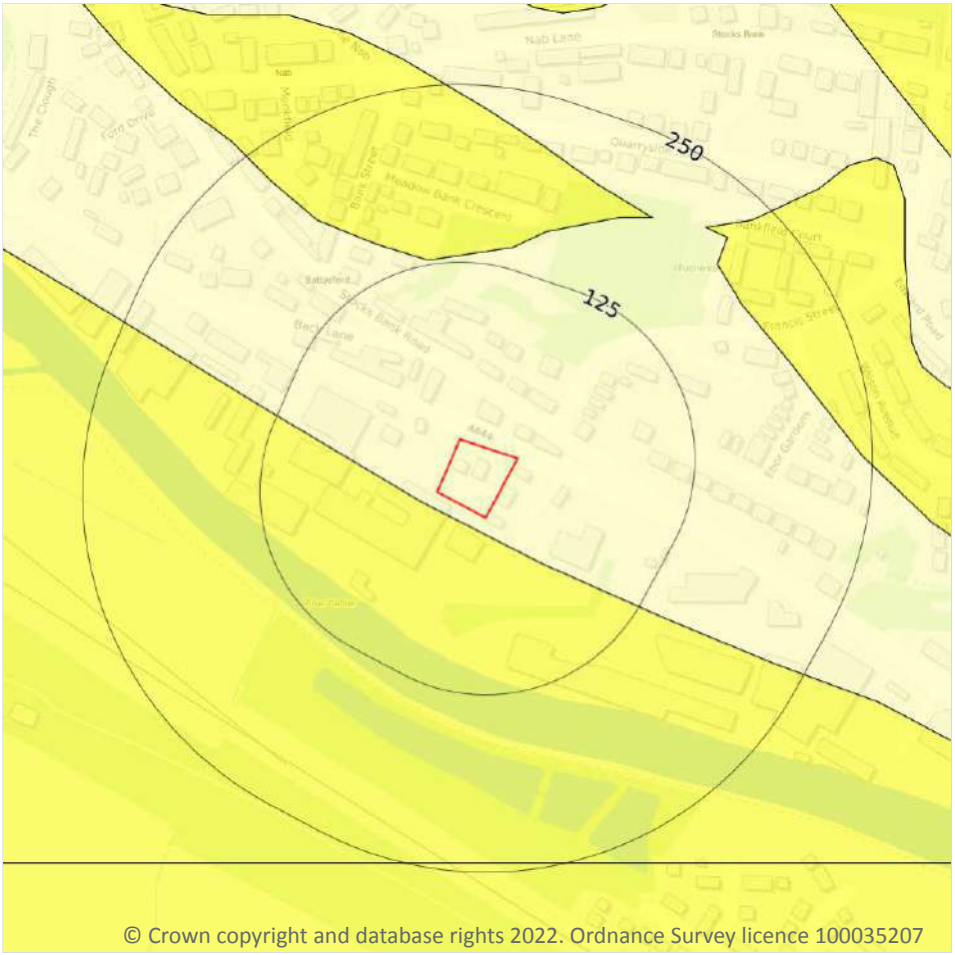
Features are displayed on the Boreholes map on **page 99**

ID	Location	Grid reference	Name	Length	Confidential	Web link
A	53m W	419286 420260	LIVERSEDGE MILLS MIRFIELD 4	-	Y	N/A
A	63m W	419277 420267	LIVERSEDGE MILLS MIRFIELD 3	-	Y	N/A
A	71m W	419273 420286	MIRFIELD WEST YORKSHIRE 2	-	Y	N/A

ID	Location	Grid reference	Name	Length	Confidential	Web link
A	81m W	419260 420276	MIRFIELD WEST YORKSHIRE 1	-	Y	N/A
1	248m NE	419520 420500	NAB LANE MIRFIELD TP 2	1.0	N	43832

This data is sourced from the British Geological Survey.

17 Natural ground subsidence - Shrink swell clays



Site Outline

Search buffers in metres (m)

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

17.1 Shrink swell clays

Records within 50m	2

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

Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 101**

Location	Hazard rating	Details
On site	**Negligible**	**Ground conditions predominantly non-plastic.**
11m S	Very low	Ground conditions predominantly low plasticity.

This data is sourced from the British Geological Survey.

Natural ground subsidence - Running sands

Site Outline

Search buffers in metres (m)

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

17.2 Running sands

Records within 50m	3

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

Features are displayed on the Natural ground subsidence - Running sands map on **page 102**

Location	Hazard rating	Details
On site	**Negligible**	**Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.**

Location	Hazard rating	Details
11m S	Low	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.
34m NE	Very low	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.

This data is sourced from the British Geological Survey.

Natural ground subsidence - Compressible deposits

Site Outline

Search buffers in metres (m)

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

17.3 Compressible deposits

Records within 50m	3

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

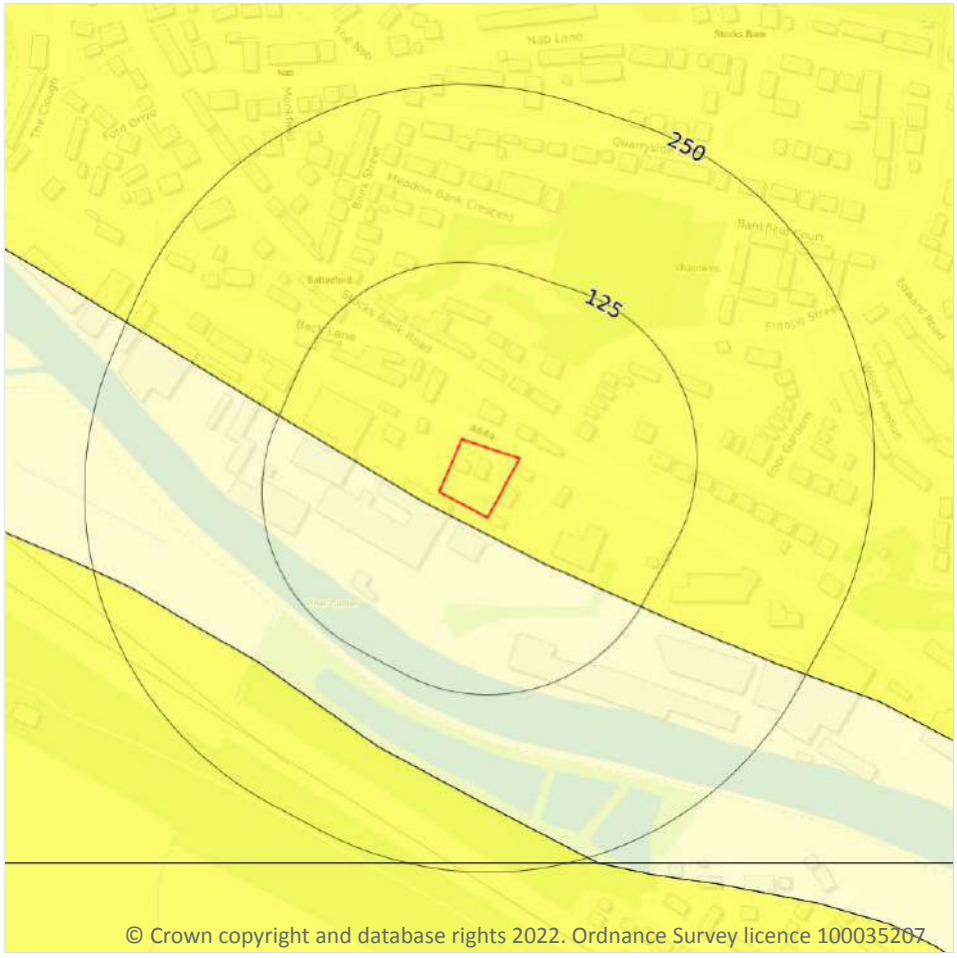
Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 104**

Location	Hazard rating	Details
On site	**Negligible**	**Compressible strata are not thought to occur.**
11m S	Moderate	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.

Location	Hazard rating	Details
34m NE	Very low	Compressibility and uneven settlement problems are not likely to be significant on the site for most land uses.

This data is sourced from the British Geological Survey.

Natural ground subsidence - Collapsible deposits



Site Outline

Search buffers in metres (m)

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

17.4 Collapsible deposits

Records within 50m	2

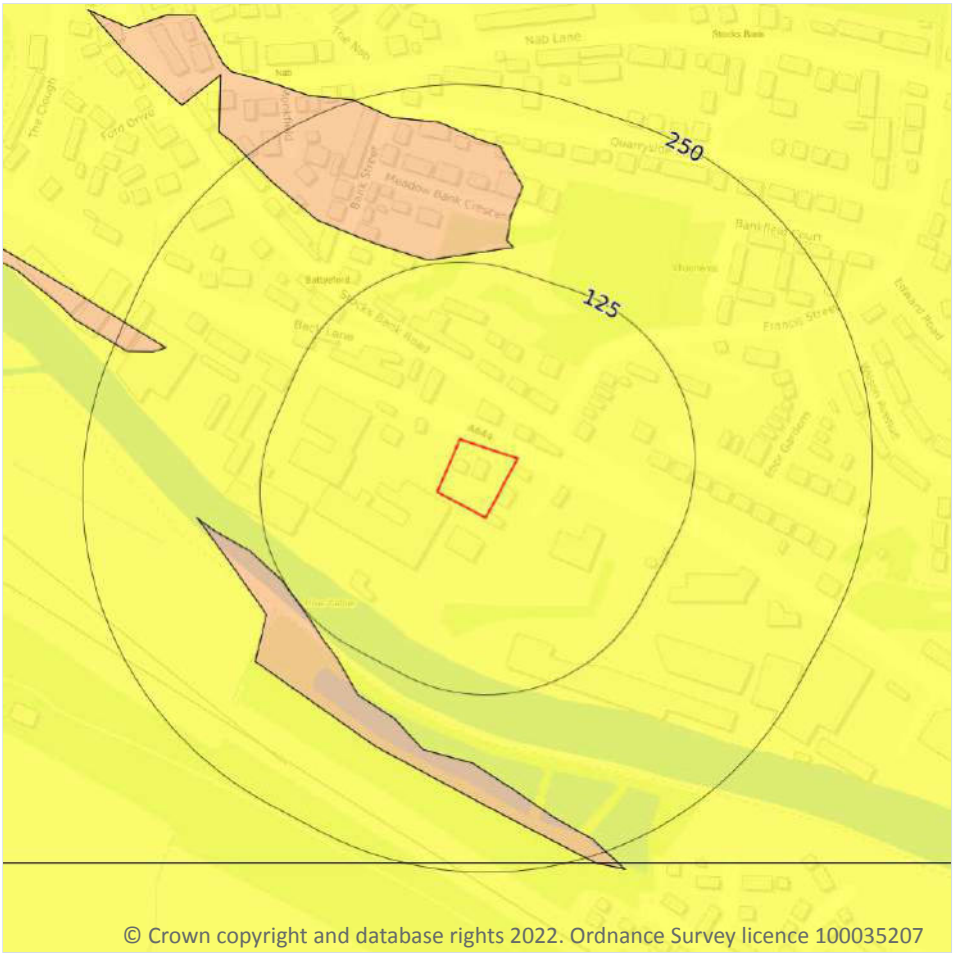
The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 106**

Location	Hazard rating	Details
On site	**Very low**	**Deposits with potential to collapse when loaded and saturated are unlikely to be present.**
11m S	Negligible	Deposits with potential to collapse when loaded and saturated are believed not to be present.

This data is sourced from the British Geological Survey.

Natural ground subsidence - Landslides



Site Outline

Search buffers in metres (m)

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

17.5 Landslides

Records within 50m	1

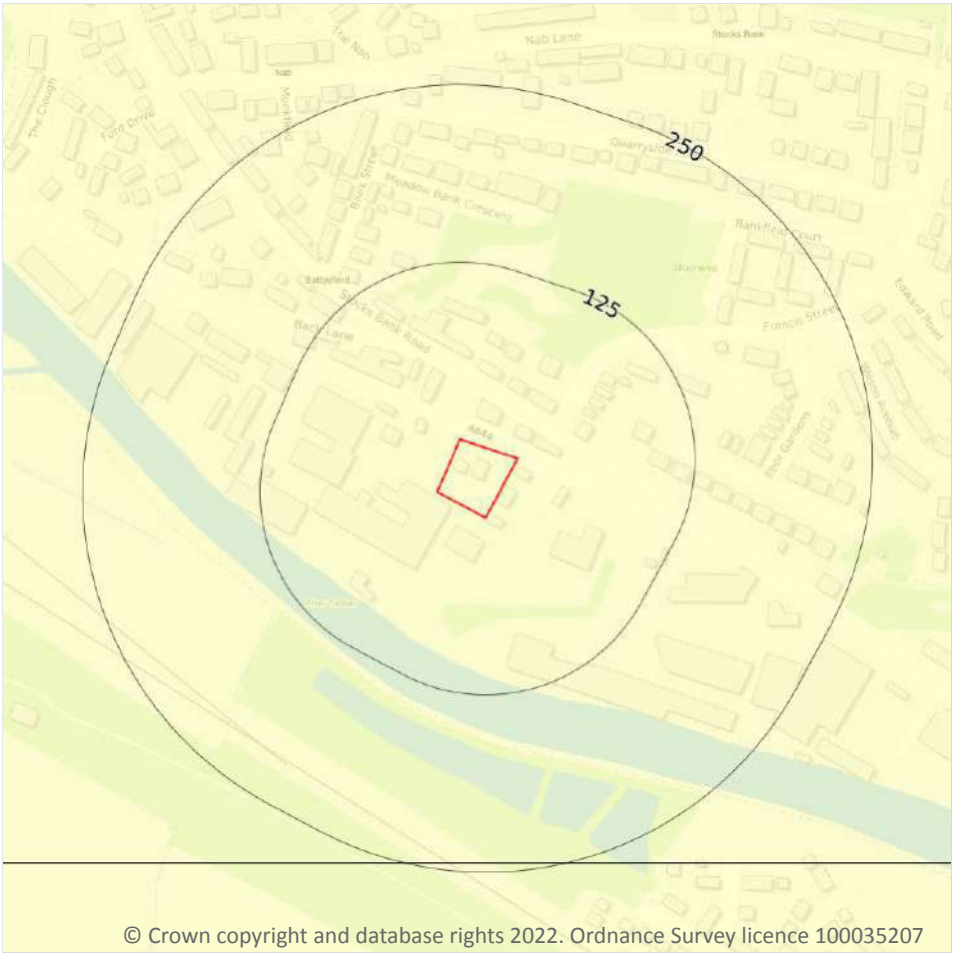
The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on **page 107**

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

This data is sourced from the British Geological Survey.

Natural ground subsidence - Ground dissolution of soluble rocks



Site Outline

Search buffers in metres (m)

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

17.6 Ground dissolution of soluble rocks

Records within 50m	1

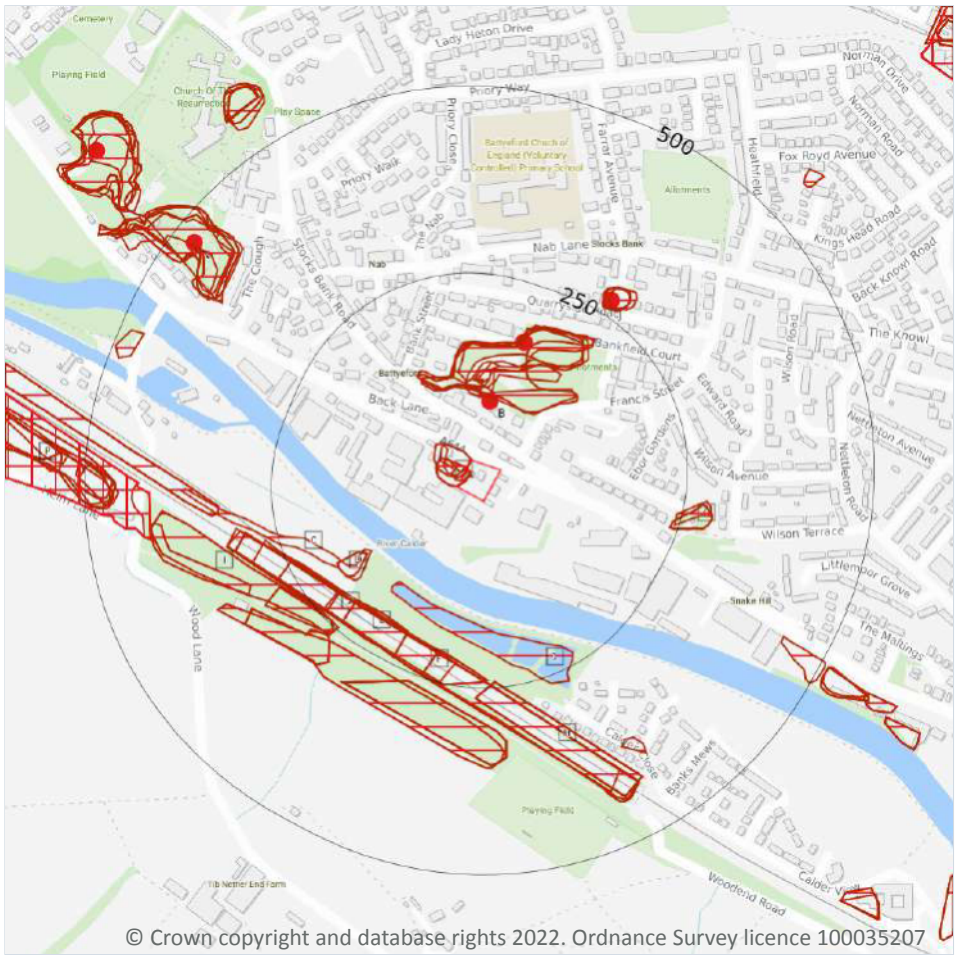
The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 108**

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

This data is sourced from the British Geological Survey.

18 Mining, ground workings and natural cavities



Site Outline

Search buffers in metres (m)

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

Non Coal Mining

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

18.1 Natural cavities

Records within 500m	0

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

This data is sourced from Stantec UK Ltd.

18.2 BritPits

Records within 500m	4

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

Features are displayed on the Mining, ground workings and natural cavities map on **page 110**

ID	Location	Details	Description
B	82m N	Name: Bank Quarry Address: Battyeford, MIRFIELD, West Yorkshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
B	171m N	Name: Stocks Bank Quarry Address: MIRFIELD, West Yorkshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
J	270m NE	Name: Nab Address: Battyeford, MIRFIELD, West Yorkshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
N	469m NW	Name: Wards End Quarry Address: Battyeford, MIRFIELD, West Yorkshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority

This data is sourced from the British Geological Survey.

18.3 Surface ground workings

Records within 250m	47

Historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

Features are displayed on the Mining, ground workings and natural cavities map on **page 110**

ID	Location	Land Use	Year of mapping	Mapping scale
A	**On site**	**Unspecified Ground Workings**	**1951**	**1:10560**
A	**On site**	**Unspecified Heap**	**1966**	**1:10560**
A	**On site**	**Unspecified Heap**	**1985**	**1:10000**
A	**On site**	**Unspecified Heap**	**1975**	**1:10000**
A	**On site**	**Unspecified Heap**	**1938**	**1:10560**
A	**On site**	**Unspecified Heap**	**1938**	**1:10560**
B	83m N	Unspecified Quarry	1985	1:10000
B	83m N	Unspecified Disused Quarry	1975	1:10000
B	85m NE	Unspecified Disused Quarry	1966	1:10560
B	85m N	Refuse Heap	1892	1:10560
B	95m N	Unspecified Quarry	1948	1:10560
B	95m N	Unspecified Quarry	1905	1:10560
B	95m N	Unspecified Quarry	1931	1:10560
B	98m N	Unspecified Quarry	1938	1:10560
B	99m N	Unspecified Ground Workings	1951	1:10560
B	104m N	Unspecified Quarry	1951	1:10560
C	144m SW	Unspecified Ground Workings	1951	1:10560
1	149m SW	Ponds	1985	1:10000
D	151m SW	Unspecified Heap	1985	1:10000
D	151m SW	Unspecified Heap	1975	1:10000
E	196m SW	Cuttings	1966	1:10560
E	196m SW	Cuttings	1985	1:10000
E	196m SW	Cuttings	1975	1:10000

ID	Location	Land Use	Year of mapping	Mapping scale
2	200m SW	Cuttings	1951	1:10560
F	201m SW	Cuttings	1938	1:10560
F	204m SW	Cuttings	1948	1:10560
F	204m SW	Cuttings	1905	1:10560
F	204m SW	Cuttings	1892	1:10560
F	204m SW	Cuttings	1931	1:10560
F	208m S	Cuttings	1966	1:10560
F	208m S	Cuttings	1985	1:10000
F	208m S	Cuttings	1975	1:10000
C	211m SW	Cuttings	1966	1:10560
C	211m SW	Cuttings	1985	1:10000
C	211m SW	Cuttings	1975	1:10000
G	240m E	Unspecified Quarry	1966	1:10560
G	240m E	Unspecified Quarry	1985	1:10000
G	240m E	Unspecified Quarry	1975	1:10000
H	242m S	Cuttings	1956	1:10560
H	242m S	Cuttings	1975	1:10000
H	242m S	Cuttings	1988	1:10000
H	242m S	Cuttings	1965	1:10560
G	243m E	Unspecified Quarry	1951	1:10560
C	246m SW	Unspecified Heap	1951	1:10560
C	246m SW	Unspecified Heap	1966	1:10560
I	246m SW	Unspecified Heap	1985	1:10000
I	246m SW	Unspecified Heap	1975	1:10000

This is data is sourced from Ordnance Survey/Groundsure.

18.4 Underground workings

Records within 1000m	15

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

Features are displayed on the Mining, ground workings and natural cavities map on **page 110**

ID	Location	Land Use	Year of mapping	Mapping scale
P	413m W	Colliery	1905	1:10560
P	413m W	Colliery	1892	1:10560
W	789m NE	Colliery	1948	1:10560
W	789m NE	Colliery	1905	1:10560
W	789m NE	Colliery	1892	1:10560
W	789m NE	Colliery	1931	1:10560
-	883m SW	Air Shaft	1988	1:10000
-	883m SW	Air Shaft	1965	1:10560
-	883m SW	Air Shaft	1951	1:10560
-	883m SW	Air Shaft	1975	1:10000
-	887m W	Tunnels	1985	1:10000
-	887m W	Tunnels	1975	1:10000
-	890m SW	Air Shaft	1905	1:10560
-	891m SW	Air Shaft	1948	1:10560
-	891m SW	Air Shaft	1931	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.5 Historical Mineral Planning Areas

Records within 500m	0

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

This data is sourced from the British Geological Survey.

18.6 Non-coal mining

Records within 1000m	0

The potential for historical non-coal mining to have affected an area. The assessment is drawn from expert knowledge and literature in addition to the digital geological map of Britain. Mineral commodities may be divided into seven general categories - vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities (including ball clay, jet, black marble, graphite and chert).

This data is sourced from the British Geological Survey.

18.7 Mining cavities

Records within 1000m	0

Industry recognised national database of mining cavities. Degraded mines may result in hazardous subsidence (crown holes). Climatic conditions and water escape can also trigger subsidence over mine entrances and workings.

This data is sourced from Stantec UK Ltd.

18.8 JPB mining areas

Records on site	0

Areas which could be affected by former coal and other mining. This data includes some mine plans unavailable to the Coal Authority.

This data is sourced from Johnson Poole and Bloomer.

18.9 Coal mining

Records on site	1

Areas which could be affected by past, current or future coal mining.

Location	Details
On site	**The site is located within a coal mining area as defined by the Coal Authority. A Consultants Coal Mining Report is recommended to further assess coal mining issues at the site. This can be ordered directly through Groundsure or your preferred search provider.**

This data is sourced from the Coal Authority.

18.10 Brine areas

Records on site	0

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

This data is sourced from the Cheshire Brine Subsidence Compensation Board.

18.11 Gypsum areas

Records on site	0

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

18.12 Tin mining

Records on site	0

Generalised areas that may be affected by historical tin mining.

This data is sourced from Groundsure.

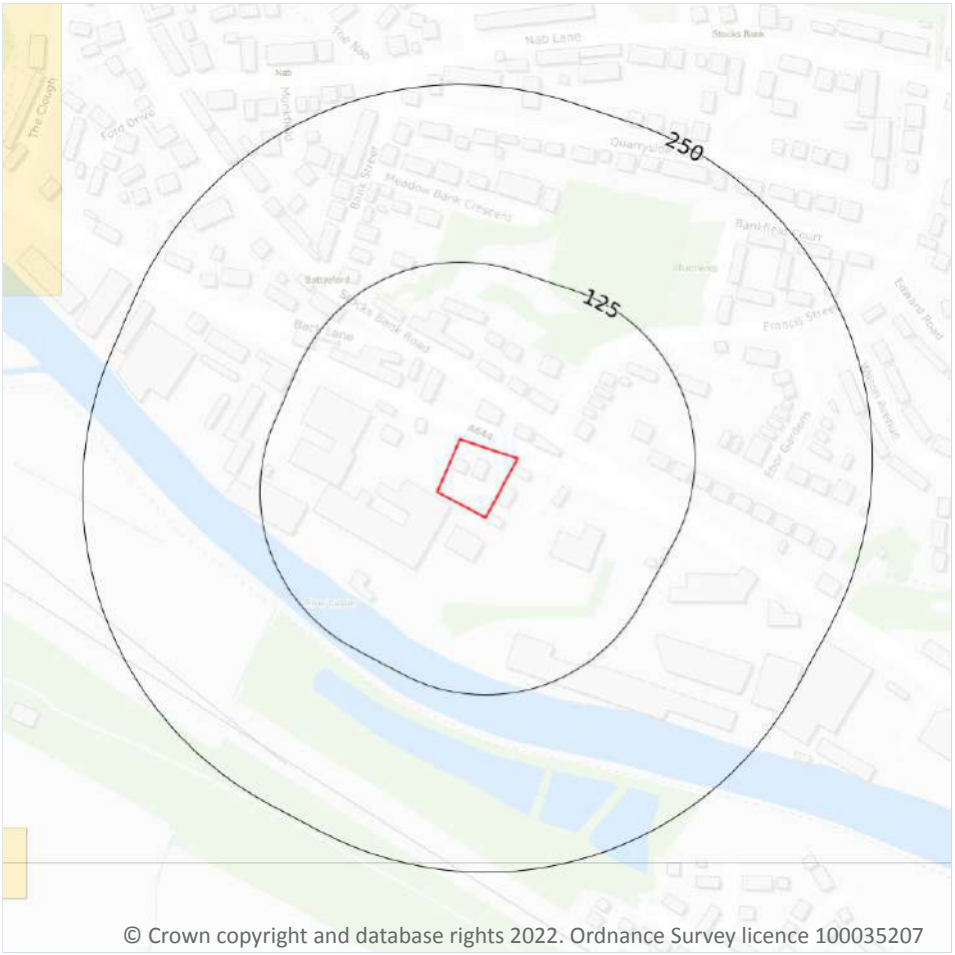
18.13 Clay mining

Records on site	0

Generalised areas that may be affected by kaolin and ball clay extraction.

This data is sourced from the Kaolin and Ball Clay Association (UK).

19 Radon



Site Outline

Search buffers in metres (m)

- Greater than 30%
- Between 10% and 30%
- Between 5% and 10%
- Between 3% and 5%
- Between 1% and 3%
- Less than 1%

19.1 Radon

Records on site	1

Estimated percentage of dwellings exceeding the Radon Action Level. This data is the highest resolution radon dataset available for the UK and is produced to a 75m level of accuracy to allow for geological data accuracy and a 'residential property' buffer. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain. The data was derived from both geological assessments and long term measurements of radon in more than 479,000 households.

Features are displayed on the Radon map on **page 117**

Location	Estimated properties affected	Radon Protection Measures required
On site	**Less than 1%**	**None****

This data is sourced from the British Geological Survey and Public Health England.

20 Soil chemistry

20.1 BGS Estimated Background Soil Chemistry

Records within 50m	3

The estimated values provide the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km^2. In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km^2; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	**15 - 25 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**15 - 30 mg/kg**
11m S	25 - 35 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
26m S	25 - 35 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	120 - 180 mg/kg	30 - 45 mg/kg

This data is sourced from the British Geological Survey.

20.2 BGS Estimated Urban Soil Chemistry

Records within 50m	0

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km^2).

This data is sourced from the British Geological Survey.

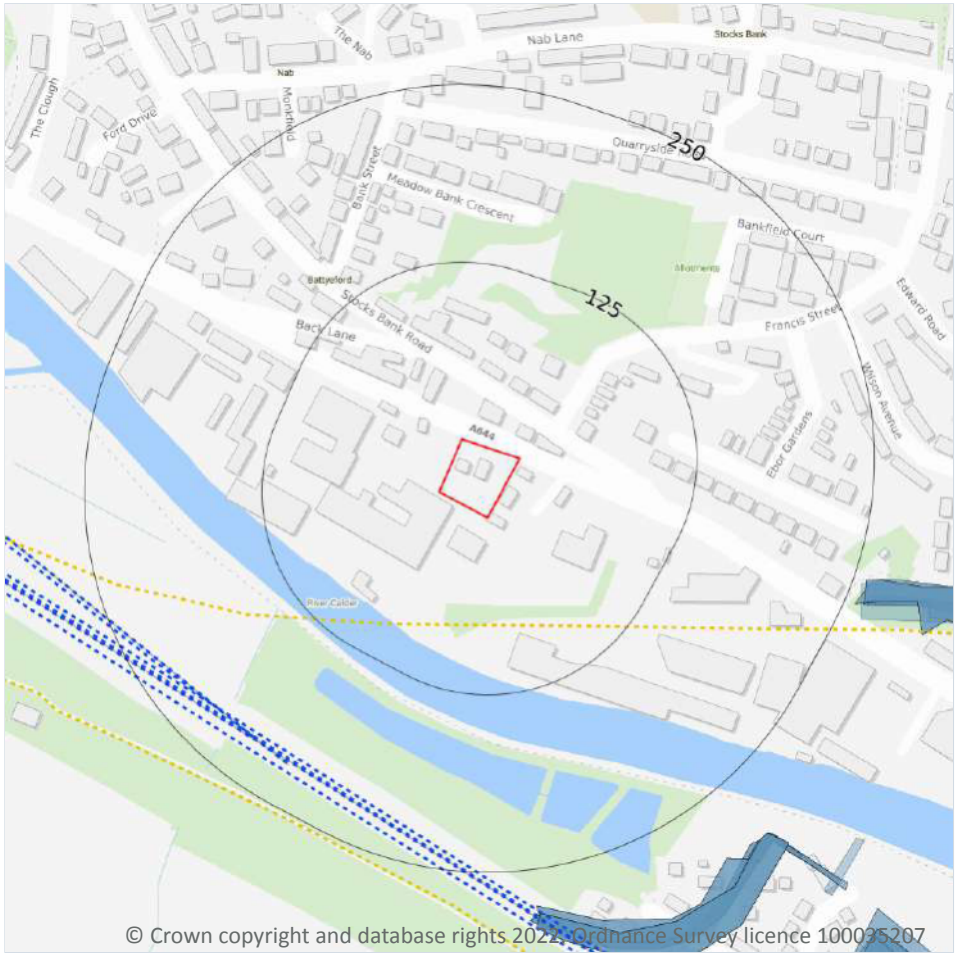
20.3 BGS Measured Urban Soil Chemistry

Records within 50m	0

The locations and measured total concentrations (mg/kg) of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc in urban topsoil samples from 23 urban centres across Great Britain. These are collected at a sample density of 4 per km^2.

This data is sourced from the British Geological Survey.

21 Railway infrastructure and projects



Site Outline

Search buffers in metres (m)

- Crossrail 1 Stations
- Crossrail 1 Route
- Crossrail 2 Stations
- Crossrail 2 Route
- Crossrail 2 Worksites
- Crossrail 2 Safeguarding
- Crossrail 2 Headhouses
- Railway stations
- Active railways
- Active tunnels
- Abandoned railways
- Historic railways
- Historic tunnels
- Underground stations
- Underground Lines
- Royal Mail tunnels
- HS2 optimised route
- HS2 Stations
- HS2 Depots
- HS2 Surface Safeguarding
- HS2 Subsurface Safeguarding

21.1 Underground railways (London)

Records within 250m	0

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

This data is sourced from publicly available information by Groundsure.

21.2 Underground railways (Non-London)

Records within 250m	0

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.

This data is sourced from publicly available information by Groundsure.

21.3 Railway tunnels

Records within 250m	0

Railway tunnels taken from contemporary Ordnance Survey mapping.

This data is sourced from the Ordnance Survey.

21.4 Historical railway and tunnel features

Records within 250m	0

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

This data is sourced from Ordnance Survey/Groundsure.

21.5 Royal Mail tunnels

Records within 250m	0

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.

This data is sourced from Groundsure/the Postal Museum.

21.6 Historical railways

Records within 250m	1

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

Features are displayed on the Railway infrastructure and projects map on **page 119**

Location	Description
76m S	Dismantled

This data is sourced from OpenStreetMap.

21.7 Railways

Records within 250m	8

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

Features are displayed on the Railway infrastructure and projects map on **page 119**

Location	Name	Type
212m SW	Huddersfield Line	rail
215m SW	Huddersfield Line	rail
217m SW	Not given	Single Track
217m SW	Not given	Single Track
217m SW	Not given	Multi Track
218m SW	Caldervale Line	rail
218m SW	Huddersfield Line	rail
225m SW	Huddersfield Line	rail

This data is sourced from Ordnance Survey and OpenStreetMap.

21.8 Crossrail 1

Records within 500m	0

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

This data is sourced from publicly available information by Groundsure.

21.9 Crossrail 2

Records within 500m	0

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

This data is sourced from publicly available information by Groundsure.

21.10 HS2

Records within 500m	0

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

This data is sourced from HS2 ltd.

Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information. To find out who they are and their areas of expertise see https://www.groundsure.com/sources-reference.

Terms and conditions

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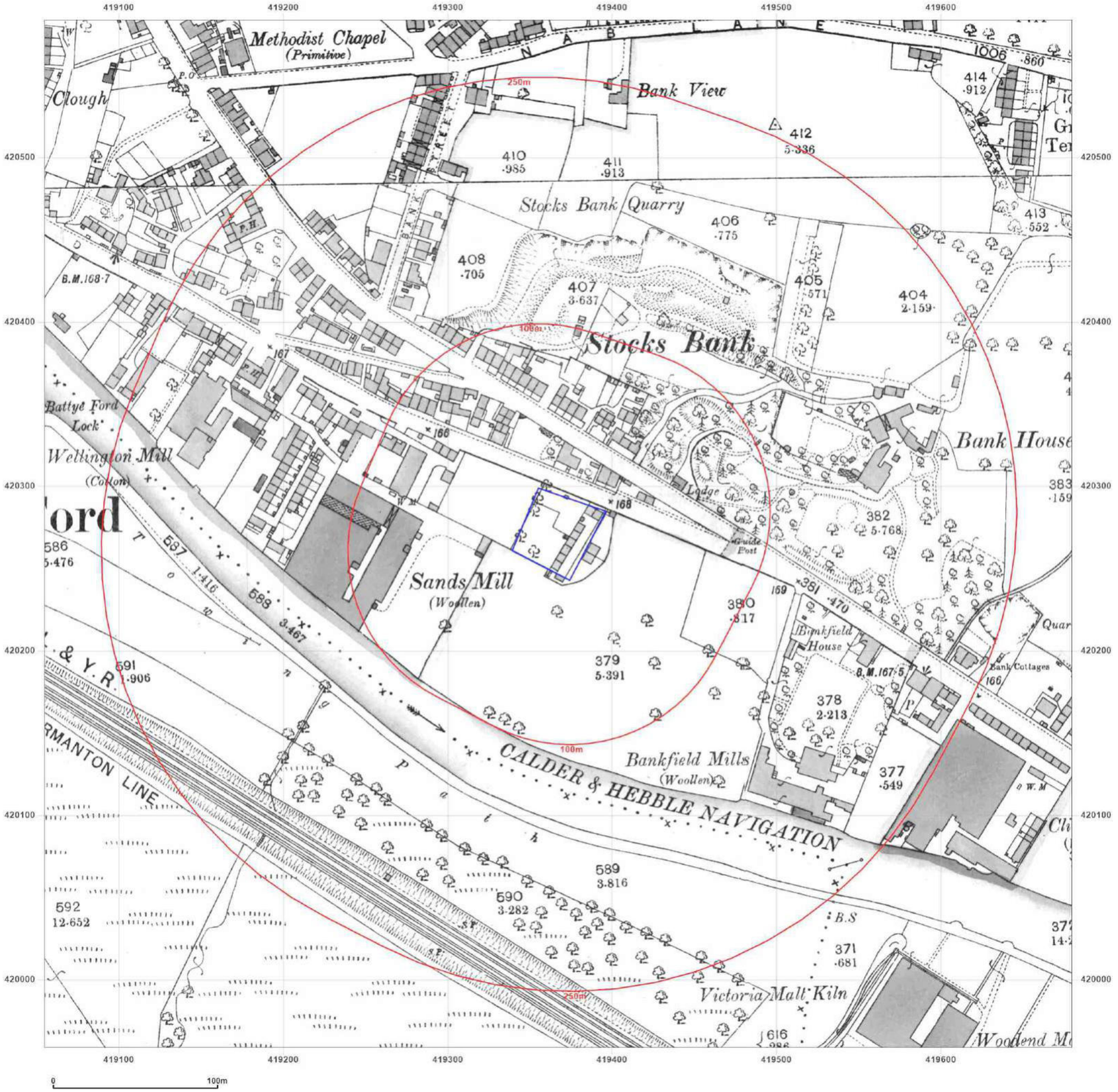

Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: County Series

Map date: **1893**

Scale: 1:2,500

Printed at: 1:2,500

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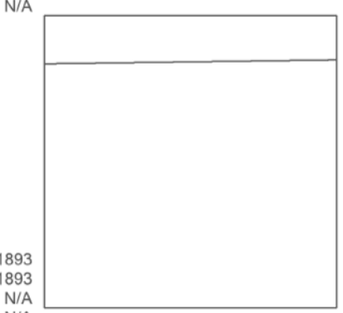
Levelled N/A



Surveyed 1893
Revised 1893
Edition N/A
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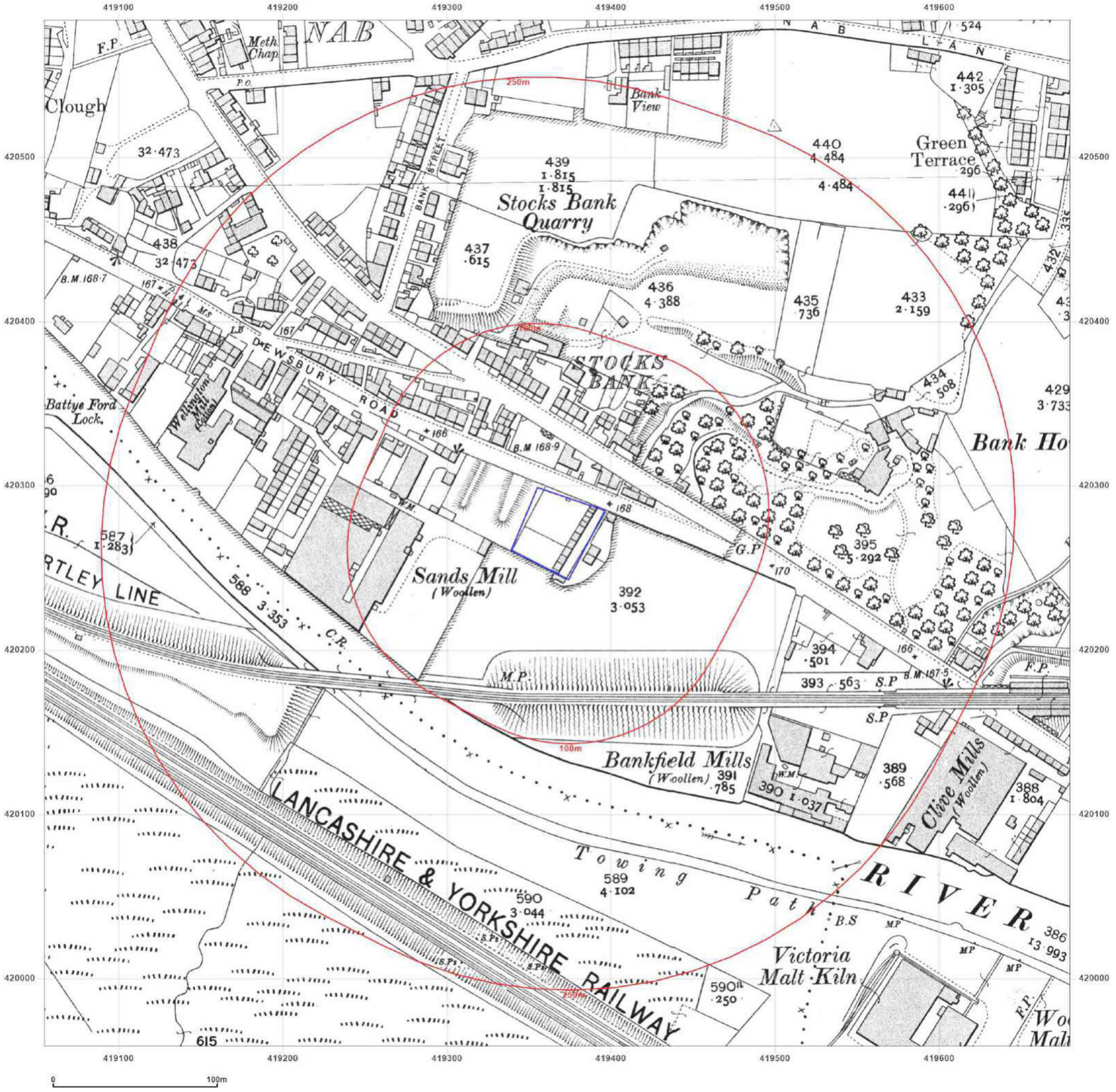

Groundsure INSIGHTS

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Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: County Series

Map date: **1907**

Scale: 1:2,500

Printed at: 1:2,500

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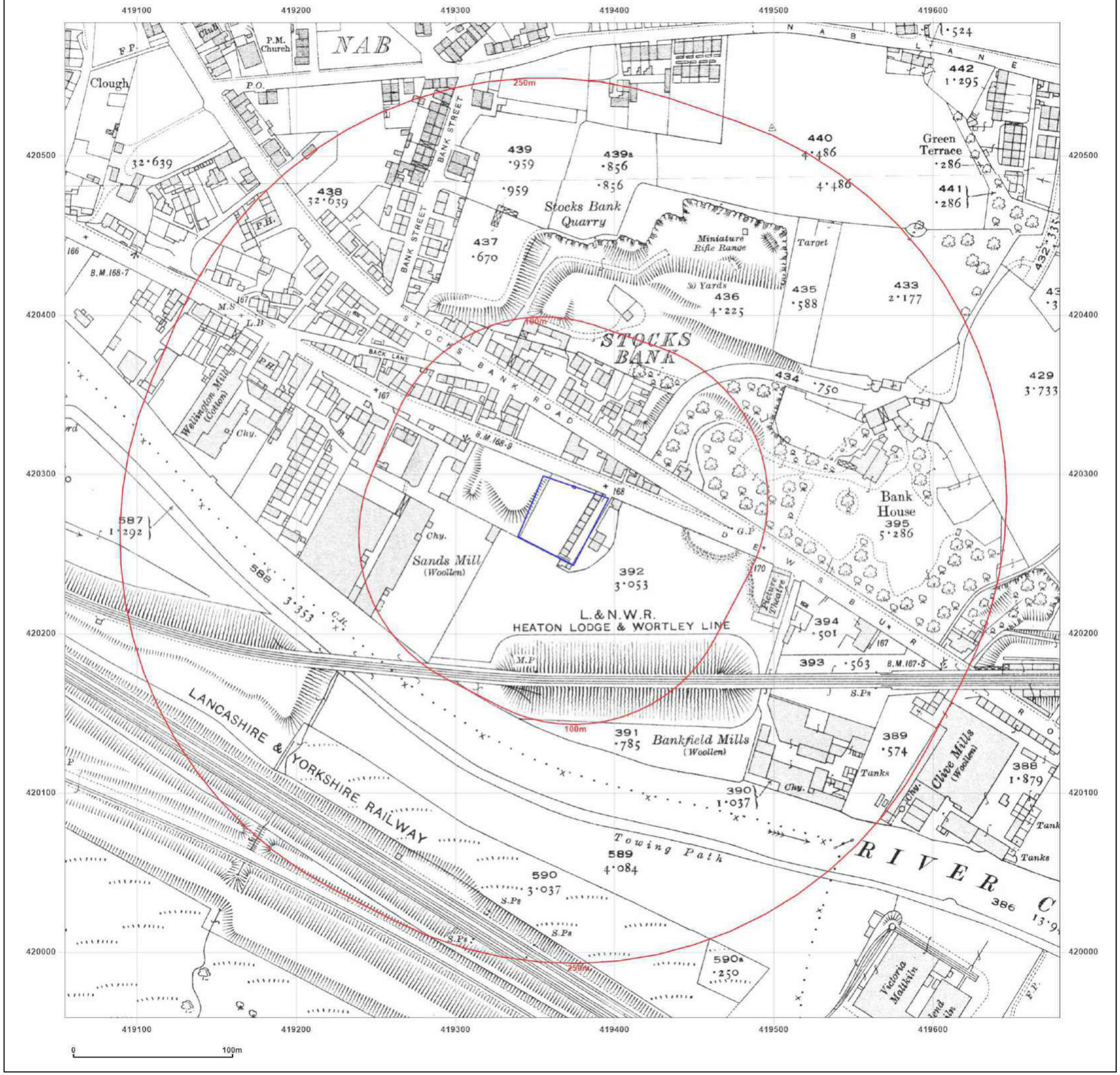

Groundsure INSIGHTS

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MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: County Series

Map date: **1922**

Scale: 1:2,500

Printed at: 1:2,500

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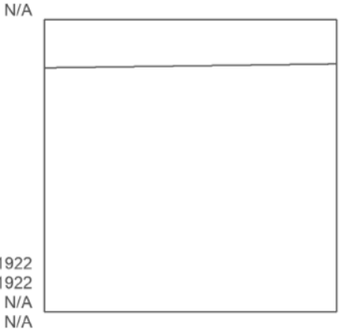
Surveyed 1922
Revised 1922
Edition N/A
Copyright N/A
Levelled N/A



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

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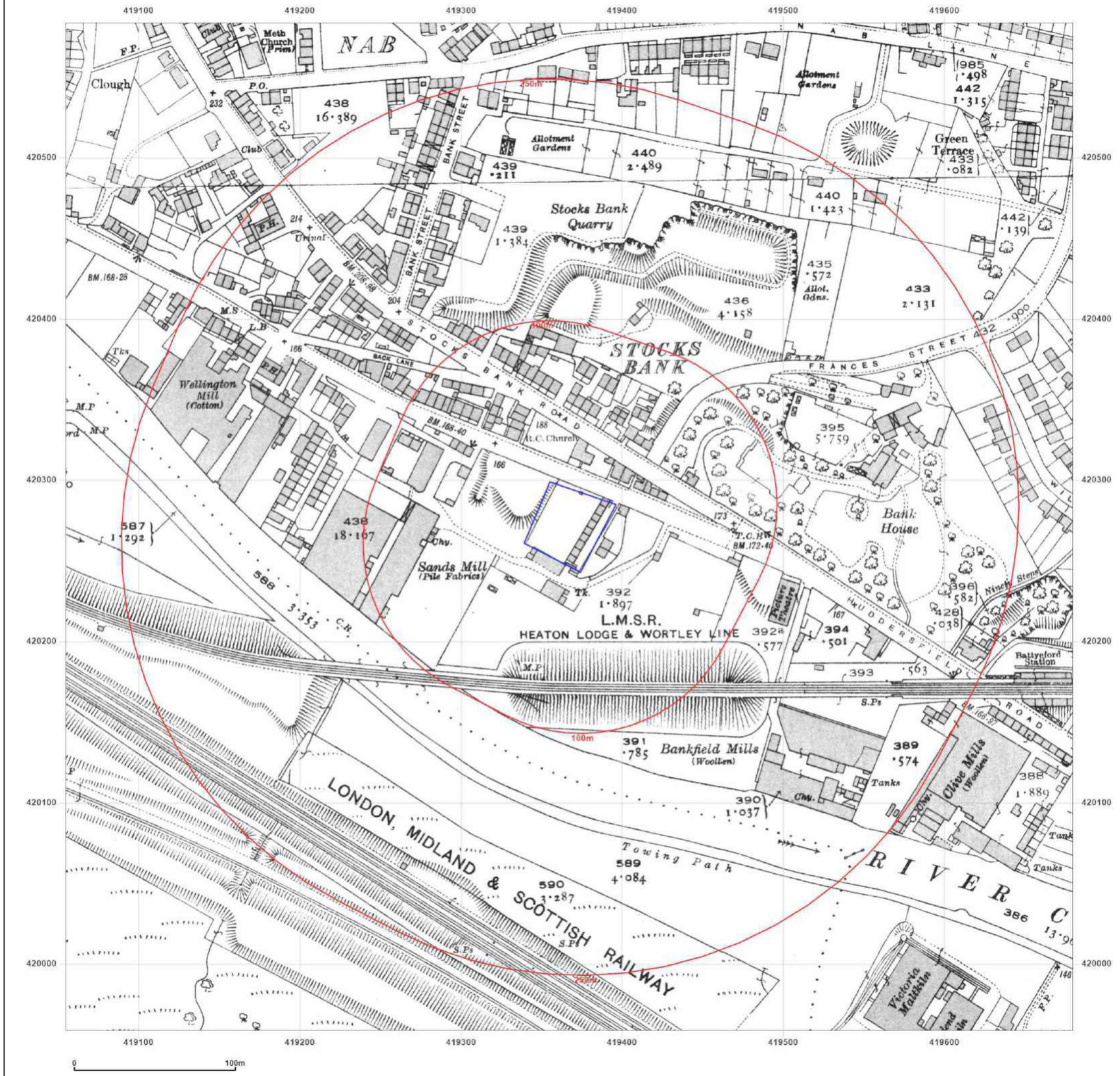

Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: County Series

Map date: **1933**

Scale: 1:2,500

Printed at: 1:2,500

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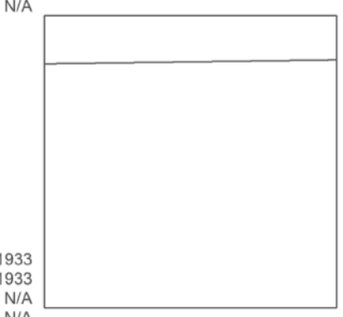
Surveyed 1933
Revised 1933
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1933
Revised 1933
Edition N/A
Copyright N/A
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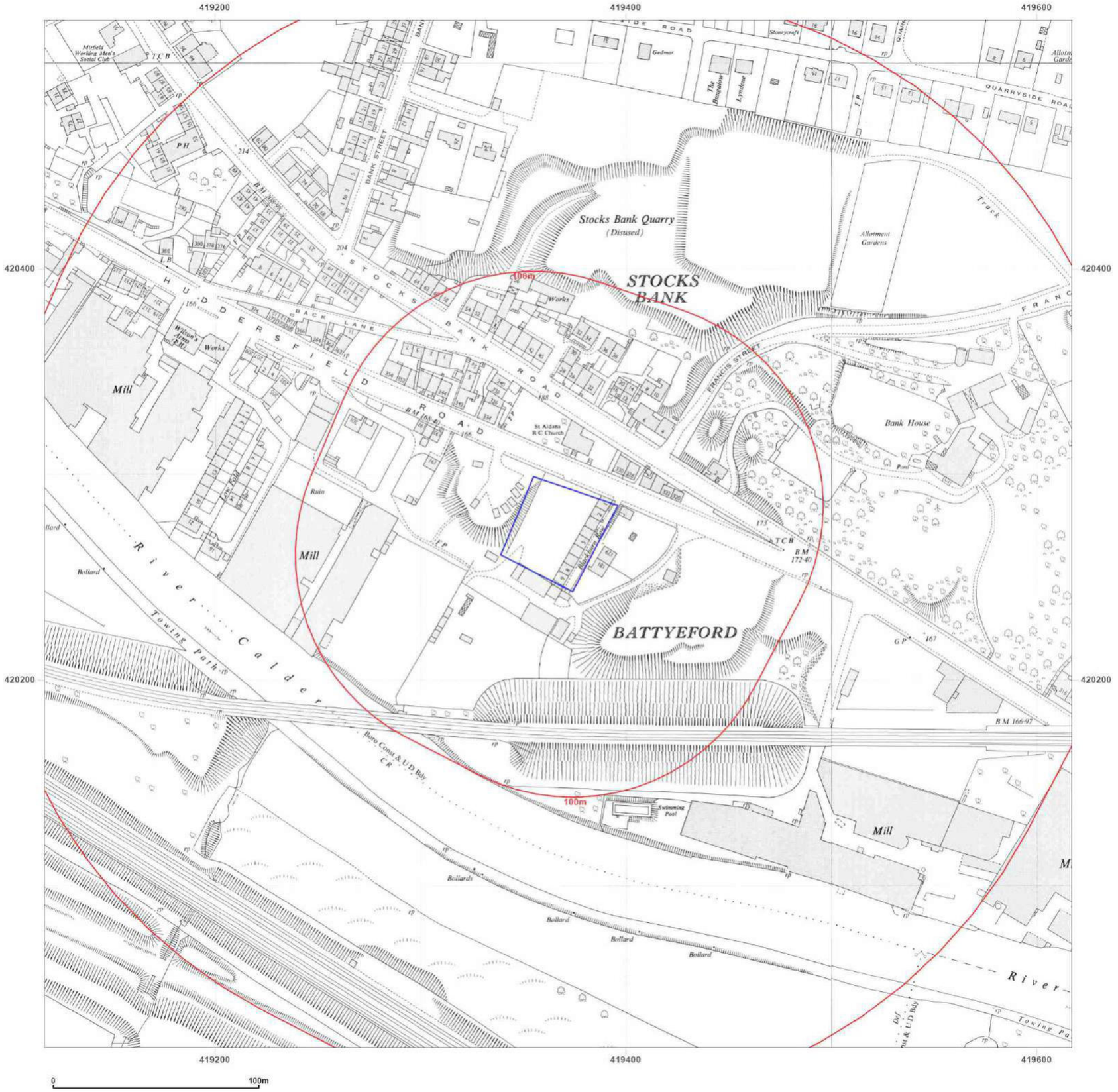

Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: National Grid

Map date: **1957**

Scale: 1:1,250

Printed at: 1:2,000

N
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Surveyed 1957
Revised 1957
Edition N/A
Copyright N/A
Levelled 1931

Surveyed 1957
Revised 1957
Edition N/A
Copyright N/A
Levelled 1931

Surveyed 1957
Revised 1957
Edition N/A
Copyright N/A
Levelled 1931

Surveyed 1957
Revised 1957
Edition N/A
Copyright N/A
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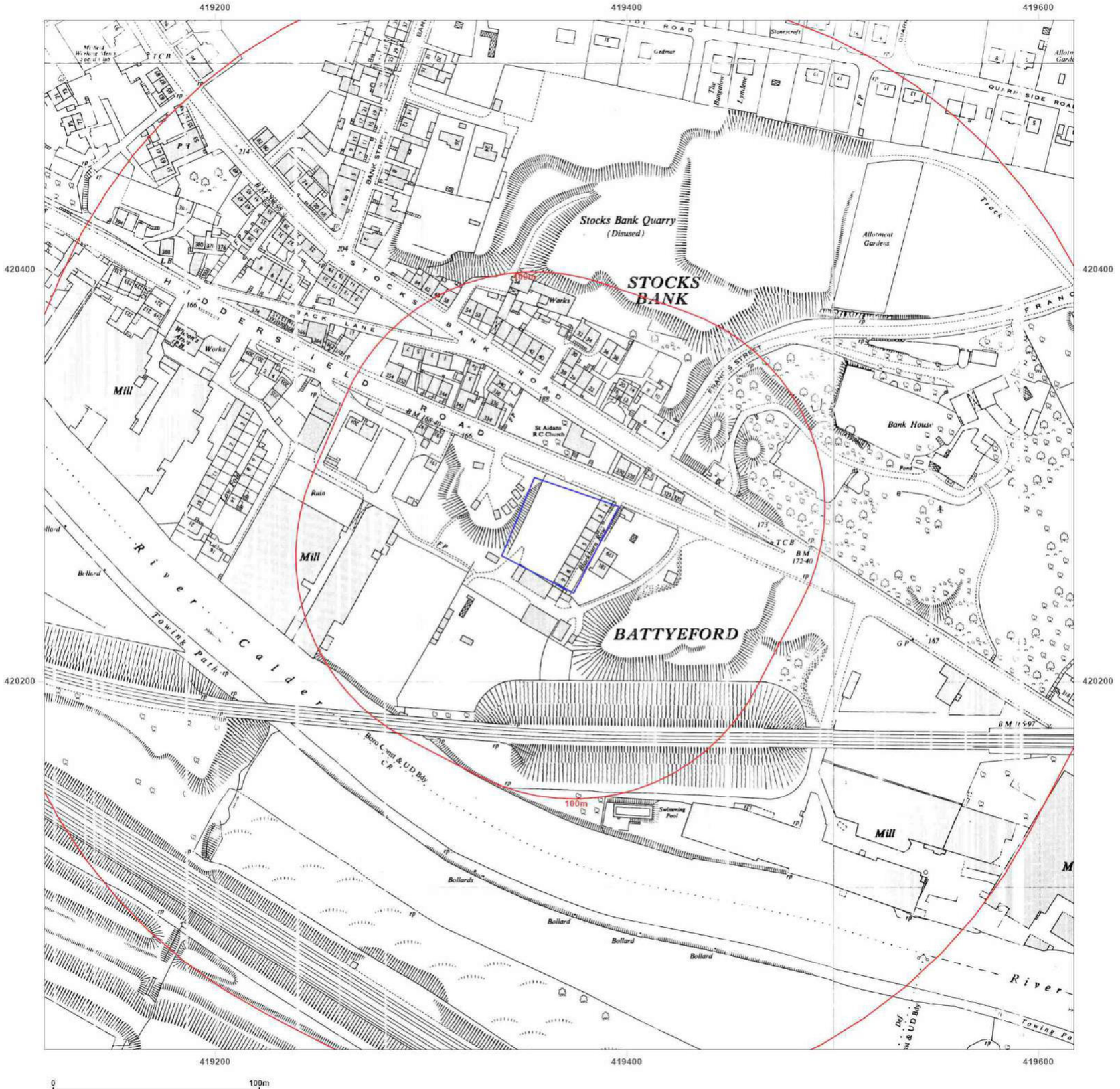

Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: National Grid

Map date: **1958**

Scale: 1:1,250

Printed at: 1:2,000

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

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

Surveyed N/A
Revised N/A
Edition N/A
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Surveyed N/A
Revised N/A
Edition N/A
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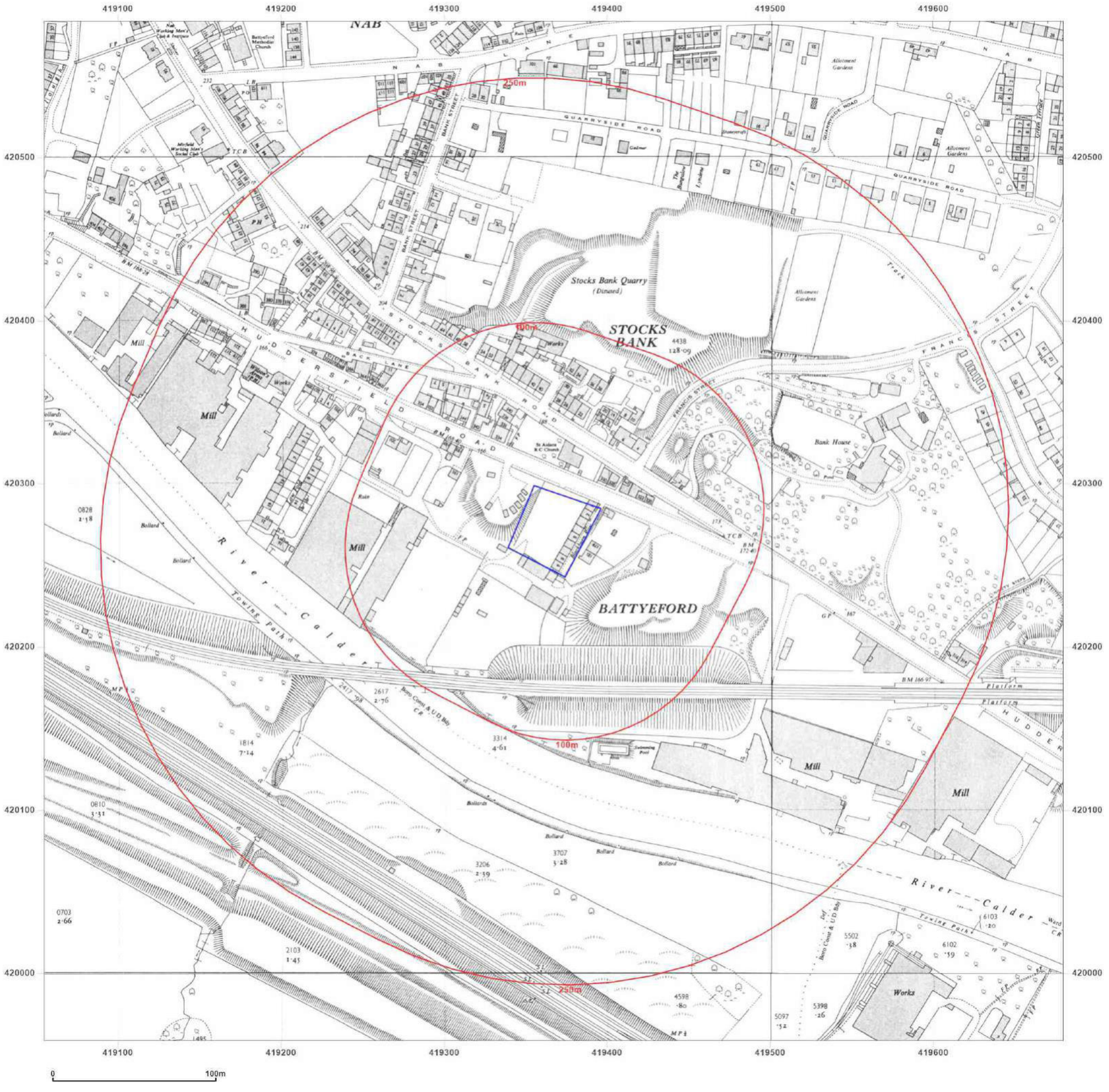

Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: National Grid

Map date: **1958**

Scale: 1:2,500

Printed at: 1:2,500

N
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Surveyed 1957
Revised 1957
Edition 1958
Copyright N/A
Levelled 1931

Surveyed 1957
Revised 1957
Edition 1958
Copyright N/A
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Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: National Grid
Map date: **1977-1982**
Scale: 1:1,250
Printed at: 1:2,000

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

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

Surveyed 1962
Revised 1982
Edition N/A
Copyright 1982
Levelled 1962

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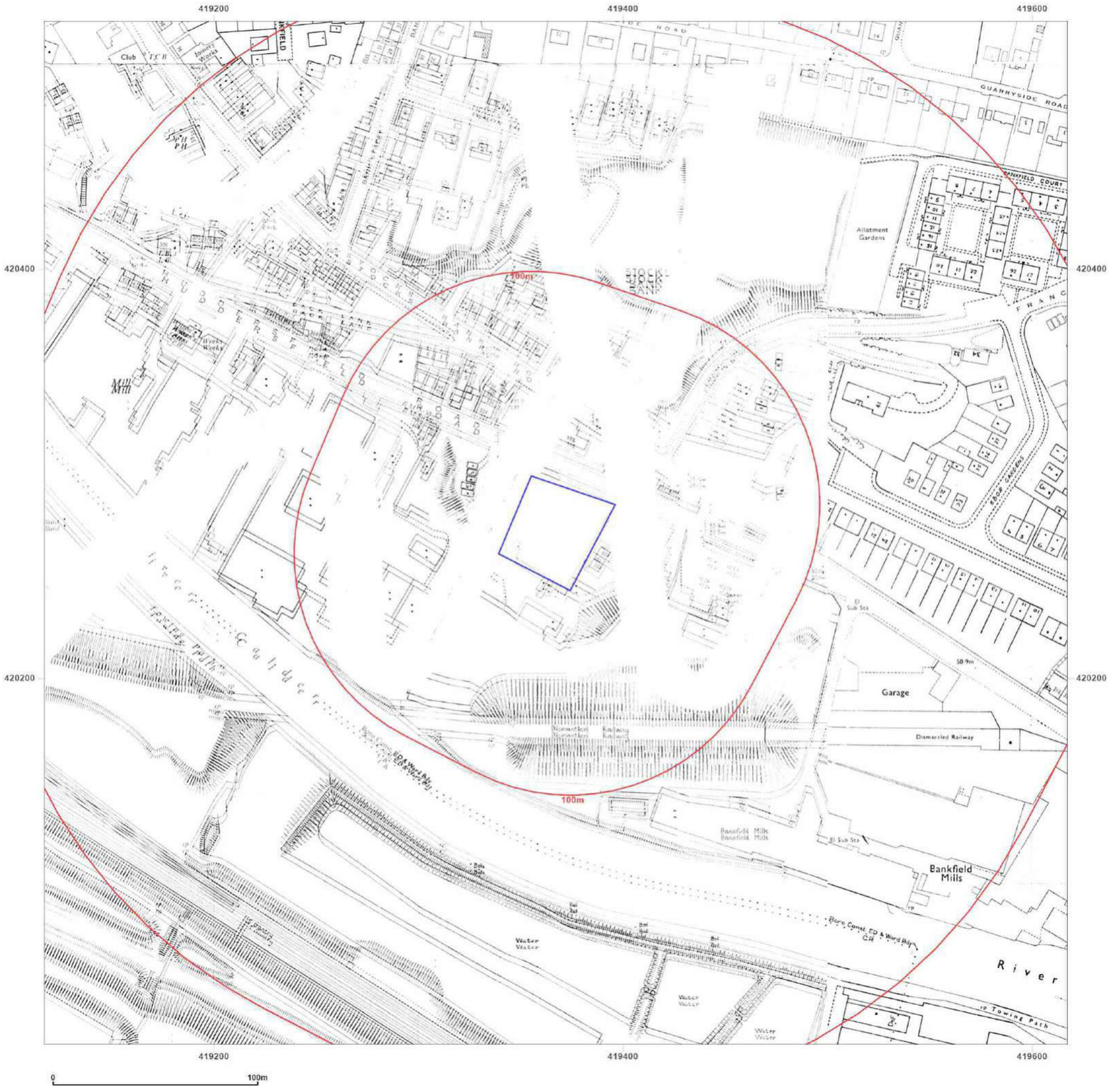

Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: National Grid

Map date: **1982-1984**

Scale: 1:1,250

Printed at: 1:2,000

N
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Surveyed 1962
Revised 1984
Edition N/A
Copyright 1984
Levelled 1962

Surveyed 1962
Revised 1984
Edition N/A
Copyright 1984
Levelled 1962

Surveyed 1962
Revised 1982
Edition N/A
Copyright 1982
Levelled 1962

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

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: National Grid

Map date: **1990-1993**

Scale: 1:1,250

Printed at: 1:2,000

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

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

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

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: National Grid

Map date: **1993-1994**

Scale: 1:1,250

Printed at: 1:2,000

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

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

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

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: National Grid

Map date: **1994**

Scale: 1:1,250

Printed at: 1:2,000

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

Surveyed 1994
Revised 1994
Edition N/A
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Site Details:

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HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

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

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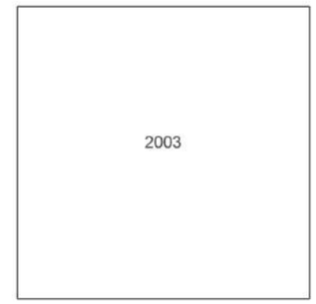

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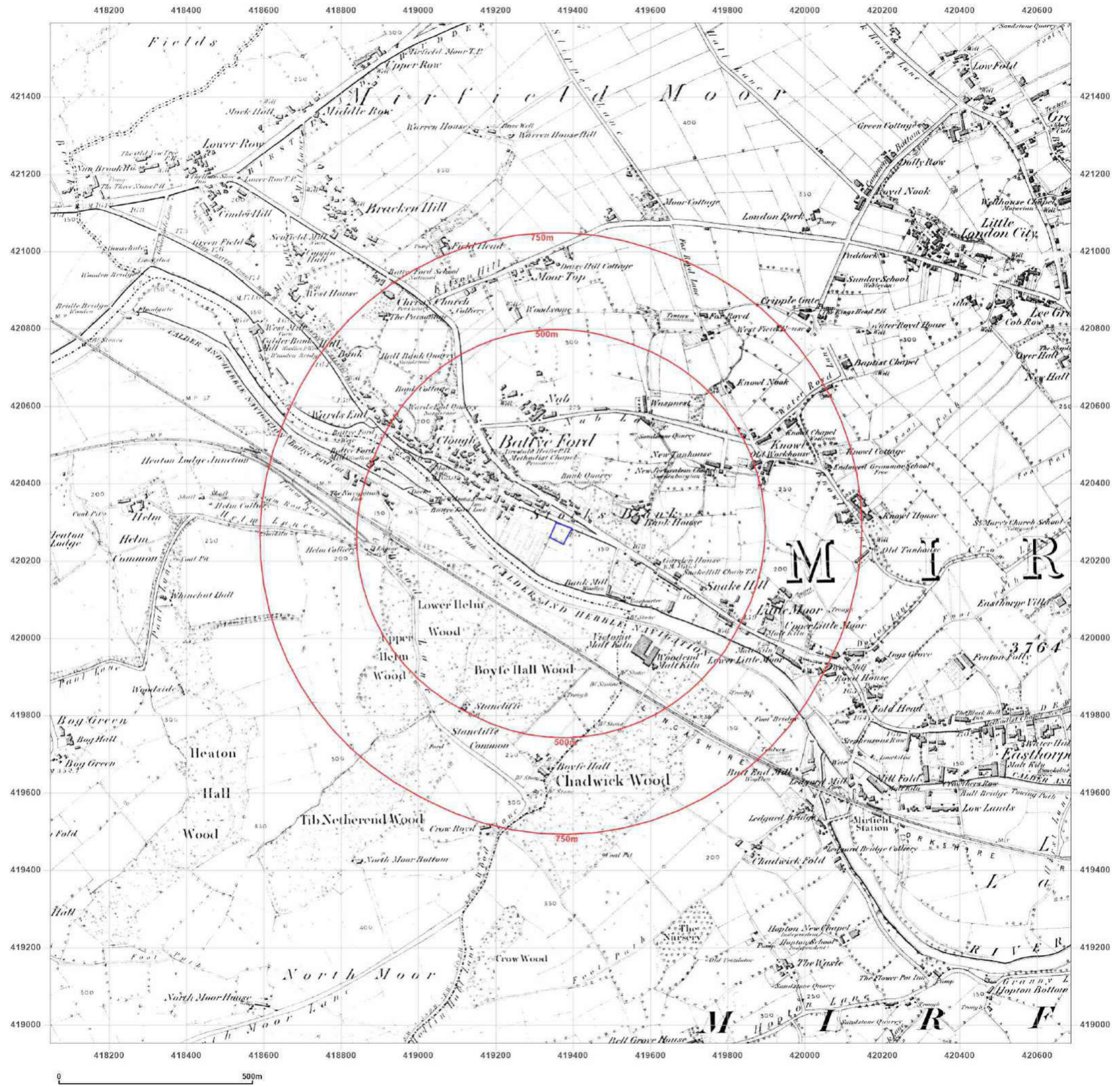

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: County Series

Map date: **1855**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1851
Revised N/A
Edition 1855
Copyright N/A
Levelled N/A

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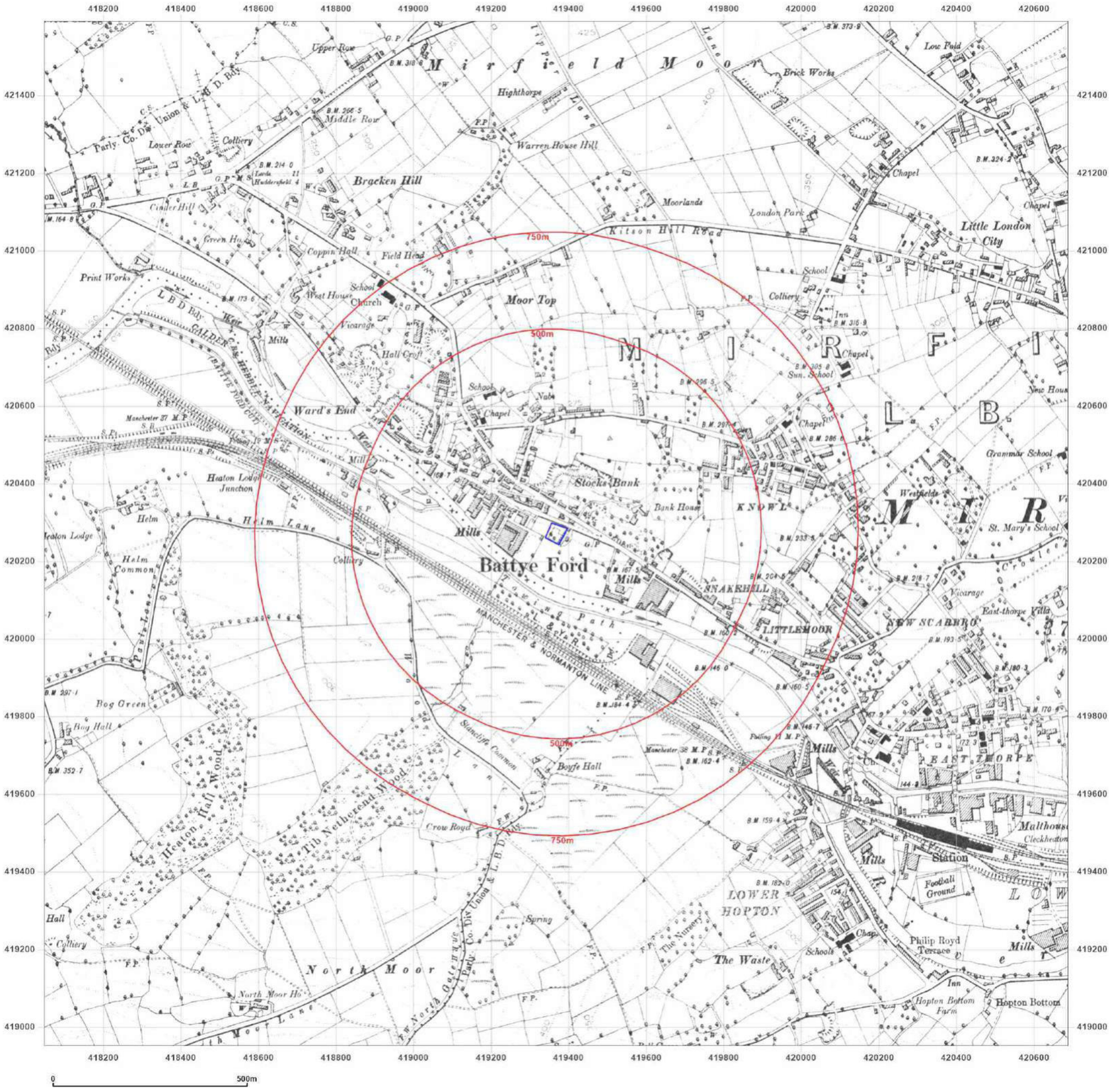

Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: County Series

Map date: **1892**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1892
Revised 1892
Edition N/A
Copyright N/A
Levelled N/A

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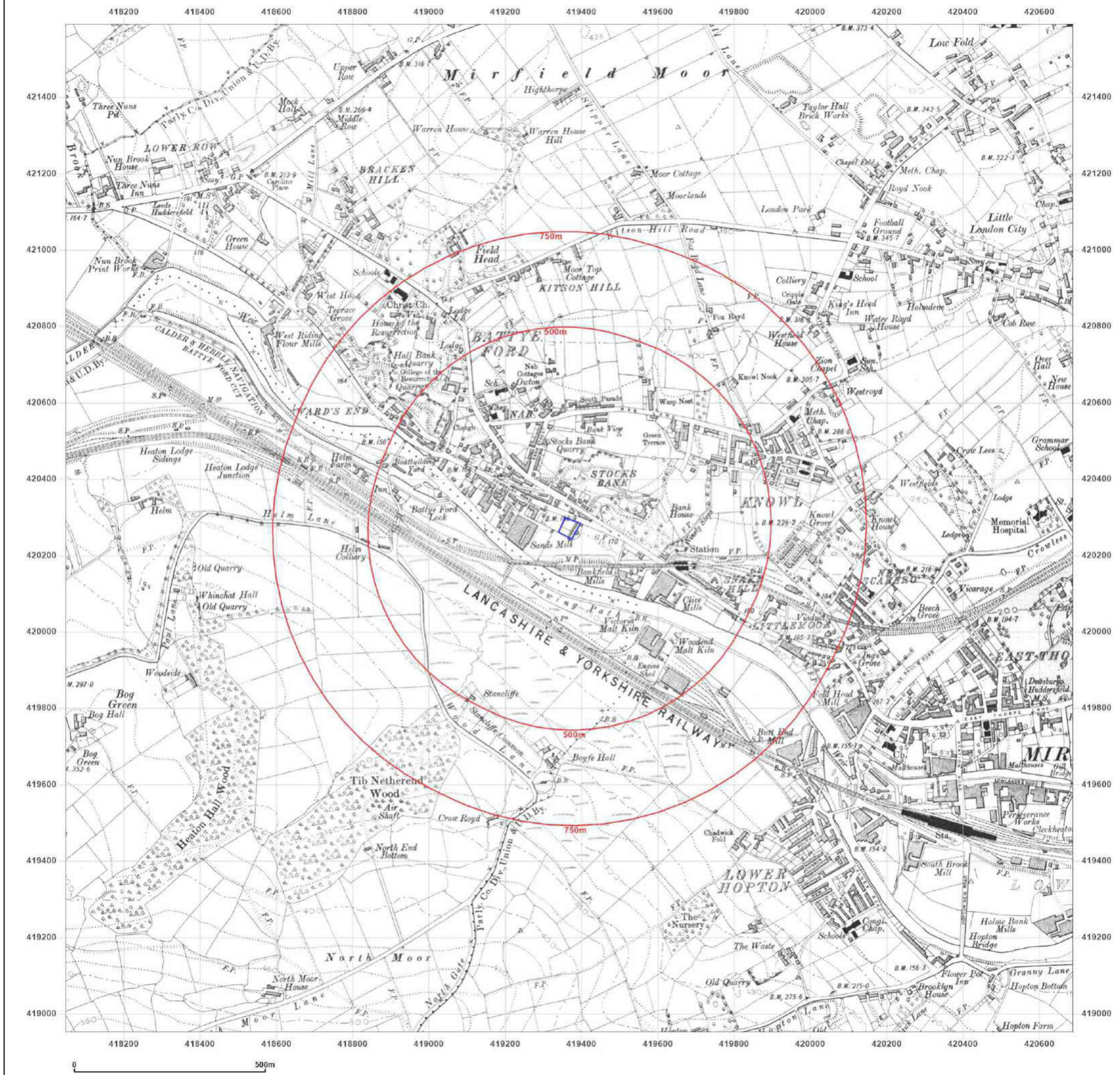

Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: County Series

Map date: **1905**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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Surveyed 1892
Revised 1905
Edition N/A
Copyright N/A
Levelled N/A

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Site Details:

MIRFIELD AIR CADET CENTRE,
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MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: County Series

Map date: **1931**

Scale: 1:10,560

Printed at: 1:10,560

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W E
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Surveyed 1851
Revised 1931
Edition N/A
Copyright N/A
Levelled N/A

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Site Details:

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HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1851
Revised 1938
Edition 1938
Copyright N/A
Levelled N/A

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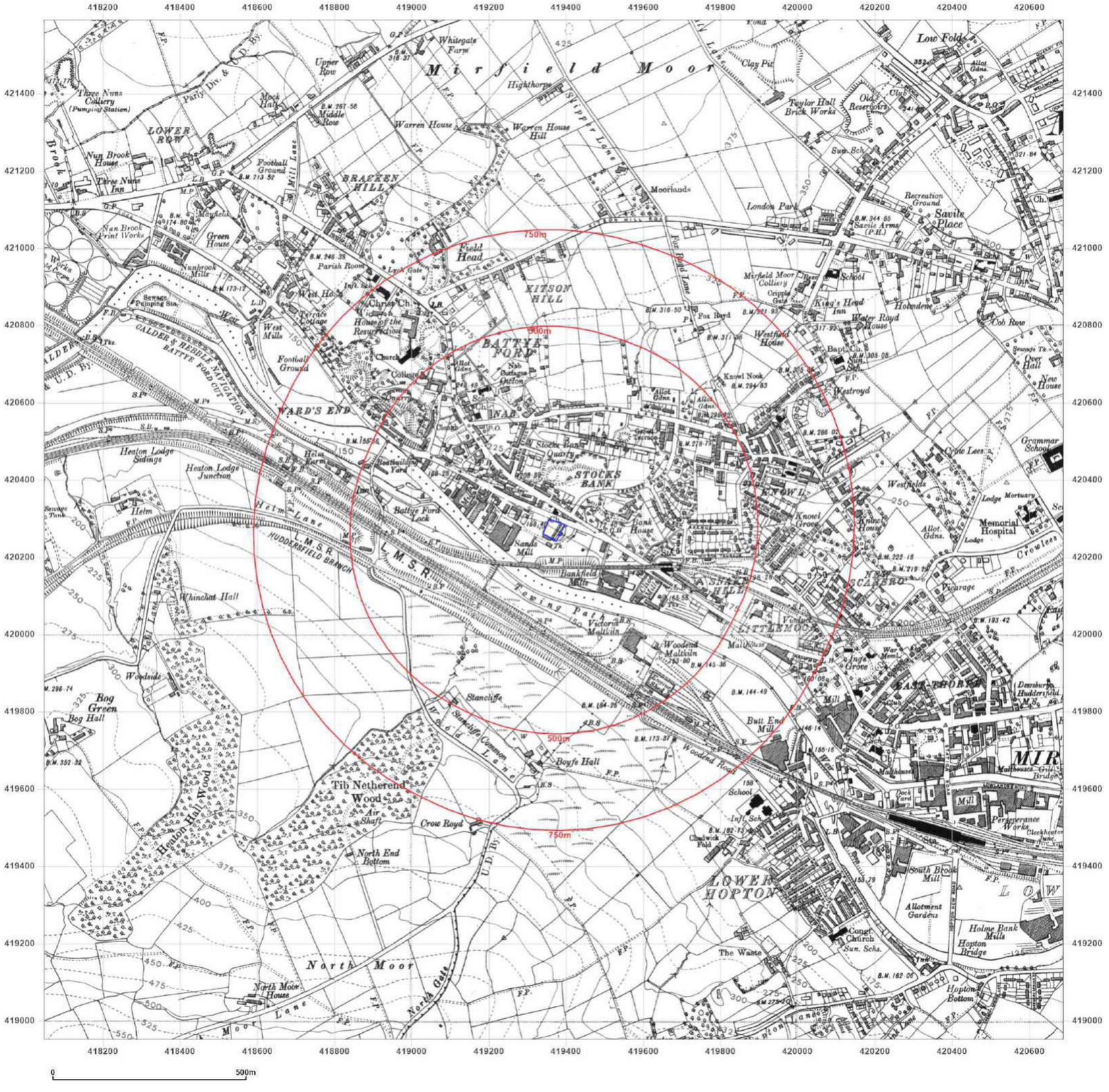

Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: County Series

Map date: **1948**

Scale: 1:10,560

Printed at: 1:10,560

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

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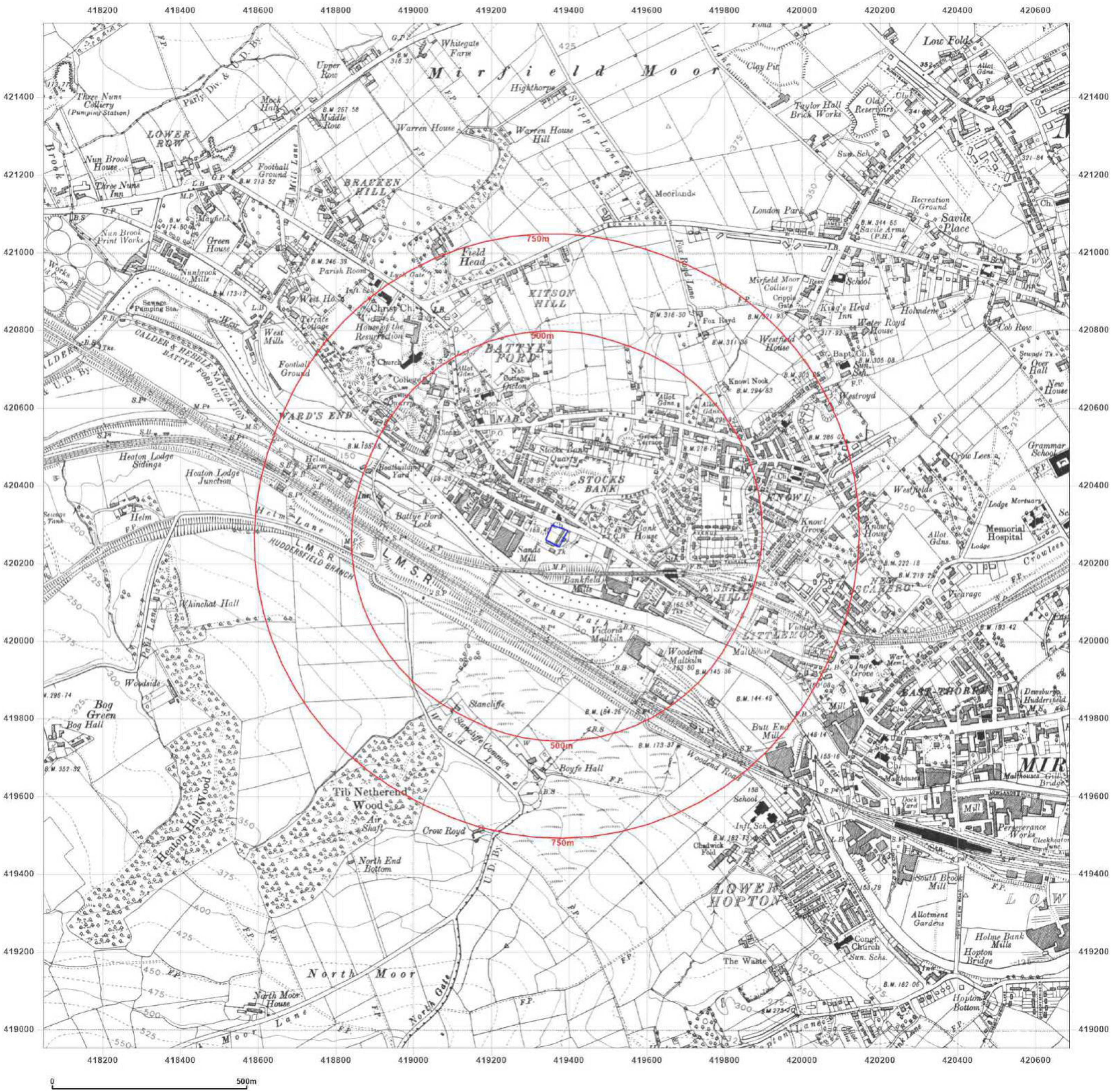

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INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: County Series

Map date: **1948**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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Surveyed 1851
Revised 1948
Edition N/A
Copyright N/A
Levelled N/A

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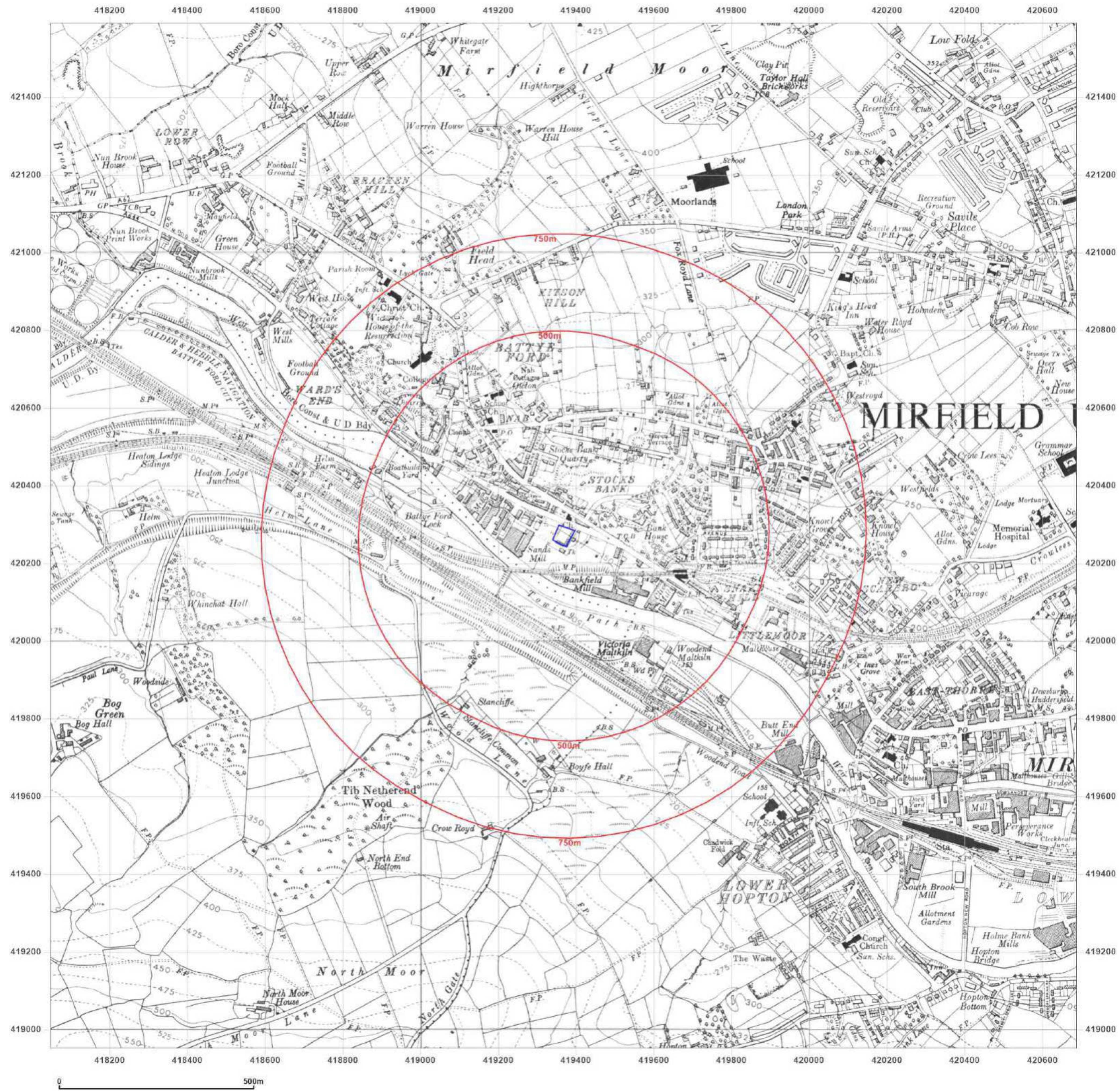

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: Provisional

Map date: **1951-1956**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1951 Revised 1951 Edition N/A Copyright N/A Levelled N/A	Surveyed 1951 Revised 1955 Edition N/A Copyright N/A Levelled N/A
Surveyed 1951 Revised 1951 Edition N/A Copyright 1956 Levelled N/A	Surveyed 1951 Revised 1951 Edition N/A Copyright N/A Levelled N/A

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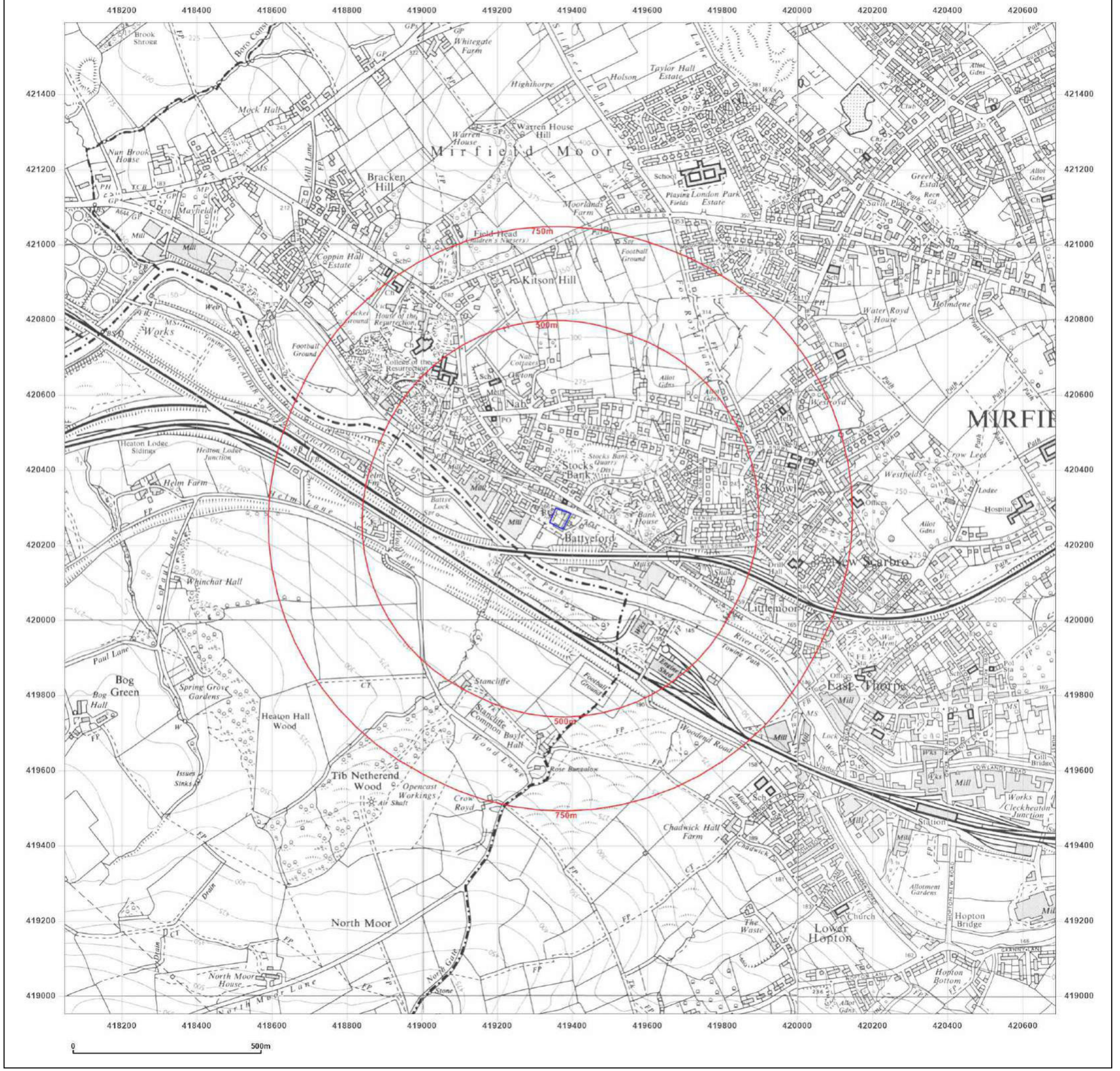

Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: Provisional
Map date: **1965-1967**
Scale: 1:10,560
Printed at: 1:10,560

N
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Surveyed 1966
Revised 1966
Edition N/A
Copyright N/A
Levelled N/A

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

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

Surveyed 1966
Revised 1966
Edition N/A
Copyright N/A
Levelled N/A

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Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: National Grid

Map date: **1974-1975**

Scale: 1:10,000

Printed at: 1:10,000

N
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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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Map legend available at:
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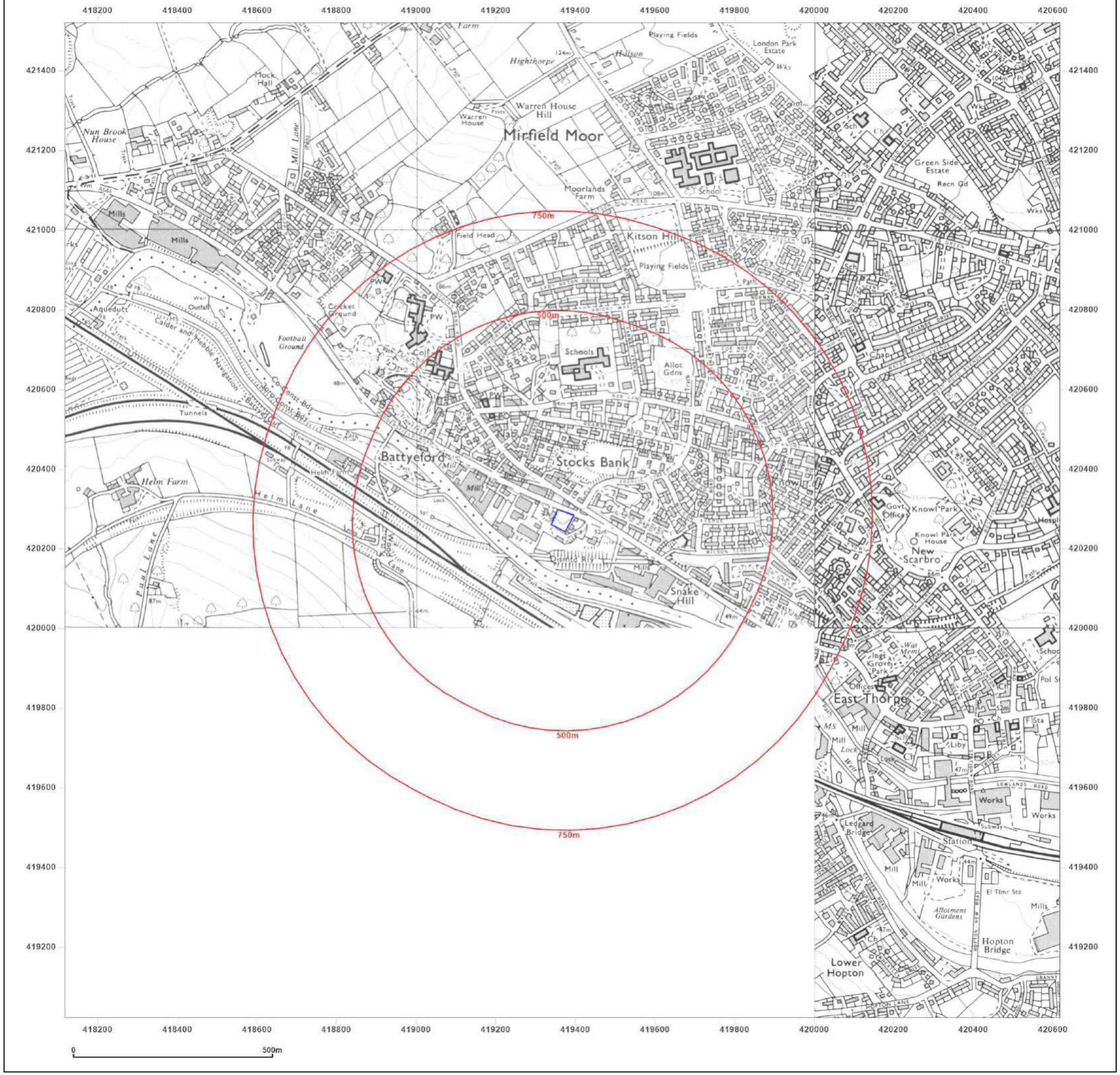

Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: National Grid

Map date: **1981-1985**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1985
Revised 1985
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1977
Revised 1981
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1977
Revised 1982
Edition N/A
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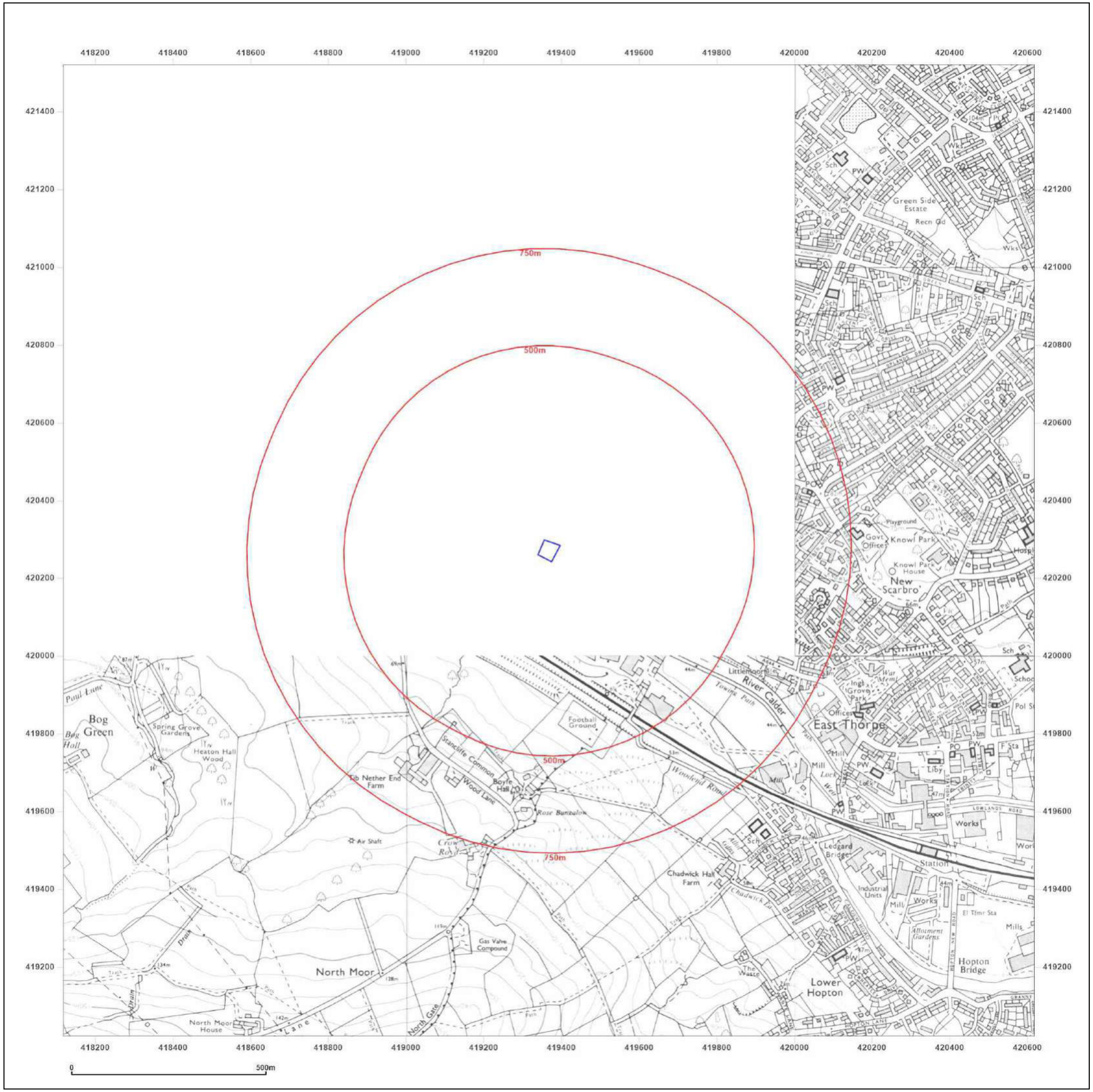

Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: National Grid

Map date: **1988-1993**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1985
Revised 1988
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1984
Revised 1988
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1991
Revised 1993
Edition N/A
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Levelled N/A

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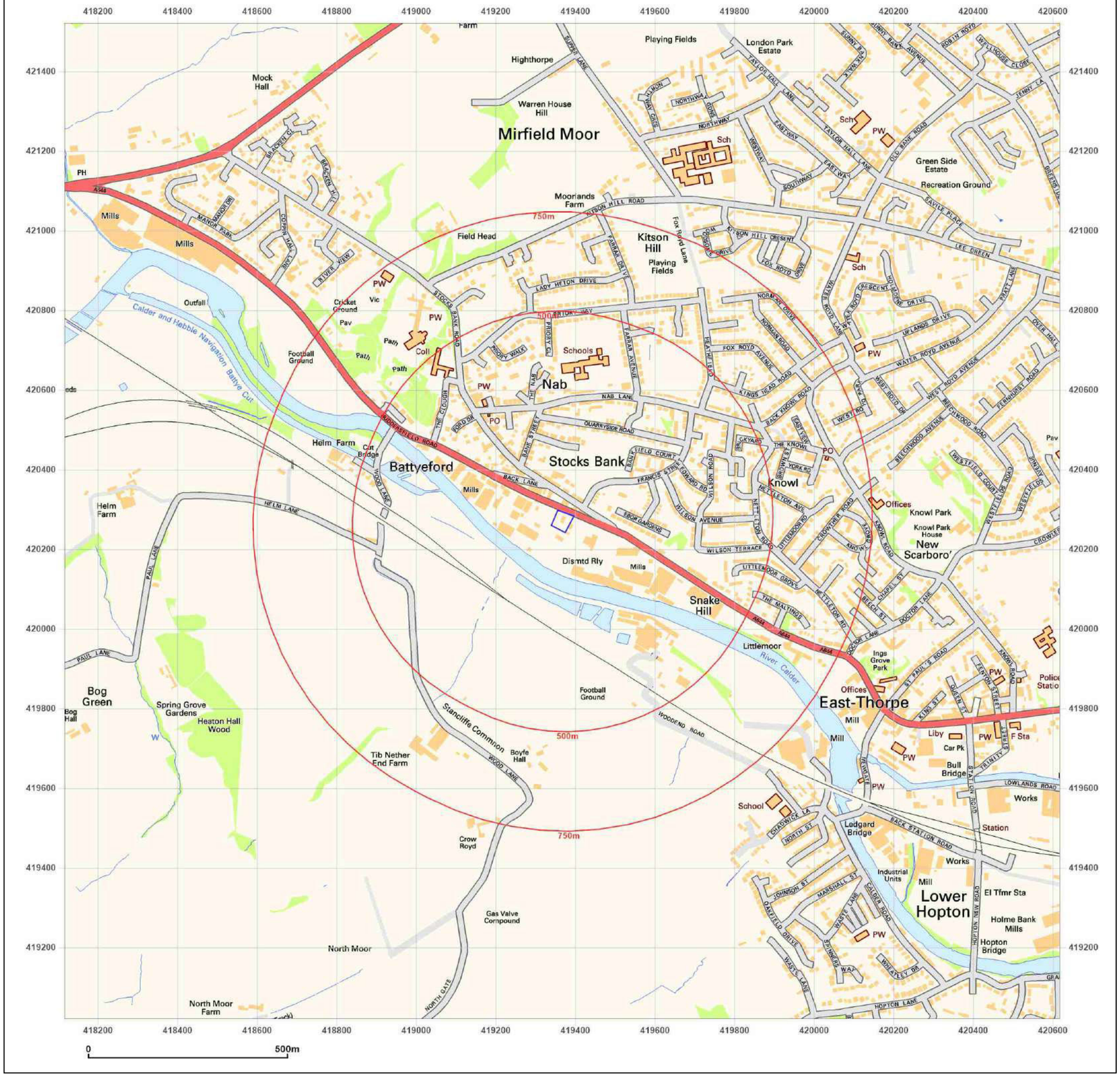
Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

Production date: 27 October 2022

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



Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: National Grid

Map date: **2001**

Scale: 1:10,000

Printed at: 1:10,000

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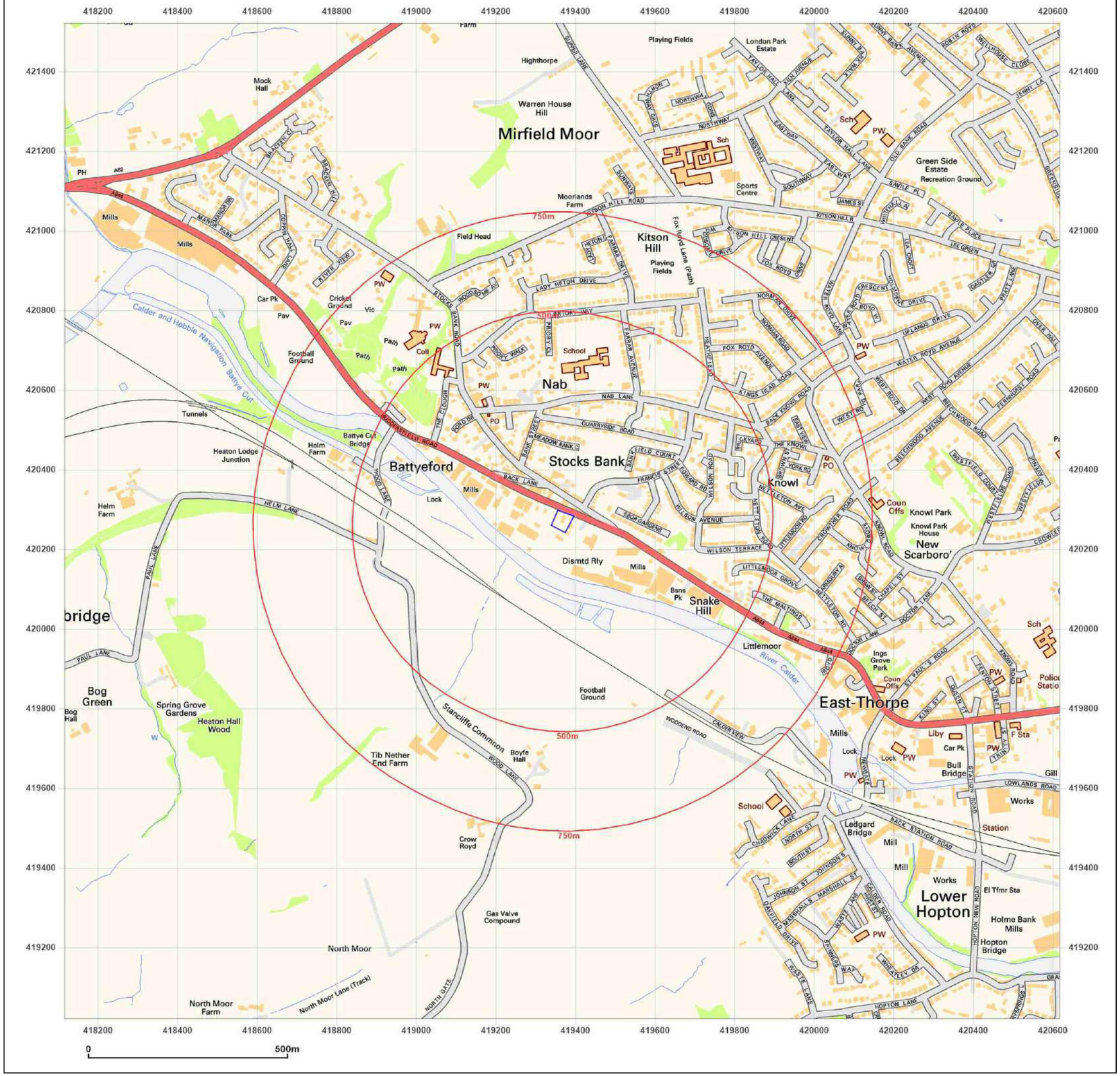

Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: National Grid
Map date: **2010**
Scale: 1:10,000
Printed at: 1:10,000

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2010

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Production date: 27 October 2022

Map legend available at:
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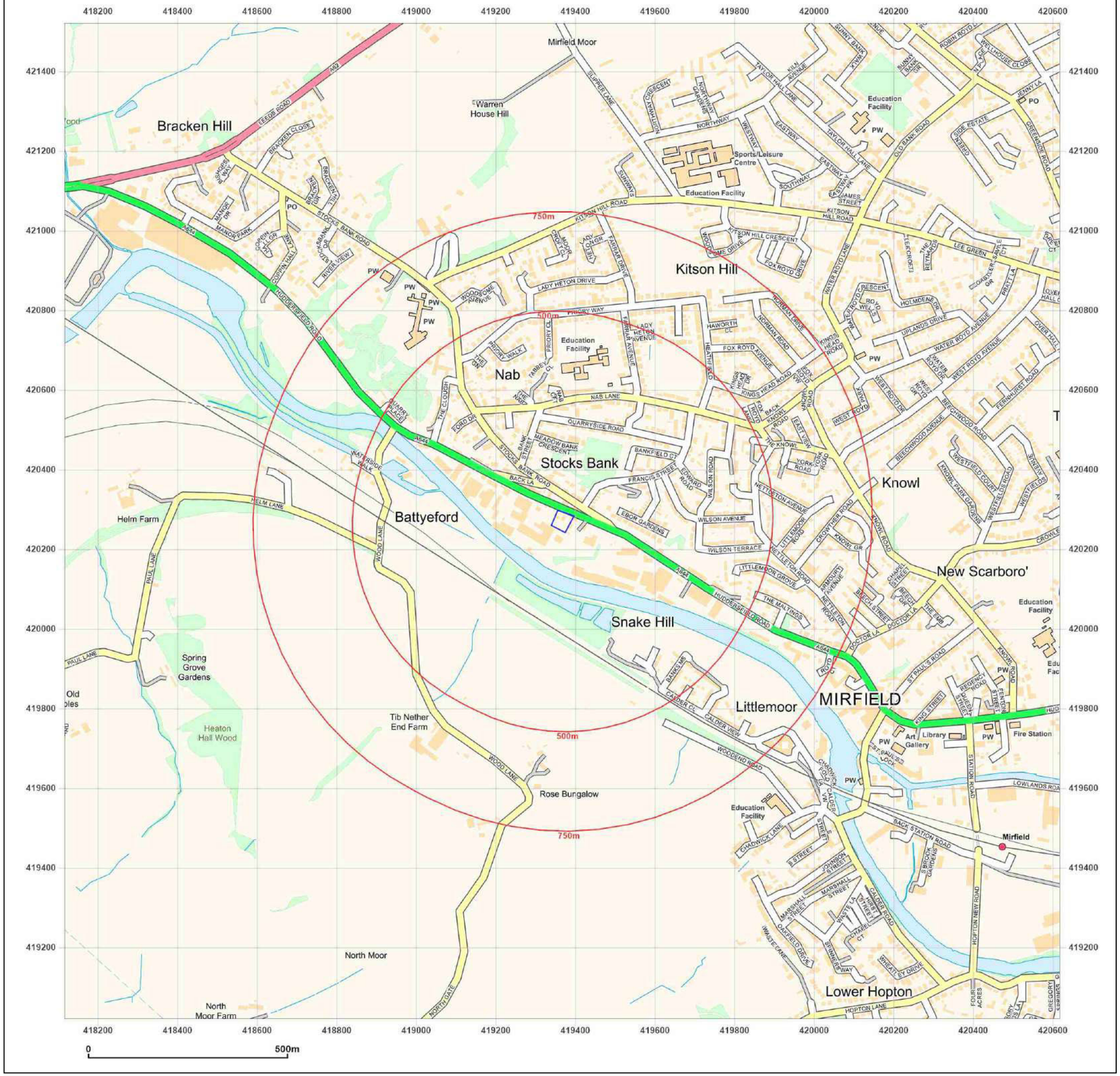

Groundsure INSIGHTS

Site Details:

MIRFIELD AIR CADET CENTRE,
HUDDERSFIELD ROAD,
MIRFIELD, WF14 9DQ

Client Ref: C541
Report Ref: GS-9159941
Grid Ref: 419367, 420271

Map Name: National Grid
Map date: **2022**
Scale: 1:10,000
Printed at: 1:10,000

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2022

Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

Production date: 27 October 2022

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

APPENDIX C

EXPLORATORY HOLE LOGS

Trial Pit Record

				TP No	1
				Contract No	C541
Method:	Machine excavated trial pit using a 1.5 tonne rated tracked excavator	**Site**	**Mirfield**	Date	13/10/22
				Scale	1:25
		Client	**John Hill Associates**	Logged By	ATS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	**Depth** To-from (m)	**Vane** kN/m²				
			MADE GROUND: TARMACADAM	0.05		
ES1	0.40		MADE GROUND: Type 1 fill	0.40		
ES2	0.80		MADE GROUND: Dark brown slightly clayey very gravelly fine to coarse SAND. Gravel is subangular fine to coarse of sandstone, mudstone, slate and brick.	0.50		
ES3	1.20		MADE GROUND: Pale cream and yellow slightly clayey subangular fine to coarse GRAVEL sized fragments of limestone, concrete and rare sandstone.	1.00		
			MADE GROUND: Dark brown slightly clayey very gravelly fine to coarse SAND of ash locally a very sandy gravel with a low cobble content. Gravel is subangular fine to coarse of clinker, brick, sandstone and limestone. Cobbles are subangular fine to coarse of brick and sandstone.	1.60		
			Trial pit terminated at 1.60m			

Remarks

Faces stable during excavation
No groundwater encountered
Pit dimension = 0.30x1.20m
Trial Pits backfilled upon completion

Sample Types

D - Disturbed
B - Bulk
W - Water
ES - Environmental

G&M CONSULTING

Trial Pit Record

				TP No	2
				Contract No	C541
Method:	Machine excavated trial pit using a 1.5 tonne rated tracked excavator	Site	Mirfield	Date	13/10/22
				Scale	1:25
		Client	John Hill Associates	Logged By	ATS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Vane kN/m²				
ES1	0.20		MADE GROUND: Grass onto TOPSOIL: Dark brown slightly clayey slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of sandstone and rare brick.	0.40		
ES2	1.00		MADE GROUND: Soft, dark brown locally speckled cream, yellow and red sandy very clayey GRAVEL, locally very gravelly CLAY with a low cobble content. Gravel is subangular fine to coarse of brick, concrete, ceramic tile, metal, plastic and fibreglass.			
ES3	2.00					
Asbestos Sample	2.20		From 1.60m Occasional 20cm by 20cm pockets of yellowish brown sandy gravelly clay.			
Asbestos Sample	2.80		2.50m Possible fine to coarse gravel sized fragments of probable asbestos fragments noted.			
ES4	3.00			3.20		
			Trial pit terminated at 3.20m			

Remarks

Faces stable during excavation
No groundwater encountered
Pit dimension = 0.45x2.10m
Trial Pits backfilled upon completion

Sample Types

D - Disturbed
B - Bulk
W - Water
ES - Environmental

G&M CONSULTING

Trial Pit Record

				TP No	3
				Contract No	C541
Method:	Machine excavated trial pit using a 1.5 tonne rated tracked excavator	Site	Mirfield	Date	13/10/22
				Scale	1:25
		Client	John Hill Associates	Logged By	ATS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Vane kN/m²				
ES1	0.20		MADE GROUND: Grass onto TOPSOIL: Dark brown slightly clayey slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of sandstone and rare brick.	0.30		
ES2	0.90		MADE GROUND: Dark brown slightly clayey very gravelly fine to coarse SAND with a low cobble and boulder content. Gravel is subangular fine to coarse of brick, concrete, tile, sandstone and plastic. Cobbles and boulders are subangular of brick and concrete.	1.90		
			Trial pit terminated at 1.90m			

Remarks

Faces stable during excavation
No groundwater encountered
Pit dimension = 0.45x1.60m
Trial Pits backfilled upon completion

Sample Types

D - Disturbed
B - Bulk
W - Water
ES - Environmental

G&M CONSULTING

Trial Pit Record

				TP No	4
				Contract No	C541
Method:	Machine excavated trial pit using a 1.5 tonne rated tracked excavator	Site	Mirfield	Date	13/10/22
				Scale	1:25
		Client	John Hill Associates	Logged By	ATS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Vane kN/m²				
ES1	0.30		MADE GROUND: Dark brown gravelly very clayey fine to coarse SAND with a low cobble and boulder content. Gravel is subangular fine to coarse of brick and concrete. Cobbles and boulders are subangular of sandstone and brick.			
ES2	1.20					
D	1.60			1.60		
HV	1.60	22, 26	Soft, locally firm light brown slightly sandy locally sandy CLAY. Sand is fine. Rare 2-5mm plant tracks noted.			
ES3	1.80					
D	2.20					
HV	2.20	36, 32, 42				
ES4	2.50					
D	3.20					
				3.40		
HV	3.50	40, 42	Firm orangish brown mottled pale grey sandy silty CLAY. Frequent 5mm root tracks			
				3.70		
			Slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of weakly cemented sandstone.			
				3.90		
			Trial pit terminated at 3.90m			

Remarks

Faces stable during excavation
No groundwater encountered
Pit dimension = 0.45x2.10m
Trial Pits backfilled upon completion

Sample Types

D - Disturbed
B - Bulk
W - Water
ES - Environmental

G&M CONSULTING

Trial Pit Record

				TP No	5
				Contract No	C541
Method:	Machine excavated trial pit using a 1.5 tonne rated tracked excavator	Site	Mirfield	Date	13/10/22
				Scale	1:25
		Client	John Hill Associates	Logged By	ATS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Vane kN/m²				
ES	0.50		MADE GROUND: Dark grey locally greyish brown clayey locally very clayey very gravelly fine to coarse SAND with a low cobble and boulder content. Gravel is subangular fine to coarse of brick, concrete, slate, plastic, tile and sandstone. Cobbles are subangular of sandstone and concrete.	1.60		
D	1.80		Firm locally soft light brown slightly sandy locally sandy CLAY. Sand is fine.			
HV	2.00	42, 48				
ES	2.00					
D	2.50		Frequent dark brown 10mm by 10mm plant root tracks	2.90		
D	3.00		Soft orangish brown mottled light grey sandy locally very sandy CLAY. Sand is fine and medium. Frequent 5cm bands of light grey very clayey fine to medium sand.			
HV	3.00	28, 30				
ES	3.00			3.30		
			Trial pit terminated at 3.30m			

Remarks

Faces stable during excavation
No groundwater encountered
Pit dimension =
Trial Pits backfilled upon completion

Sample Types

D - Disturbed
B - Bulk
W - Water
ES - Environmental

G&M CONSULTING

Borehole Record

BH No			CP1
Contract No			C541
Method:	Cable percussive drilling using a Dando 150 - 150mm diameter	Site	Mirfield ATC
Date			28/10/22
Scale			1:50
Client	John Hill Associates	Logged By	AS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Records				
			MADE GROUND: Tarmacadam	0.10		
			MADE GROUND: Yellowish cream clayey sandy subangular fine to coarse GRAVEL sized fragments of limestone and sandstone (Type 1 Fill)	0.60		
SPT D	1.0-1.45	N=1 (1,1/0,0,0,1)	MADE GROUND: Dark brown localy black slightly clayey very gravelly fine to coarse SAND of ash locally a very sandy gravel with a low cobble content. Gravel is subangular fine to coarse of clinker, brick, sandstone and limestone. Cobbles are subangular fine to coarse of brick and sandstone.			
SPT D	2.0-2.45	N=3 (0,1/2,0,1,0)	From 1.80m: becoming clayey			
SPT D	3.0-3.45	N=5 (2,2/1,1,1,2)				
SPT D	4.0-4.45	N=6 (16,6/1,2,1,2)		4.30		
SPT D	5.0-5.45	N=23 (2,5/7,6,5,5)	Firm, yellowish brown gravelly very sandy CLAY with a low cobble content. Sand is fine to coarse, gravel is subangular to rounded fine to coarse of quartzite and sandstone. Cobbles are subangular of sandstone.			
SPT D	6.0-6.45	N=27 (16,9/8,6,6,7)				
B	6.0-7.0					
SPT D	7.0-7.45	N=16 (5,4/4,5,4,3)				
SPT D	8.0-8.45	N=21 (5,5/6,5,5,5)		8.30		
SPT D	9.0-9.45	N=16 (6,6/6,4,3,3)	Medium dense, light brown sandy subangular to rounded fine to coarse GRAVEL of quartzite and sandstone with a low cobble content. Sand is fine to coarse. Cobbles are subrounded to rounded of quartzite			
B	9.0-10.0					

Remarks

Monitoring well installed to 4m bgl. Borehole backfilled with arisings and bentonite below well
Failed U100 - 5.00-5.45m - High granular content
No groundwater encountered

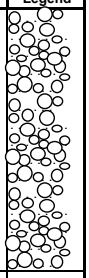
Sample Types

D - Disturbed
U - Undisturbed
W - Water

G&M CONSULTING

Borehole Record

				BH No	CP1
				Contract No	C541
Method:	As Sheet 1	Site	Mirfield ATC	Date	28/10/22
				Scale	1:50
		Client	John Hill Associates	Logged By	AS

Sample Details						
Type	Depth To-from (m)	Records	Description	Depth (m)	Level (mAOD)	Legend
CPT	10.0-10.45	N=14 (2,4/3,3,4,4)	Medium dense, light brown sandy subangular to rounded fine to coarse of quartzite and sandstone with a low cobble content. Sand is fine to coarse, cobbles are subrounded to rounded of quartzite			
B	10.0-11.0					
CPT	11.0-11.45	N=23 (8,11/7,6,5,5)				
			Borehole complete at 11.45m			

Remarks

Sample Types
D - Disturbed
U - Undisturbed
W - Water

APPENDIX D

LABORATORY TEST RESULTS

Andrew Swinbourne
G & M Consulting Ltd
The Chestnuts
Brackenhill Road
East Lound
Haxey
Doncaster
DN9 2 LR

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

Analytical Report Number : 22-90884

Project / Site name:	Mirfield ATC	**Samples received on:**	14/10/2022
Your job number:	C541	**Samples instructed on/ Analysis started on:**	18/10/2022
Your order number:		**Analysis completed by:**	02/11/2022
Report Issue Number:	1	**Report issued on:**	02/11/2022
Samples Analysed:	15 soil samples		

Signed:

Dominika Warjan
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

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 22-90884
Project / Site name: Mirfield ATC

Lab Sample Number				2465971	2465972	2465973	2465974	2465975
Sample Reference				TP1	TP1	TP1	TP2	TP2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.80	1.20	0.20	1.00
Date Sampled				13/10/2022	13/10/2022	13/10/2022	13/10/2022	13/10/2022
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	< 0.1	33	24	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	17	17	17	17	17
Total mass of sample received	kg	0.001	NONE	0.4	0.4	0.4	0.4	0.4
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	Chrysotile, Amosite, Crocidolite- Loose Fibrous Debris
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	-	-	Detected
Asbestos Analyst ID	N/A	N/A	N/A	SSZ	SSZ	N/A	N/A	SSZ
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	-	9.5	-	-	7.8
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	0.06	-	-	1.9
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	-
Speciated PAHs								
Naphthalene	mg/kg	0.05	NONE	< 0.05	-	< 0.05	< 0.05	0.33
Acenaphthylene	mg/kg	0.05	NONE	< 0.05	-	< 0.05	0.17	0.23
Acenaphthene	mg/kg	0.05	NONE	< 0.05	-	< 0.05	< 0.05	0.77
Fluorene	mg/kg	0.05	NONE	< 0.05	-	< 0.05	< 0.05	0.53
Phenanthrene	mg/kg	0.05	NONE	0.86	-	1.2	0.87	5
Anthracene	mg/kg	0.05	NONE	0.26	-	0.33	0.29	1.4
Fluoranthene	mg/kg	0.05	NONE	1.5	-	2	2.4	7.5
Pyrene	mg/kg	0.05	NONE	1.4	-	1.9	2.3	6.9
Benzo(a)anthracene	mg/kg	0.05	NONE	0.93	-	1.1	1.6	4.7
Chrysene	mg/kg	0.05	NONE	1.1	-	1.3	1.5	3.9
Benzo(b)fluoranthene	mg/kg	0.05	NONE	1.1	-	1.2	1.8	5.3
Benzo(k)fluoranthene	mg/kg	0.05	NONE	0.37	-	0.66	1.5	2
Benzo(a)pyrene	mg/kg	0.05	NONE	1.1	-	1.3	1.6	5
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	0.61	-	0.74	1.1	3.1
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	< 0.05	-	< 0.05	< 0.05	0.8
Benzo(ghi)perylene	mg/kg	0.05	NONE	0.72	-	0.88	1.3	3.1
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	9.93	-	12.7	16.3	50.6
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	140	-	88	32	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	3.4	-
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	-	< 1.8	U/S*	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	120	-	96	130	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	130	-	200	390	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	0.5	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	100	-	79	27	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	160	-	300	1200	-

U/S = Unsuitable Sample I/S = Insufficient Sample
*Unsuitable for analysis due to high colour intensity.

Analytical Report Number: 22-90884
Project / Site name: Mirfield ATC

Lab Sample Number				2465976	2465977	2465978	2465979	2465980
Sample Reference				TP2	TP2	TP3	TP3	TP4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.00	3.00	0.20	0.90	0.30
Date Sampled				13/10/2022	13/10/2022	13/10/2022	13/10/2022	13/10/2022
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	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	14	21	9.6	10	18
Total mass of sample received	kg	0.001	NONE	0.4	0.4	0.4	0.4	0.4
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Amosite- Loose Fibrous Debris	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	-	Detected	-	Not-detected	-
Asbestos Analyst ID	N/A	N/A	N/A	N/A	SSZ	N/A	SSZ	N/A
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	-	-	8.6	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	0.041	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Speciated PAHs								
Naphthalene	mg/kg	0.05	NONE	0.53	< 0.05	-	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	NONE	0.39	0.3	-	0.17	< 0.05
Acenaphthene	mg/kg	0.05	NONE	2.8	0.43	-	< 0.05	< 0.05
Fluorene	mg/kg	0.05	NONE	2	0.25	-	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	NONE	20	3.8	-	2	0.45
Anthracene	mg/kg	0.05	NONE	4.7	1.3	-	0.74	< 0.05
Fluoranthene	mg/kg	0.05	NONE	32	8.1	-	5.7	0.7
Pyrene	mg/kg	0.05	NONE	28	7.4	-	5.3	0.7
Benzo(a)anthracene	mg/kg	0.05	NONE	18	4.6	-	2.5	0.52
Chrysene	mg/kg	0.05	NONE	15	3.8	-	2.4	0.43
Benzo(b)fluoranthene	mg/kg	0.05	NONE	17	3.5	-	2.3	0.55
Benzo(k)fluoranthene	mg/kg	0.05	NONE	11	2.8	-	2	0.3
Benzo(a)pyrene	mg/kg	0.05	NONE	20	3.1	-	2.1	0.51
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	8.8	1.6	-	1.1	0.31
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	2.9	0.49	-	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	NONE	9.5	1.8	-	1.3	0.36
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	193	43.3	-	27.6	4.83
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	40	64	-	29	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	-	< 0.2	-
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	-	< 1.8	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	110	140	-	65	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	250	420	-	160	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	1.9	-	< 0.3	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	41	33	-	32	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	250	1100	-	130	-

U/S = Unsuitable Sample I/S = Insufficient Sample
*Unsuitable for analysis due to high colour intensity.

Analytical Report Number: 22-90884
Project / Site name: Mirfield ATC

Lab Sample Number				2465981	2465982	2465983	2465984	2465985
Sample Reference				TP4	TP4	TP5	TP5	TP5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.80	2.50	0.50	2.00	3.00
Date Sampled				13/10/2022	13/10/2022	13/10/2022	13/10/2022	13/10/2022
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	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	20	18	14	17	17
Total mass of sample received	kg	0.001	NONE	0.4	0.4	0.4	0.4	0.4
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	-	-	-
Asbestos Analyst ID	N/A	N/A	N/A	SSZ	N/A	N/A	N/A	N/A
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	-	7.7	-	-	8
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	0.06	-	-	0.12
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	-
Speciated PAHs								
Naphthalene	mg/kg	0.05	NONE	< 0.05	-	1	-	-
Acenaphthylene	mg/kg	0.05	NONE	< 0.05	-	0.41	-	-
Acenaphthene	mg/kg	0.05	NONE	< 0.05	-	1.3	-	-
Fluorene	mg/kg	0.05	NONE	< 0.05	-	1.1	-	-
Phenanthrene	mg/kg	0.05	NONE	< 0.05	-	12	-	-
Anthracene	mg/kg	0.05	NONE	< 0.05	-	3.4	-	-
Fluoranthene	mg/kg	0.05	NONE	< 0.05	-	20	-	-
Pyrene	mg/kg	0.05	NONE	< 0.05	-	18	-	-
Benzo(a)anthracene	mg/kg	0.05	NONE	< 0.05	-	10	-	-
Chrysene	mg/kg	0.05	NONE	< 0.05	-	8.7	-	-
Benzo(b)fluoranthene	mg/kg	0.05	NONE	< 0.05	-	11	-	-
Benzo(k)fluoranthene	mg/kg	0.05	NONE	< 0.05	-	4.7	-	-
Benzo(a)pyrene	mg/kg	0.05	NONE	< 0.05	-	11	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	< 0.05	-	5	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	< 0.05	-	1.4	-	-
Benzo(ghi)perylene	mg/kg	0.05	NONE	< 0.05	-	5.5	-	-
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	< 0.80	-	114	-	-
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	6.8	-	37	8.4	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	< 0.2	-
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	-	< 1.8	< 1.8	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	21	-	71	24	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	25	-	740	26	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-	0.6	< 0.3	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	32	-	28	34	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	100	-	210	110	-

U/S = Unsuitable Sample I/S = Insufficient Sample
*Unsuitable for analysis due to high colour intensity.

Analytical Report Number : 22-90884
Project / Site name: Mirfield ATC

* 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 *
2465971	TP1	None Supplied	0.4	Brown gravelly clay.
2465972	TP1	None Supplied	0.8	Brown gravelly clay with stones.
2465973	TP1	None Supplied	1.2	Brown gravelly clay with stones.
2465974	TP2	None Supplied	0.2	Brown loam with vegetation and gravel
2465975	TP2	None Supplied	1	Brown clay and gravel.
2465976	TP2	None Supplied	2	Brown clay with gravel.
2465977	TP2	None Supplied	3	Brown clay and sand with gravel and vegetation.
2465978	TP3	None Supplied	0.2	Brown loam and sand with gravel and vegetation.
2465979	TP3	None Supplied	0.9	Brown loam and sand with gravel and vegetation.
2465980	TP4	None Supplied	0.3	Brown loam and clay with gravel.
2465981	TP4	None Supplied	1.8	Brown clay and sand.
2465982	TP4	None Supplied	2.5	Brown clay and sand.
2465983	TP5	None Supplied	0.5	Brown sandy loam with gravel.
2465984	TP5	None Supplied	2	Brown sandy clay.
2465985	TP5	None Supplied	3	Brown clay and sand.

Analytical Report Number : 22-90884
Project / Site name: Mirfield ATC

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
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
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
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 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	NONE
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
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
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

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

LABORATORY REPORT

4043

Contract Number: PSL22/6710

Report Date: 03 November 2022

Client's Reference: C541

Client Name: G&M Consulting Ltd
Howard House
Lowfields Road
Leeds
West Yorkshire
LS12 6BS

For the attention of: Graeme Swinbourne

Contract Title: Mirfield ATC

Date Received: 18/10/2022
Date Commenced: 18/10/2022
Date Completed: 3/11/2022

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 (Senior Technician)	S Eyre (Senior Technician)	T Watkins (Senior Technician)

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tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: awatkins@prosoils.co.uk
rberriman@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP4		D	1.60		Brown slightly sandy CLAY.
TP4		D	2.20		Brown slightly sandy CLAY.
TP4		D	3.20		Brown mottled grey slightly sandy CLAY.
TP5		D	1.80		Brown slightly sandy CLAY.
TP5		D	2.50		Brown slightly sandy CLAY.
TP5		D	3.00		Brown mottled grey sandy CLAY.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
TP4		D	1.60		28			55	25	30	100	High Plasticity CH
TP4		D	2.20		35							
TP4		D	3.20		31							
TP5		D	1.80		29			60	26	34	100	High Plasticity CH
TP5		D	2.50		32			59	26	33	100	High Plasticity CH
TP5		D	3.00		24							

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Mirfield ATC

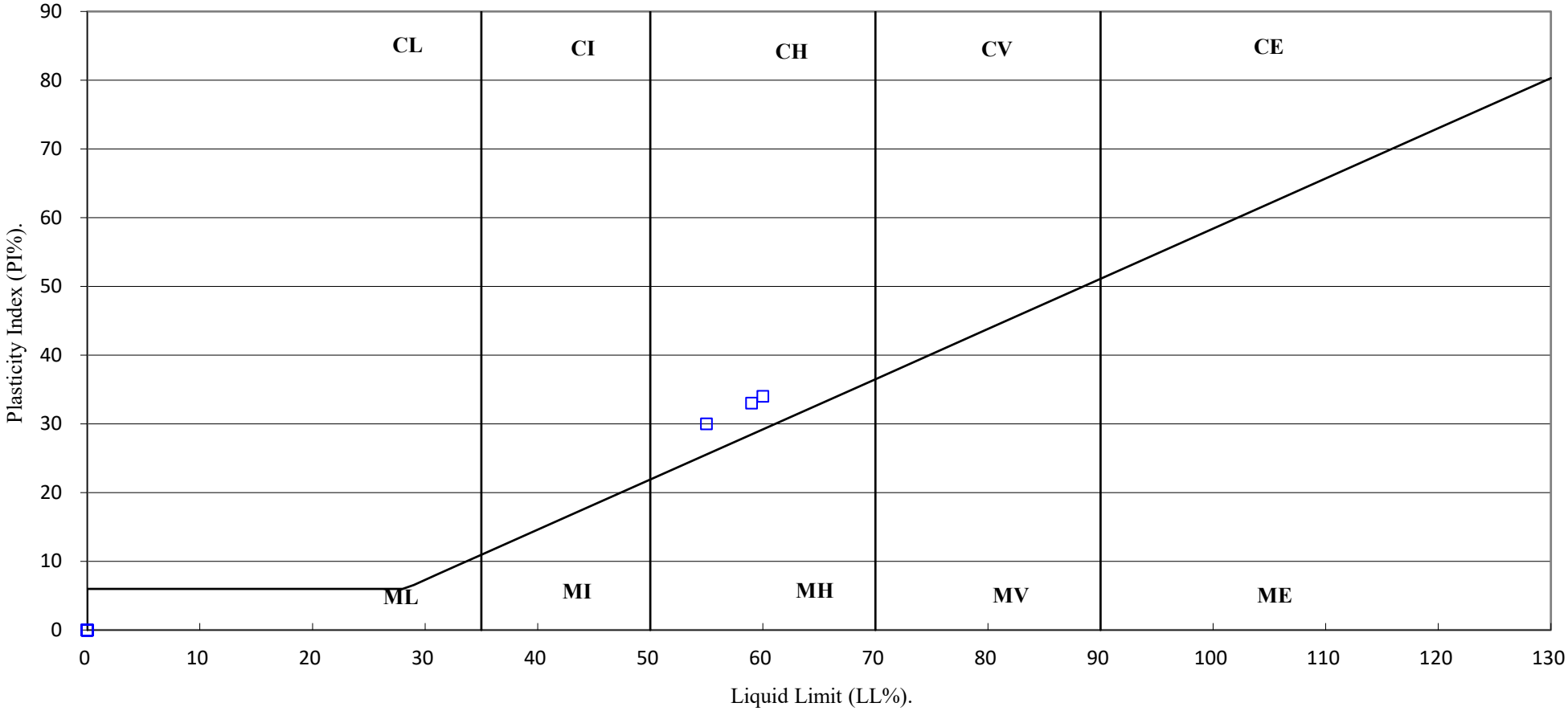
Contract No:

PSL22/6710

Client Ref:

C541

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	Mirfield ATC	Contract No: PSL22/6710 Client Ref: C541

LABORATORY REPORT

4043

Contract Number: PSL22/7075

Report Date: 04 November 2022

Client's Reference: C541

Client Name: G&M Consulting Ltd
Howard House
Lowfields Road
Leeds
West Yorkshire
LS12 6BS

For the attention of: Graeme Swinbourne

Contract Title: Mirfield ATC

Date Received: 2/11/2022
Date Commenced: 2/11/2022
Date Completed: 4/11/2022

Notes: Opinions and Interpretations are outside the UKAS Accreditation

Checked and Approved Signatories:

A Watkins (Director)	R Berriman (Quality Manager)	S Royle (Laboratory Manager)
L Knight (Assistant Laboratory Manager)	S Eyre (Senior Technician)	T Watkins (Senior Technician)

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Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BH1		D	5.00	5.45	Brown slightly gravelly very sandy CLAY.
BH1		D	7.00	7.45	Brown gravelly slightly clayey silty SAND.
BH1		D	9.00	10.00	Brown very sandy slightly silty GRAVEL with cobbles.
BH1		D	10.00	11.00	Brown slightly sandy slightly silty GRAVEL with cobbles.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
BH1		D	5.00	5.45	15			31	17	14	93	Low Plasticity CL
BH1		D	7.00	7.45	10				NP			

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Mirfield ATC

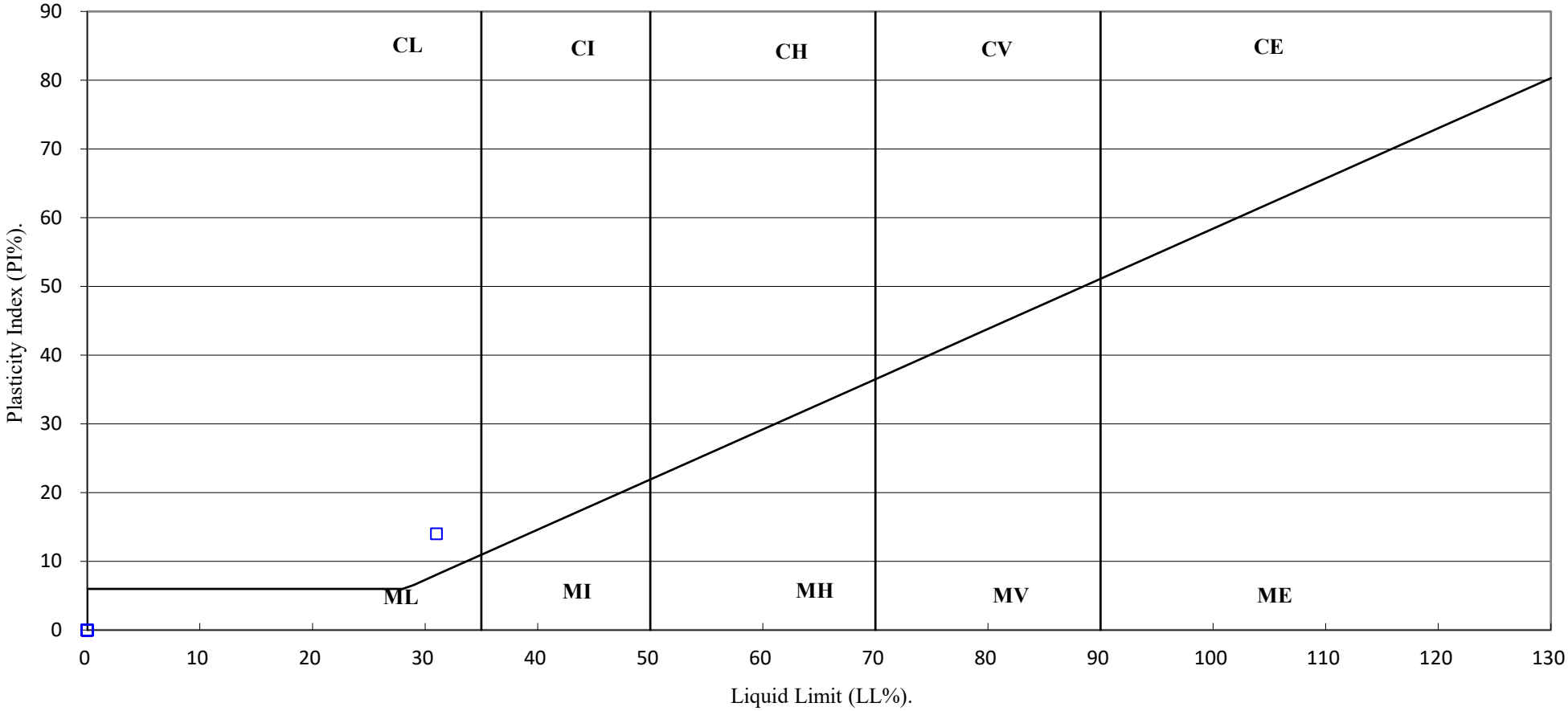
Contract No:

PSL22/7075

Client Ref:

C541

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	Mirfield ATC	Contract No: PSL22/7075 Client Ref: C541

PARTICLE SIZE DISTRIBUTION TEST

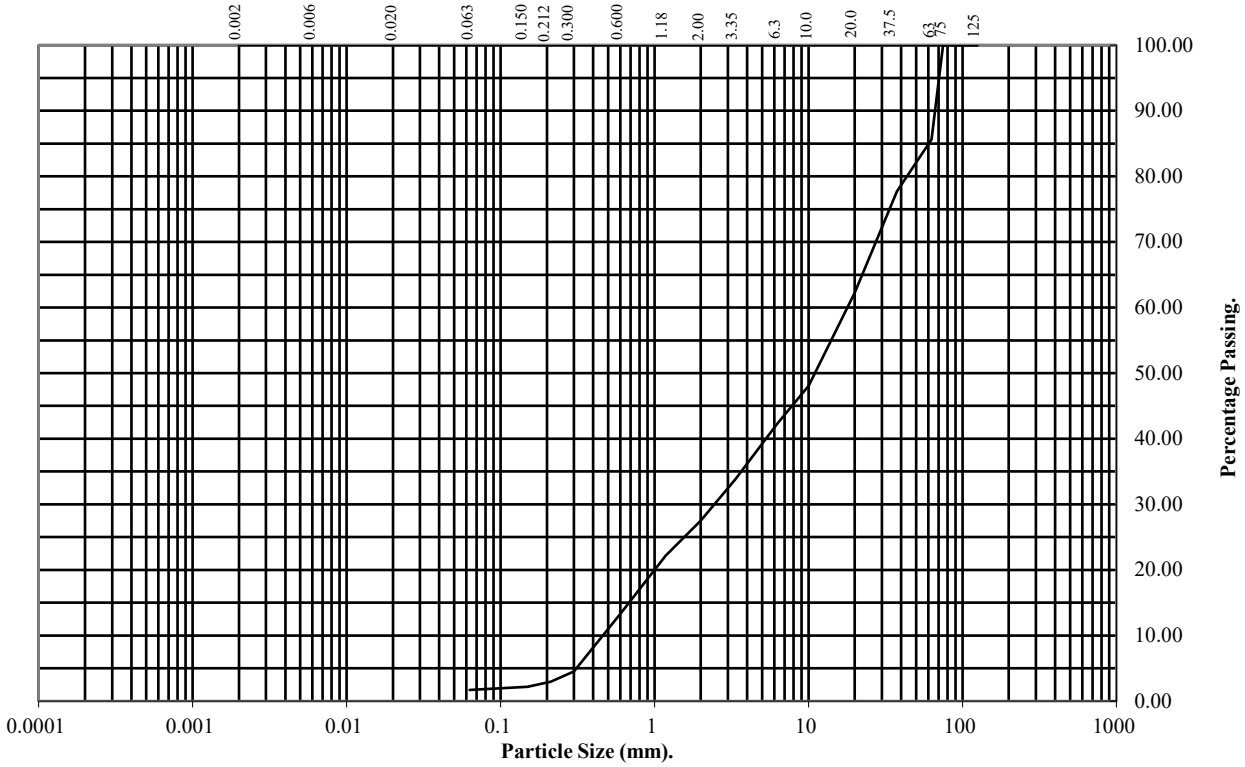
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **BH1** **Top Depth (m):** **9.00**

Sample Number: **Base Depth(m):** **10.00**

Sample Type: **D**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	86
37.5	78
20	62
10	48
6.3	42
3.35	34
2	27
1.18	22
0.6	13
0.3	5
0.212	3
0.15	2
0.063	2

Soil Fraction	Total Percentage
Cobbles	14
Gravel	59
Sand	25
Silt/Clay	2

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

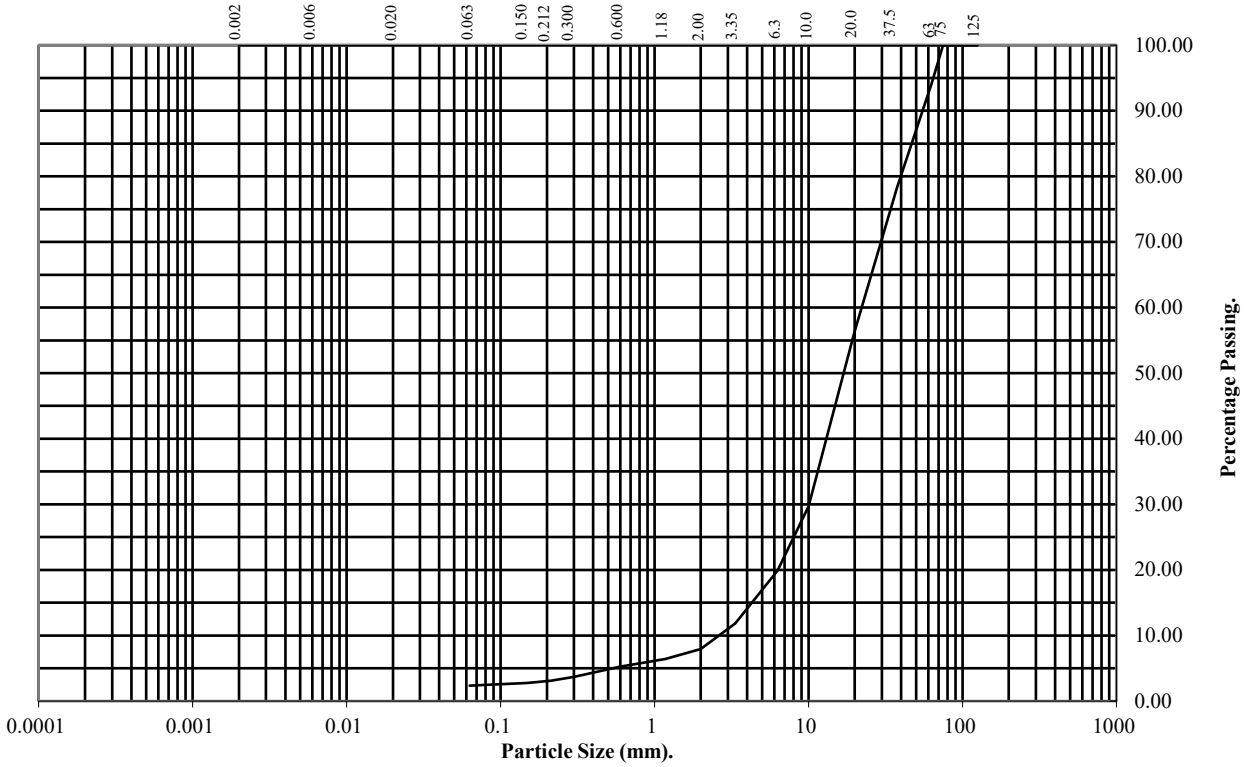
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **BH1** **Top Depth (m):** **10.00**

Sample Number: **Base Depth(m):** **11.00**

Sample Type: **D**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	94
37.5	78
20	56
10	30
6.3	20
3.35	12
2	8
1.18	6
0.6	5
0.3	4
0.212	3
0.15	3
0.063	2

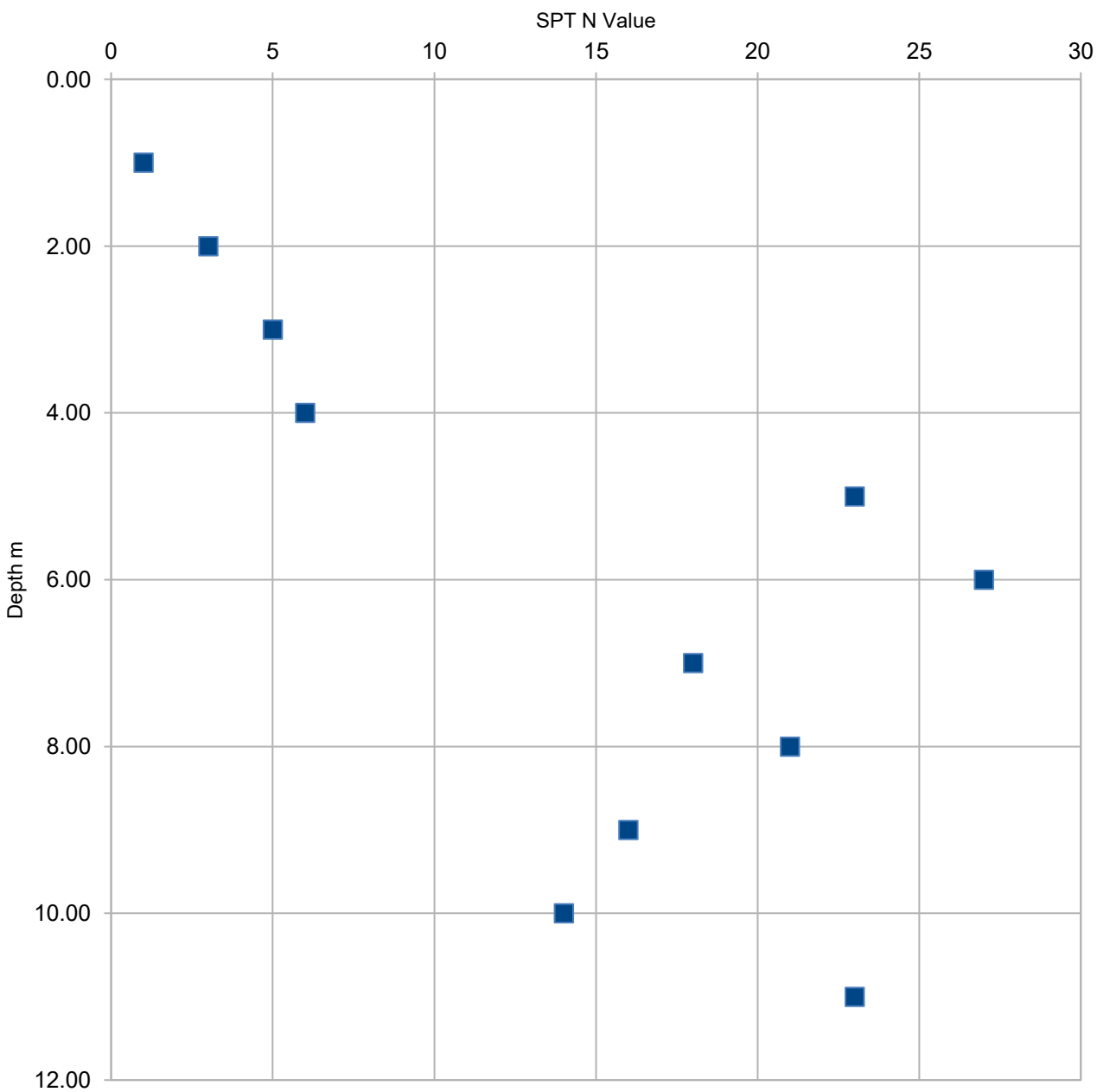
Soil Fraction	Total Percentage
Cobbles	6
Gravel	86
Sand	6
Silt/Clay	2

Remarks:

See Summary of Soil Descriptions

APPENDIX E

FIELD DATA SHEETS/PLOTS



Contract Number: C541			
Contract	Mirfield ATC	Plotted by ATS	Approved GS
		Drawing Name: SPT N Value Vs Depth	
Client	John Hill Associates		

G&M CONSULTING

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING UK LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	CP01
Test Date:	06/05/2022
Report Date:	06/05/2022
File Name:	CP01.spt
Test Operator:	CM

Instrumented Rod Data

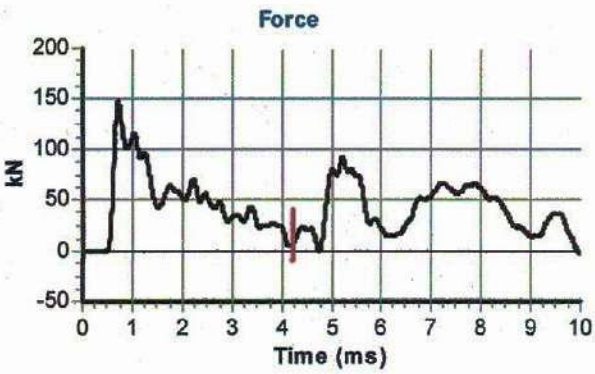
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.5
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	72572
Accelerometer No.2:	72757

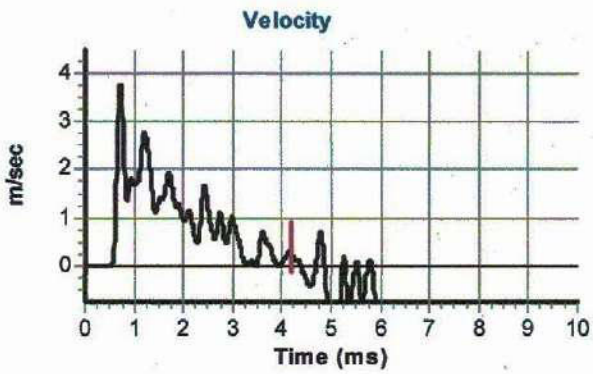
SPT Hammer Information

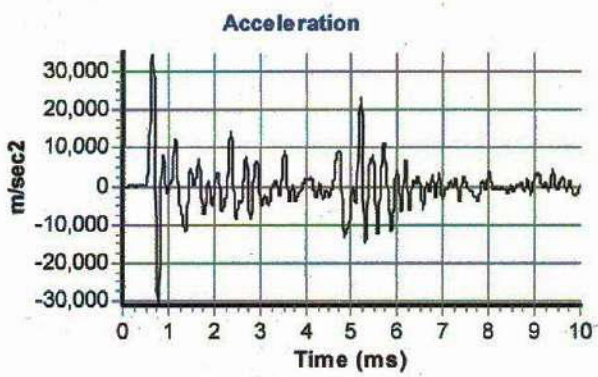
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

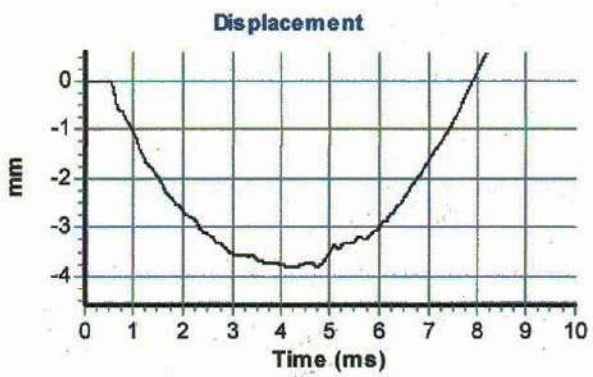
Comments / Location

RP DRILLING - 80220









Calculations

Area of Rod A (mm2):	970
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	305

Energy Ratio E_r (%): **65**

Signed: C.McCLUSKEY
Title: FITTER

APPENDIX F

GAS MONITORING
RESULTS SHEETS

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: John Hill Associates **Job No:** C541
Site: Mirfield **Visit No:** 1 **of** 6
Date: 03/11/2022 **Operator:** VF **Project Manager:** AS

Monitoring Point	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Water level (mbgl)	Depth of well (m)	Reduced level (mAOD)	Water level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Minimum	Steady			Peak	Steady								
BH1	0	0	0	0	0.0	0.0	4	1	1	0	17.7	17.9	0		0	0			DRY	4.0				
Max	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**1**	**1**	**0**	**17.7**	**17.9**	**0**	**0**	**0**	**0**	**0**	**0**						
Min	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**1**	**1**	**0**	**17.7**	**17.9**	**0**	**0**	**0**	**0**	**0**	**0**						
GSV (l/hr)	**0**																							

METEOROLOGICAL AND SITE INFORMATION: (Select correct box with X or enter data, as applicable)

State of ground:		Dry	X	Moist		Wet		Snow		Frozen	**Notes**	
Wind:		Calm	X	Light		Moderate		Strong			NR-	Not recorded
Cloud cover:		None		Slight	X	Cloudy		Overcast				
Preciptation:		None	X	Slight		Moderate		Heavy				
Barometric pressure (mbar):			1006	Before			1006	After				
Pressure trend:				Falling	X	Steady		Rising				
Air Temperature (Deg. C):				Before				After				

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GFM 430
Gas concentration: **CH_4** 0.2%@5%, 1.0@30%, 3.0@100% **CO_2** 0.1%@10%, 3.0%@30%,3.0%@100% **O_2**
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +100/-50 l/hour
Differential Pressure: (+/-) 1000 Pa
Date of last calibration: 30/09/2022
Date of next calibration: 29/09/2023

PID: MiniRAE 3000
Calbrated range:
Calibration gas:
Response time:
Accuracy:
Date of last calibration: On site calibration using 100ppm Isobutylene
Date of next calibration:

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: John Hill Associates **Job No:** C541
Site: Mirfield **Visit No:** 2 **of** 6
Date: 07/11/2022 **Operator:** VF **Project Manager:** AS

Monitoring Point	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Water level (mbgl)	Depth of well (m)	Reduced level (mAOD)	Water level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Minimum	Steady			Peak	Steady								
BH1	0	0	0	0	0.3	0.3	6	0	1	0	17.4	17.5	0		0	0			DRY	4.0				
Max	**0**	**0**	**0**	**0**	**0.3**	**0.3**	**6**	**0**	**1**	**0**	**17.4**	**17.5**	**0**	**0**	**0**	**0**	**0**	**0**						
Min	**0**	**0**	**0**	**0**	**0.3**	**0.3**	**6**	**0**	**1**	**0**	**17.4**	**17.5**	**0**	**0**	**0**	**0**	**0**	**0**						
GSV (l/hr)	**0**																							

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground:		Dry	X	Moist		Wet		Snow		Frozen	**Notes**	
Wind:		Calm	X	Light		Moderate		Strong			NR-	Not recorded
Cloud cover:		None	X	Slight		Cloudy		Overcast				
Preciptation:	X	None		Slight		Moderate		Heavy				
Barometric pressure (mbar):			991	Before			991	After				
Pressure trend:				Falling	X	Steady		Rising				
Air Temperature (Deg. C):				Before				After				

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GFM 430
Gas concentration: **CH_4** 0.2%@5%, 1.0@30%, 3.0@100% **CO_2** 0.1%@10%, 3.0%@30%,3.0%@100% **O_2**
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +100/-50 l/hour
Differential Pressure: (+/-) 1000 Pa
Date of last calibration: 30/09/2022
Date of next calibration: 29/09/2023

PID: MiniRAE 3000
Calbrated range:
Calibration gas:
Response time:
Accuracy:
Date of last calibration: On site calibration using 100ppm Isobutylene
Date of next calibration:

APPENDIX G

TRIAL PIT PHOTOS

Project Number: C541	**Project Name:** Mirfield ATC
Client: John Hill Associates	**Document Name:** Trial Pit Photographs: Photo 1 – TP01 (1.60m), Photo 2 – TP02 (3.20m)

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Project Number: C541	**Project Name:** Mirfield ATC
Client: John Hill Associates	**Document Name:** Trial Pit Photographs: Photo 3 – TP03 (1.80m), Photo 4 – TP04 (3.90m)

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Project Number: C541	**Project Name:** Mirfield ATC
Client: John Hill Associates	**Document Name:** Trial Pit Photographs: Photo 5 – TP05 (3.30m)

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APPENDIX H

DEFINITIONS AND CLASSIFICATIONS OF RISK ASSESSMENT TERMINOLOGY

Definitions and Classifications of Risk Assessment Terminology.

Probability

Probability can be defined as the chance of a particular event occurring in a given period of time.

Descriptions of each of the four qualitative terms to be use in this report to describe the perceived probability of any identified pollutant linkage becoming realised are shown below in Table W.

Term	Description
High Likelihood	There is pollutant linkage and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.
Likely	There is pollutant linkage and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.
Low Likelihood	There is pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place, and is less likely in the shorter term.
Unlikely	There is pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long-term.

Table W. Description of Probability Classifications

Severity

Severity (consequence) can be defined as the adverse effects (or harm) arising from a defined hazard, which impairs the quality of human health or the environment in the short or longer term.

Descriptions of each of the four qualitative terms to be use in this report to describe the perceived potential severity of any identified pollutant linkage becoming realised are shown below in Table X.

Term	Description
Severe	Highly elevated concentrations **likely** to result in "significant harm" to human health as defined by the EPA 1990, Part 2A, if exposure occurs. Equivalent to **EA Category 1** pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce. Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population. Catastrophic damage to crops, buildings or property.
Medium	Elevated concentrations which could result in "significant harm" to human health as defined by the EPA 1990, Part 2A if exposure occurs. Equivalent to **EA Category 2** pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce. Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Significant damage to crops, buildings or property.
Mild	Exposure to human health **unlikely** to lead to "significant harm". Equivalent to **EA Category 3** pollution incident including minimal or short-lived effect on water quality; marginal effect on amenity value, agriculture or commerce. Minor or short-lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population. Minor damage to crops, buildings or property.
Minor	No measurable effect on humans. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects of damage to buildings, structures and services.

Table X. Description of Severity Classifications

Once the severity and probability of a pollutant linkage has been determined the risk can be assessed using the risk matrix shown overleaf on Table Y.

Risk Matrix

By cross referencing the derived severity and probability in Table Y, below the perceived potential risk can be determined.

		Severity			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

Table Y. Risk Assessment Matrix

The risk categories detailed above are defined below in the following Table Z.

Term	Description
Very High Risk	There is a high probability that significant harm could arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
High Risk	Significant harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
Moderate Risk	It is possible that without appropriate remedial action, harm could arise to a designated receptor but it is relatively unlikely that any such harm would be severe and if any harm were to occur, it is likely that such harm would be relatively mild.
Low Risk	It is possible that significant harm could arise to a designated receptor from an identified hazard but it is likely that at worst this harm if realised would normally be mild.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

Table Z. Definition of Risk

APPENDIX D
REMEDIATION / VALIDATION CRITERIA

HUMAN HEALTH REMEDIATION TARGETS – LOW-RISE RESIDENTIAL END USE

DETERMINAND	UNITS	WITHIN 600 mm COVER SYSTEM (GARDEN)	HARD STANDING AND >600 mm OF COVER	PUBLIC OPEN SPACE 300 mm COVER	PUBLIC OPEN SPACE > 300 mm	PATH-WAY
Arsenic	mg/kg	37[(i)]	40[(ii)]	79[(iii)]	640[(iv)]	1
Cadmium	mg/kg	11[(i)]	85[(ii)]	120[(iii)]	532[(iv)]	1
Chromium (Hexavalent)	mg/kg	6[(i)]	6[(ii)]	7.7[(iii)]	220[(iv)]	1
Lead	mg/kg	210[(vi)]	330[(vii)]	760[(viii)]	760[(viii)]	1
Elemental Mercury	mg/kg	1.2[(i)]	1.2[(ii)]	16[(iii)]	30[(iv)]	2
Nickel	mg/kg	180[(i)]	180[(ii)]	230[(iii)]	3400[(iv)]	1
Selenium	mg/kg	250[(i)]	430[(ii)]	1100[(iii)]	1800[(iv)]	1
Copper	mg/kg	2400[(i)]	7100[(ii)]	12,000[(iii)]	44,000[(iv)]	1
Zinc	mg/kg	3700[(i)]	40,000[(ii)]	81,000[(iii)]	170,000[(iv)]	1
Phenol	mg/kg	280[(i)(xi)]	280[(xiv)(xi)]	760[(iii)(xi)]	760[(iv)(xi)]	2
Naphthalene	mg/kg	2.3[(i)(xi)]	2.3[(xiv)(xi)]	1200[(iv)(xi)]	1200[(iv)(xi)]	2
Acenaphthylene	mg/kg	170[(i)(xi)]	500[(v)]	15,000[(iii)(xi)]	29,000[(iv)(xi)]	3
Acenaphthene	mg/kg	210[(i)(xi)]	500[(v)]	15,000[(iii)(xi)]	29,000[(iv)(xi)]	1
Fluorene	mg/kg	170[(i)(xi)]	500[(v)]	9900[(iii)(xi)]	20,000[(iv)(xi)]	1
Phenanthrene	mg/kg	95[(i)(xi)]	500[(v)]	3100[(iii)(xi)]	6200[(iv)(xi)]	3
Anthracene	mg/kg	500[(i)(xi)]	500[(v)]	74,000[(iii)(xi)]	150,000[(iv)(xi)]	3
Fluoranthene	mg/kg	280[(i)(xi)]	500[(v)]	3100[(iii)(xi)]	6300[(iv)(xi)]	3
Pyrene	mg/kg	500[(i)(xi)]	500[(v)]	7400[(iii)(xi)]	15,000[(iv)(xi)]	3
Benzo(a)Anthracene	mg/kg	7.2[(i)(xi)]	11[(ii)(xi)]	29[(iii)(xi)]	49[(iv)(xi)]	3
Chrysene	mg/kg	15[(i)(xi)]	30[(ii)(xi)]	57[(iii)(xi)]	93[(iv)(xi)]	3
Benzo(b)Fluoranthene	mg/kg	2.6[(i)(xi)]	3.9[(ii)(xi)]	7.1[(iii)(xi)]	13[(iv)(xi)]	3
Benzo(k)Fluoranthene	mg/kg	77[(i)(xi)]	110[(ii)(xi)]	190[(iii)(xi)]	370[(iv)(xi)]	3
Benzo(a)Pyrene	mg/kg	2.2[(i)(xi)]	3.2[(ii)(xi)]	5.7[(iii)(xi)]	11[(iv)(xi)]	3
Indeno(123-cd)Pyrene	mg/kg	27[(i)(xi)]	45[(ii)(xi)]	82[(iii)(xi)]	150[(iv)(xi)]	3
Dibenzo(a,h)Anthracene	mg/kg	0.24[(i)(xi)]	0.31[(ii)(xi)]	0.57[(iii)(xi)]	1.1[(iv)(xi)]	3
Benzo(ghi)Perylene	mg/kg	320[(i)(xi)]	360[(ii)(xi)]	640[(iii)(xi)]	1400[(iv)(xi)]	3
TPH C_5-C_6 (aliphatic)	mg/kg	42[(i)(xi)]	42[(ii)(xi)]	42[(ii)(xi)]	10,000[(xiv)(xi)]	2
TPH C_6-C_8 (aliphatic)	mg/kg	100[(i)(xi)]	100[(ii)(xi)]	100[(ii)(xi)]	10,000[(xiv)(xi)]	2
TPH C_8-C_{10} (aliphatic)	mg/kg	27[(i)(xi)]	27[(ii)(xi)]	27[(ii)(xi)]	10,000[(xiv)(xi)]	2
TPH C_{10}-C_{12} (aliphatic)	mg/kg	130[(i)(xi)]	130[(ii)(xi)]	130[(ii)(xi)]	10,000[(xiv)(xi)]	2
TPH C_{12}-C_{16} (aliphatic)	mg/kg	1000[(xiv)(xi)]	1000[(xiv)(xi)]	1000[(xiv)(xi)]	10,000[(xiv)(xi)]	1
TPH C_{16}-C_{21} (aliphatic)	mg/kg	1000[(xiv)(xi)]	1000[(xiv)(xi)]	1000[(xiv)(xi)]	10,000[(xiv)(xi)]	1
TPH C_{21}-C_{35} (aliphatic)	mg/kg					1
TPH C_5-C_7 (aromatic)	mg/kg	70[(i)(xi)]	370[(ii)(xi)]	370[(ii)(xi)]	10,000[(xiv)(xi)]	2
TPH C_7-C_8 (aromatic)	mg/kg	130[(i)(xi)]	860[(ii)(xi)]	860[(ii)(xi)]	10,000[(xiv)(xi)]	2
TPH C_8-C_{10} (aromatic)	mg/kg	34[(i)(xi)]	47[(ii)(xi)]	47[(ii)(xi)]	10,000[(xiv)(xi)]	2
TPH C_{10}-C_{12} (aromatic)	mg/kg	74[(i)(xi)]	250[(ii)(xi)]	250[(ii)(xi)]	10,000[(xiv)(xi)]	2
TPH C_{12}-C_{16} (aromatic)	mg/kg	140[(i)(xi)]	1800[(ii)(xi)]	1800[(ii)(xi)]	10,000[(xiv)(xi)]	1

DETERMINAND	UNITS	WITHIN 600 mm COVER SYSTEM (GARDEN)	HARD STANDING AND >600 mm OF COVER	PUBLIC OPEN SPACE 300 mm COVER	PUBLIC OPEN SPACE > 300 mm	PATH-WAY
TPH C_{16}-C_{21} (aromatic)	mg/kg	260[(i)(xi)]	1900[(ii)(xi)]	1900[(ii)(xi)]	10,000[(xiv)(xi)]	1
TPH C_{21}-C_{35} (aromatic)	mg/kg	1000[(xiv)(xi)]	1900[(ii)(xi)]	1900[(ii)(xi)]	10,000[(xiv)(xi)]	1
Asbestos	Fibres Volume Weight (%)	NFD	0.001%	NFD	0.001	4

Notes 1

NFD = No Fibres Detected

Asbestos will be screened visually on site by a qualified environmental consultant and where potential ACM is identified, representative samples will be subject to quantitative analysis of % volume by weight.

Should any ACM be identified within the soil matrices, further detailed % assessment would be required when the reported laboratory result exceeds the limit of detection for the analytical method at 0.01% by volume (weight).

Notes 2
Excludes matrices where free product is observed.

No viable exposure pathway beneath hardstanding and cover system.

Notes 3
Main exposure pathways: 1 = soil ingestion, 2 = vapour inhalation (indoor), 3 = dermal contact and ingestion, 4 = dust inhalation.

Abbreviations: GAC = general assessment criteria, n = number of samples, MC = maximum concentration, N/A = Not Applicable (no exceedance of assessment criteria), Loc of MC = location of exceedances.

i. Value derived from LQM Suitable 4 Use Levels (S4ULs) for residential end use with plant uptake.
ii. Value derived from LQM Suitable 4 Use Levels (S4ULs) for residential end use without plant uptake – these levels used below 600 mm cover system within residential gardens as soils will be present within a residential setting, yet soils will not be disturbed and garden plants will not reach these soils.
iii. Value derived from LQM Suitable 4 Use Levels (S4ULs) for public open space (POS) residential.
iv. Value derived from LQM Suitable 4 Use Levels (S4ULs) for public open space (POS) park – these levels used below 300 mm POS cover system as soils will not be disturbed by any future site users and exposure to these soils will be similar to a park end use.
v. Value derived from LQM Suitable 4 Use Levels (S4ULs) alongside assessment with WM3 to ensure that materials remaining on site do not exceed the WM3 toxicity criteria for hazardous waste.
vi. Value derived from Category 4 Screening Levels (C4SL) for residential land use with homegrown produce.
vii. Value derived from Category 4 Screening Levels (C4SL) for residential land use without homegrown produce.
viii. Value derived from Category 4 Screening Levels (C4SL) for public open space (POS) residential.
ix. Value derived from Category 4 Screening Levels (C4SL) for public open space (POS) park.
x. Mercury – based on elemental mercury.
xi. PAH and TPH levels used are for 1% SOM.
xii. Xylenes based on p-xylene (o-xylene 2600 mg/kg, m-xylene 3500 mg/kg) and is capped by its solubility.
xiii. Value derived from LQM Suitable 4 Use Levels (S4ULs) for residential end use with plant uptake due to the volatilisation risk.
xiv. BTEX is not SOM-related due to inhalation pathway.

REMEDIATION TARGETS – COMPARISON OF GROUNDWATER / LEACHATE ANALYSIS WITH TIER 1 SCREENING LEVELS

DETERMINAND	UNIT	EQS SCREENING VALUE[1, 2, 3]		DWS [3,4,5]
		AA	MAC	
Arsenic	µg/l	50	–	10
Cadmium	µg/l	0.08-0.25	0.45-1.5	5
Chromium (VI)	µg/l	3.4	–	–
Chromium (III)	µg/l	4.7	–	50
Copper	µg/l	1	–	2000
Total Cyanide	µg/l	1	–	50
Lead	µg/l	1.2	14	10
Mercury	µg/l	–	0.07	1.0
Nickel	µg/l	4	34	20
Selenium	µg/l	–	–	10
Zinc	µg/l	10.9	–	–
pH	6–9			
Naphthalene	µg/l	2	130	10*
Anthracene	µg/l	0.1	0.1	
Benzo[b]fluoranthene	µg/l	0.00017*	0.017	
Benzo[k]fluoranthene	µg/l	0.00017*	0.017	
Benzo(a)pyrene	µg/l	0.00017*	0.27	
Indeno(123-cd)pyrene	µg/l	0.00017*	5*	
Benzo(ghi)pyrene	µg/l	0.00017*	5*	
Fluoranthene	µg/l	0.0063	0.12	
Benzo(ghi)perylene	µg/l	1.7–4	8.2–3	
TPH C5-C6 (benzene)	µg/l	10	50	1
TPH C6-C8 (toluene)	µg/l	74	–	700
TPH C8-C10 (ethyl benzene)	µg/l	20	–	300
TPH C10-C12 (xylene)	µg/l	30	–	500
TPH C12-C16	µg/l	2	130	90[5]
TPH C16-C35	µg/l	50#	50#	90[5]
TPH C5-C6	µg/l	–	–	15000
TPH C6-C8	µg/l	–	–	15000
TPH C8-C10	µg/l	–	–	300
TPH C10-C12	µg/l	–	–	300
TPH C12-C16	µg/l	–	–	300

DETERMINAND	UNIT	EQS SCREENING VALUE[1, 2, 3]		DWS [3,4,5]
		AA	MAC	
TPH C16 – C21	µg/l	–	–	300**
TPH C21-C35	µg/l	–	–	300**
Tetrachloroethylene	µg/l	0.4	–	10
Trichloroethylene	µg/l	10	–	10
Trichlorobenzene	µg/l	0.4	–	–
Trichloromethane	µg/l	2.5	–	–
Dichloromethane	µg/l	20	–	200
Carbon Tetrachloride	µg/l	12	–	3
Vinyl Chloride	µg/l	–	–	0.3

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)