

**Phase 1 Geoenvironmental Risk Assessment and
Phase 2 Ground Investigation**

**COTE LANE
THURGOLAND, BARNSELY**

for

Alfa Homes Ltd

Report Number 3819

May 2018

Michael D Joyce Associates LLP
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Charnock Court 6 South Parade Wakefield West Yorkshire WF1 1LR UK
T +44(0)1924 360458 E mdja@geoenvironmental.co.uk W www.geoenvironmental.co.uk

Phase 1 Geoenvironmental Risk Assessment and Phase 2 Ground Investigation

COTE LANE, THURGOLAND, BARNSLEY

Contents

1.	Introduction
2.	The Site
3.	Site History
4.	Geology and Mining
5.	Hydrogeology and Flooding
6.	GroundSure Enviro-Insight and Geo-Insight Reports
7.	Contaminated Land
8.	Radon
9.	The Investigation
10.	Strata Profile
11.	In-Situ and Laboratory Testing
12.	Geoenvironmental Risk Assessment
13.	Recommendations
	Procedure Notes

Figures

Figure 1	General Site Location
Figure 2	Site Plan, Exploratory Borehole and Trial Pit Positions
Figure 3	Development Proposals
Figure 4	Conceptual Site Model

Appendices

Appendix 1	Trial Pit Records
Appendix 2	Geotechnical Laboratory Test Results
Appendix 3	Contamination Laboratory Test Results
Appendix 4	GroundSure Enviro-Insight and Geo-Insight Reports
Appendix 5	Historical Mapping
Appendix 6	Coal Authority Mining Report
	Standard Appendices A and B

1 INTRODUCTION

- 1.1 On behalf of Alfa Homes Limited, a Phase I Geoenvironmental and Geotechnical Assessment (Desk Study) and a Phase II Intrusive Investigation have been carried out at Cote Lane in Thurgoland. It is proposed to develop the site with residential accommodation.
- 1.2 The purpose of the desk study was to review and assess published information on the site including geological, mining and hydrogeological data. It was also to review the past history of the site and its environmental setting.
- 1.3 The intrusive investigation has comprised window sampling with associated in-situ and laboratory testing. Recommendations are made for the safe and economic development of the site.
- 1.4 The study has not included checks on services on or adjacent to the site, and no structural or asbestos surveys have been carried out.

2 THE SITE

- 2.1 The site covers an area of approximately 1 hectare and is located on Cote Lane in Thurgoland, approximately 6km southwest of the centre of Barnsley, and 13km northeast of Sheffield. The Ordnance Survey National Grid Reference is 429200, 400600 and it lies at approximately 190m AOD on Cote Lane. Figure 1 shows the general site location, whilst figure 2 shows the site in more detail.
- 2.2 The site is a roughly rectangular shaped plot of open grassland. All four site boundaries are marked by mature trees and hedges, with wooden fences and hedges running along the South Western site boundary. Topographically, the site slopes down the North towards the South and slightly up from the West towards the East and then down towards the East from the centre of the site.

3 SITE HISTORY

- 3.1 The following archival Ordnance Survey maps have been examined to trace the past development of the site. These are reproduced in Appendix 5 with the current site boundary superimposed on them. The apparent displacement on the older maps is due to a change in Ordnance Survey co-ordinates.

Scale and Year of Publication			
6" to 1 mile	1855	1:2500	1893
	1891		1905
	1903		1931
	1932		1959
	1951		1980
	1965		1988
1:10,000	1987	1:1250	
	2002		
	2010		
	2014		

- 3.2 The earliest map to show the site in detail dates from 1893. It shows the site to be undeveloped agricultural land between Cote Lane in the west and Spring Wood to the east. A spring is shown to the southwest corner of the site, with Spring House just to the south.
- 3.3 The map of 1951 shows an Electricity Transmission line crossing the site in a roughly northwest to southeast direction. There are a few detached properties shown to the northwest, although the site itself is shown to have remained undeveloped.

- 3.4 Due to time and cost constraints, it has not been possible to consult with local history journals and newspapers. This can be carried out if requested, but is unlikely to provide any significant additional information.
- 3.5 It is not believed that the study site is of archaeological interest but it would be prudent to make enquiries with South Yorkshire Archaeology Service.

4 GEOLOGY AND MINING

4.1 Geology

- 4.1.1 Maps of the British Geological Survey (BGS), in particular 1:10,560 scale and 1:50,000 scale sheet 87 show the site to be underlain in partly by the Penistone Flags Sandstone, and partly by undifferentiated mudstones, siltstones and shales of the Carboniferous Pennine Lower Coal Measures.

4.2 Mining

- 4.2.1 A mining report has been obtained from the Coal Authority, and is reproduced in full in Appendix 6. It states that there has *been* no recorded mining beneath the site.
- 4.2.2 The report makes no mention of shallow workings being present or that shallow unrecorded workings might be present. The Coal Authority holds no record of any notice or subsidence claim having been made.
- 4.2.3 No shaft or adits are reported on, or within 20m of the site boundary. Although old unrecorded mine entries might be present on the site, these are considered unlikely. No past, present or future opencasts are reported within the vicinity of the site.

4.3 GroundSure Geo-Insight

- 4.3.1 A GroundSure Geo-Insight Report has been obtained for the site and is reproduced in Appendix 4. The report is based on the British Geological Survey (BGS) geological maps, GroundSure data and miscellaneous other geological sources.

4.3.2 None of the following are recorded beneath the site.

Geology
Artificial Ground / Made Ground present beneath the site Records relating to permeability of artificial ground within the site Superficial Ground / Drift Geology present beneath the site Records relating to permeability of superficial geology within the site boundary Records of Landslip within 500m of site boundary Records relating to permeability of Landslips within the site boundary Bedrock and Solid Geology beneath the site

Ground Workings
Historical Surface Ground Working Features from Small Scale Mapping Historical Underground Working Features from Small Scale Mapping Current Ground Workings

Mining, Extraction and Natural Cavities
Historical Mining Johnson Poole and Bloomer Mining Area Non-Coal Mining Cavities Natural Cavities Brine Extraction Gypsum Extraction Tin Mining Clay Mining

Railways and Tunnels
Tunnels Historical Railway and Tunnel Features Historical Railways Active Railways Railway Projects

In respect of natural ground subsidence, the BGS reports the following risk ratings.

Hazard	Risk
Shrink-Swell Clay	Very Low
Landslide	Low
Ground Dissolution of Soluble Rocks	Negligible
Compressible Deposits	Negligible
Collapsible Deposits	Very Low
Running Sand	Negligible

4.3.3 A number of boreholes have been sunk in the vicinity of the site and their records could probably be obtained if necessary. However soil variability in the area would render them of limited use. In terms of determining the actual ground conditions on the site there would be no substitute for the intrusive ground investigation.

5 HYDROGEOLOGY AND FLOODING

Hydrogeology

- 5.1 The Coal Measures occur throughout the heavily industrialised areas of West and South Yorkshire. They comprise a thick sequence of faulted rocks characterised by the repeated sequence of mudstone, siltstone, sandstone, seatearth and coal.
- 5.2 The Coal Measures, though classed as a minor aquifer, may provide good borehole yields from sandstones and many industrial supplies rely on them. However, groundwater flow is extensively affected by the faulting and fissuring of the rocks, and also by the results of coal mining and associated dewatering activities. Due to the complex, and often poorly understood hydrogeology, it is impossible to subdivide the Coal Measures into aquifers and non-aquifers except on a very detailed level and the whole sequence must therefore be considered in general terms as an aquifer.
- 5.3 Since April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive.
- 5.4 The aquifer within the bedrock deposits is designated as Secondary A. This is described as 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.
- 5.5 Details provided by the Environment Agency in the GroundSure Enviro-Insight report, indicate there to be no licensed surface water or groundwater abstraction points within at least 1.2km of the site.

Flooding

- 5.6 The nearest watercourse which lies 14m to the east of the site, and a second which lies 35m to the west. However according to data supplied by the Environment Agency in the GroundSure Enviro-Insight report the site is not at risk from flooding.
- 5.7 The Environment Agency Risk of Flooding from Rivers and the Sea (RoFRaS) database provides an indication of river and coastal flood risk at a national level on a 50m grid as used by many of the insurance companies. RoFRaS data is based on a 50m grid system, with the flood rating at the centre of the grid calculated and given below. The data considers the probability that the flood defences will overtop or breach, and the distance from the river or the sea.
- 5.8 RoFRaS data for the study site indicates the property or an area within 25m *has a Very Low (less than 1 in 1000) chance of flooding in any given year.*

6 GROUNDSURE ENVIRO-INSIGHT REPORT

- 6.1 A GroundSure Enviro-Insight Report has also been commissioned for this site. None of the following features are recorded within 250m of the site. Full details are given in Appendix 4.

Environmental Permits, Incidents and Registers
Historic IPC Authorisations Part A(1) and IPPC Authorised Activities Red List Discharge Consents List 1 Dangerous Substances Inventory sites List 2 Dangerous Substances Inventory sites Part A(2) and Part B Activities and Enforcements Category 3 or 4 Radioactive Substances Authorisations Licensed Discharge Consents Water Industry Referrals Planning Hazardous Substance Consents and Enforcements (within 500m) COMAH and NIHHS sites Environment Agency Recorded Pollution Incidents Sites Determined as Contaminated Land under Part 2A EPA 1990

Landfill and Other Waste Sites
Environment Agency Registered Landfill Sites Environment Agency Historic Landfill Sites BGS/DoE Landfill Site Survey Landfills in Local Authority and Historical Mapping Records Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites Environment Agency Licensed Waste Sites

Current Land Uses
Current Industrial Sites Data Records of Petrol and Fuel Sites National Grid Underground Electricity Cables National Grid Gas Transmission Pipelines

Hydrogeology and Hydrology
Groundwater Abstraction Licences Surface Water Abstraction Licences Potable Water Abstraction Licences Source Protection Zones Source Protection Zones within Confined Aquifer Environment Agency information on river quality Groundwater Vulnerability and Soil Leaching Potential Environment Agency information on River quality River Network entries Surface Water Features

Flooding
Environment Agency Zone 2 floodplains Environment Agency Zone 3 floodplains Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Defences Areas benefiting from Flood Defences Areas used for Flood Storage BGS Groundwater Flooding susceptibility (within 50m) BGS confidence rating for the Groundwater Flooding susceptibility areas

Designated Environmentally Sensitive Sites
Sites of Special Scientific Interest (SSSI) National Nature Reserves (NNR) Special Areas of Conservation (SAC) Special Protection Areas (SPA) Ramsar Sites Ancient Woodlands Local Nature Reserves (LNR) World Heritage Sites Environmentally Sensitive Areas Outstanding Natural Beauty (AONB) National Parks Nitrate Sensitive Areas Nitrate Vulnerable Zones

- 6.2 The GroundSure Enviro-Insight Report is based upon known, published information and may not comprise a complete record of all features of relevance. An explanation of the datasets used is available on request.

7 CONTAMINATED LAND

- 7.1 There is no visibly contaminated material on the surface of the site, nor is there any distressed vegetation suggestive of significant or serious contamination.

8 RADON

- 8.1 According to the GroundSure Geo-Insight report the site lies in an area where less than 1% of homes are above the action level recommended by the Health Protection Agency. Radon protective measures are therefore not necessary according to the BGS data provided in the GroundSure report and as described in Building Research Publication BR 211.

9 THE INVESTIGATION

- 9.1 The investigation was designed to provide preliminary information on ground and groundwater conditions on the site, together with identifying potential areas of contamination. The investigation was undertaken in accordance with the principles of BS EN 1997-1: 2004 "Eurocode 7 - Geotechnical Design - Part 1: General Rules", BS EN 1997-2: 2007 "Eurocode 7 - Geotechnical Design - Part 2: Ground Investigation and Testing", BS5930: 1999 and BS10175: 2001 and under the full-time supervision of a Fellow of the Geological Society from Michael D Joyce Associates LLP.
- 9.2 The ground investigation was carried out on 20th July 2017 and comprised trial pitting, and the positions are shown on figure 2.
- 9.3 The trial pitting consisted of excavating a number of trial holes using a mechanical mini-digger provided by the client. On completion, the excavations were backfilled with the arisings.

10 STRATA PROFILE

- 10.1 The full exploratory trial pit records are presented in Appendix 1. These give full strata descriptions based on visual examination and are in accordance with the requirements of BS EN ISO 14688-1:2002 “Geotechnical Investigation and Testing – Identification and Classification of Soil – Part 1” BS EN ISO 14688-2:2004 “Geotechnical Investigation and Testing – Identification and Classification of Soil – Part 2”, and BS EN ISO 14689-1:2003 “Geotechnical Investigation and Testing – Identification and Classification of Rock – Part 1”.
- 10.2 The trial pitting encountered between 100mm and 300mm of brown topsoil. This was underlain in most places by a firm light brown and grey silty clay. With depth, this graded into a highly weathered mudstone.
- 10.3 At between 0.9m and 1.8m depth, a brown moderately weathered clay and shaly mudstone was encountered. Due to the limited reach of the mini-digger, the trial pits terminated at around 1.8m to 2.0m depth.
- 10.4 There was also a 200mm thick band of intact coal at 1.1m depth in trial pit TP2, and at 0.8m depth in trial pit TP5.
- 10.5 Trial pit TP6 also encountered a band of sandstone below a thin covering of topsoil. This extended to 0.8m and overlay the mudstone encountered elsewhere on the site.
- 10.6 All the trial pit sides were stable and all were dry on completion.

- 10.7 There was no unusual colouration or odours to any of the soils encountered during the investigation and no obvious visual evidence of contamination, such as asbestos, was found during the investigation. This does not mean that asbestos containing materials or asbestos fibres are not present.
- 10.8 It should be noted that lateral and vertical changes can occur between exploratory points and care is needed when extrapolation is used.

11 IN-SITU AND LABORATORY TESTING

11.1 In-Situ Gas Monitoring

11.1.1 Methane is the dominant constituent of landfill gas, and can form an explosive mixture in air at concentrations of between 5% and 15%. Thus 5% methane in air is known as the Lower Explosive Limit (LEL). Concentrations less than this do not normally ignite. Carbon dioxide can also be a potential problem, especially where it occurs in concentrations greater than 1.5%.

11.1.2 In-situ gas tests were carried out in probe holes made in the sides of the trial pits. Testing was with a portable meter, which measures the methane content as its percentage volume in air. The corresponding oxygen and carbon dioxide concentrations are also measured.

11.1.3 No methane, carbon monoxide or hydrogen sulphide gases were detected in any of the boreholes. Carbon dioxide ranged from zero% to 0.3% by volume.

11.2 Geotechnical Laboratory Testing

The soil testing was carried out to BS1377:1990 Methods of Test for Soils for Civil Engineering Purposes. Testing was carried out by Envirolab of Cheshire and Geo-Site and Testing Services Limited (GSTL) of Llanelli to UKAS accredited procedures. The full results are presented in Appendix 2.

11.2.1 Plasticity Test

Atterberg Limits Classification tests was carried out on four natural samples of the clay derived from the weathered mudstone bedrock.

Trial Pit No.	Depth (m)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
TP1	1.00	21	37	24	13
TP3	0.40	14	36	17	19
TP4	0.90	26	58	27	31
TP6	1.00	13	30	16	14

The clays are of low to high plasticity. They can be expected to exhibit low to medium swelling and shrinkage properties, and are also potentially frost susceptible.

11.2.2 Sulphate and Acidity Tests

Chemical tests were carried out on representative samples of the sub-soils in order to determine their water soluble content and acidity.

Trial Pit No.	Depth (m)	Water Soluble Sulphate Content (g/l)	pH
Natural Clay			
TP1	1.00	0.02	6.9
TP3	0.40	0.01	7.4
TP4	0.90	0.02	6.9
TP6	1.00	0.01	7.5
Topsoil			
TP1	0.10	0.01	7.5
TP2	0.10	<0.01	7.1
TP4	0.15	0.01	6.7
TP5	0.10	<0.01	6.7
TP6	0.05	0.04	6.7
TP7	0.05	<0.01	6.9
TP8	0.10	<0.01	6.8

Geotechnical and contamination testing recorded negligible water soluble sulphate contents and near neutral pH values.

11.3 Contamination Testing

Rationale

- 11.3.1 The investigation and sampling was under the full time direction of a Fellow of the Geological Society. All the recovered soil samples were screened on site for any visual or olfactory evidence of contamination including the presence of VOCs. Samples were selected from the trial pits on the basis of those which were most likely to be contaminated and those which gave the most appropriate indication of the spread of any contaminants. The samples were stored in both glass and plastic containers and

kept in cooled conditions. Testing was carried out by Envirolab of Cheshire to UKAS accredited procedures in accordance with MCERTS performance standards.

- 11.3.2 The aim of this was to make a preliminary assessment of the level of any contamination on the site in order to determine if there was any significant risk associated with contaminants in respect of both human health and the environment, including controlled waters.
- 11.3.3 Standard Appendix B attached to this report discusses the methodology for the assessment of contamination and should be read in conjunction with the comments overleaf.
- 11.3.4 The Contaminated Land Report (CLR) series of documents have been produced by the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency, to provide regulators with "relevant, appropriate, authoritative and scientifically based information and advice on the assessment of risk from contamination in soils".
- 11.3.5 The Environment Agency has issued a number of Soil Guideline Values (SGVs) which, whilst non-binding, may be used as guidance in the assessment of land and in setting remediation targets. They should only be applied to human health assessments.
- 11.3.6 The SGVs have been derived using the Contaminated Land Exposure Assessment Model (CLEA) and are based on assumptions relating to soil conditions, pollutant type and behaviour, land use patterns and the availability of receptors. SGVs are also subject to statistical assessment. The CLR documentation requires that the results of

laboratory testing are subject to statistical analysis to remove uncertainty over a so-called 'averaging area'.

11.3.7 To date selective SGVs have been issued for the following land-uses as follows;

- Residential with and without plant uptake (SGVres)
- Allotments
- Commercial/Industrial (SGVcomm)

11.3.8 DEFRA previously issued "Outcome of the Way Forward Exercise on Soil Guideline Values". This document was intended to provide guidance to determine if there is a Significant Possibility of Significant Harm (SPOSH) i.e. whether land meets the legal trigger of being contaminated land.

11.3.9 In the context of Part 2A, a risk assessor using an SGV would conclude the following (DEFRA, 2008).

- At a representative average soil concentration at or below an SGV, it is very unlikely that there will be a *significant possibility of significant harm (SPOSH)*.
- At a representative average soil concentration above an SGV, there *might* be a *significant possibility of significant harm* with the significance linked to the margin of exceedance, the duration and frequency of exposure, and other site-specific factors that the enforcing authority may wish to take into account. Further investigation and/or detailed evaluation will usually be required.

- 11.3.10 It should be stressed that where there is any uncertainty as to whether or not there is a SPOSH, it was the policy of this practice to adopt a conservative approach, particularly in the adoption of clean cover systems.
- 11.3.11 In April 2012, Defra published new Statutory Guidance which forms a major part of their contaminated land regimes under Part 2A of the Environment Protection Act 1990. The regime provides a means of dealing with contaminated land which poses a significant risk to human health or the environment where there is no alternative solution. It also works alongside planning rules and building regulations to help ensure that affected land is made suitable for use when it is redeveloped.
- 11.3.12 Since the regime was first introduced in 2000 there has been considerable uncertainty over how to decide when land is, and is not, contaminated land on grounds of the legal test of *significant possibility of significant harm to human health or the environment*.
- 11.3.13 To help address this, one of the main changes set out in the new Statutory Guidance, is the introduction of a new four category test to help decide when land is, and is not, contaminated land on grounds of *significant possibility of significant harm to human health*. Under the new four category test:
- Category 1 describes land that is clearly contaminated land, for example because similar land is known to have caused significant harm in the past.
 - Categories 2 and 3 cover less straightforward land where more detailed consideration is needed before the regulator can decide either: (a) that there is a strong case for regulatory action, in which case the land would be in Category 2 and be classified as contaminated land under Part 2A; or (b) that such a case does

not exist, in which case the land would be in Category 3 and not be classified as contaminated land under Part 2A.

- Category 4 describes land that is clearly not contaminated land, as discussed below.

11.3.14 One of the main purposes of including the Categories in the Statutory Guidance is to provide a legal framework against which new technical tools can be developed by the land contamination sector to describe the Categories in more detail with regard to specific substances and/or situations.

11.3.15 The new Category 4 test is particularly important in terms of reducing uncertainty over when land is definitely not caught by the regime.

11.3.16 The new Statutory Guidance makes clear what land should be placed into Category 4, for example:

- (a) Land where no relevant contaminant linkage has been established.
- (b) Land where there are only normal levels of contaminants in soil (as explained in Section 3 of the guidance), unless there is a particular reason to consider otherwise. In other words land with normal background concentrations in the soil.
- (c) Land that has been excluded from the need for further inspection and assessment under Part 2A because contaminant levels do not exceed relevant generic assessment criteria in accordance with Section 3 of the guidance, or relevant technical tools or advice that may be developed in accordance with paragraph 3.30 of the guidance, e.g. Category 4 Screening Levels.
- (d) Land where estimated levels of exposure to contaminants in soil are likely to form only a small proportion of what a receptor might be exposed to anyway

through other sources of environmental exposure (e.g. in relation to average estimated national levels of exposure to substances commonly found in the environment, to which receptors are likely to be exposed to in the normal course of their lives).

11.3.17 The guidance clarifies how generic assessment criteria (including the currently available SGVs/GACs) should and should not be used. It states that:

3.27 *It is common practice in contaminated land risk assessment to use “generic assessment criteria” (GACs) as screening tools in generic quantitative human health risk assessment to help assessors decide when land can be excluded from the need for further inspection and assessment, or when further work may be warranted.*

3.28 *Local authorities may use GACs and other technical tools to inform certain decisions under the Part 2A regime, provided: (i) they understand how they were derived and how they can be used appropriately; (ii) they have been produced in an objective, scientifically robust and expert manner by reputable organisations; and (iii) they are only used in a manner that is in accordance with Part 2A and this Guidance.*

3.29 *GACs relating to human health risk assessment represent cautious estimates of levels of contaminants in soil at which there is considered to be no risk to health or, at most, a minimal risk to health. With regard to such GACs:*

(a) They may be used to indicate when land is very unlikely to pose a significant possibility of significant harm to human health. This is on the basis that they are designed to estimate levels of contamination at which risks are likely to be negligible or minimal and far from posing a significant possibility of significant harm to human health.

- (b) They should not be used as direct indicators of whether a significant possibility of significant harm to human health may exist. Also, the local authority should not view the degree by which GACs are exceeded (in itself) as being particularly relevant to this consideration, given that the degree of risk posed by land would normally depend on many factors other than simply the amount of contaminants in soil.
- (c) They should not be seen as screening levels which describe the boundary between Categories 3 and 4 in terms of Section 4 (i.e. the two Categories in which land would not be contaminated land on grounds of risks to human health). In the very large majority of cases, these SGVs/GACs describe levels of contamination from which risks should be considered to be comfortably within Category 4.
- (d) They should not be viewed as indicators of levels of contamination above which detailed risk assessment would automatically be required under Part 2A.
- (e) They should not be used as generic remediation targets under the Part 2A regime. Nor should they be used in this way under the planning system, for example in relation to ensuring that land affected by contamination does not meet the Part 2A definition of contaminated land after it has been developed.

11.3.18 The way in which the new four category system is intended to operate and the place of the C4SLs within that system, was explained in detail in the Impact Assessment which accompanied the Statutory Guidance. Please note that although the detail of the Impact Assessment is included here to provide clarity on the job expected of C4SLs, the Statutory Guidance, itself, sets out the regime that needs to be delivered under Part 2A.

11.3.19 The C4SLs are intended as “*relevant technical tools*” (in relation to Paragraph 4.2.1(c)) provides to help local authorities and others when deciding to stop further assessment of a site, on the grounds that it falls within Category 4 (Human Health).

11.3.20 The Impact Assessment (IA), which accompanied the revised SG (Defra, 2012b) provides further information on the nature and potential role of the C4SLs. Paragraph 47(h) of the IA states that:

“The new statutory guidance will bring about a situation where the current SGVs/GACs are replaced with more pragmatic (but still strongly precautionary) Category 4 screening levels (C4SLs) which will provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land”.

11.4.21 A key distinction between the Soil Guideline Values (SGVs) and the C4SLs is the level of risk that they describe. As described by the Environment Agency (2009a):

“SGVs are guidelines on the level of long-term human exposure to individual chemicals in soils that, unless stated otherwise, are tolerable or pose a minimal risk to human health”.

11.4.22 C4SLs, therefore, should not be viewed as “SPOSH levels” and they should not be used as a legal trigger for the determination of land under Part 2A.

11.4.23 In 2014 CL:AIRE (Contaminated Land: Application in Real Environments) published “*Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination*”. In it a series of C4SLs were proposed as follows;

Analyte	Residential (with home grown produce) (mg/kg)	Residential (without home grown produce) (mg/kg)	Allotments (mg/kg)	Commercial (mg/kg)	POS (mg/kg)
Arsenic	37	40	49	640	79
Benzene	0.87	3.3	0.18	98	140
Benzo(a)Pyrene	5.0	5.3	5.7	77	10
Cadmium	22	150	3.9	410	880
Chromium (vi)	21	21	170	49	21
Lead	200	310	80	2300	630

Results

11.4.24 The following range of results was obtained and the full results are presented in Appendix 3. All the results fell within their respective C4SL and SGV limit for a residential end-use. In addition no asbestos was detected.

Soils

Analyte	Concentration Range (mg/kg)		SGV/C4SL Concentration for Residential Use (mg/kg)
Arsenic	2	7	32 (2) / 37 (3)
Cadmium	2.4	4.2	10 (2) / 22 (3)
Chromium (vi)	<5	<5	21 (3)
Copper	23	51	2330 (1)
Mercury	<0.17	0.18	170 (2)
Nickel	23	40	130 (2)
Selenium	3	4	350 (2)
Lead	41	80	200 (3)
Zinc	97	133	3750 (1)
Phenol	<0.2	<0.2	420 (2)
Benzo(a)pyrene	0.41	0.92	5.0 (3)
Dibenzo(a,h)anthracene	<0.04	0.10	0.9 (1)
Naphthalene	<0.03	0.13	8.7 (1)
Fluorene	0.04	0.12	780 (1)
Asbestos	None	None	None

(1) Values derived by LQM/CIEH "Generic Assessment Criteria for Human Health Risk Assessment" 2009. For organics a SOM of 2.5% assumed.

(2) Latest SGV published in 2009.
< indicates below the limit of detection.

(3) C4SL published 2014.

12 GEOENVIRONMENTAL RISK ASSESSMENT

Conceptual Site Model

- 12.1 A quantitative health and environmental risk assessment has been carried out as part of this assessment. The process of risk assessment is set out in Part IIA of the Environment Protection Act 1990 and amended in part by The Water Act 2003. This defines contaminated land as *"any land which appears to the local authority in whose area it is situated to be in such a condition by reason of substances in, on or under the land, that there is a significant possibility of significant harm being caused, or that significant pollution of controlled waters is being caused or there is a significant possibility of such pollution being caused"*.
- 12.2 The Act introduces the concept of a pollution linkage. This linkage consists of a pollution (contaminative) source or hazard and a receptor, together with an established pathway between the two. For land to be contaminated, a pollution linkage (hazard-pathway-receptor) must exist. This forms a so-called 'conceptual model' of the site.
- 12.3 Examples of pathways and effects from land contamination (after PPS 23) are given below, and these are illustrated on figure 4.

12.4 **Human Health (Pathways 1-5, Receptors A – C)**

Uptake of contaminants by food plants grown in contaminated soil - Uptake will depend on the concentration of a contaminant in soil, its chemical form, soil pH, plant species and prominence in diet.

Ingestion and inhalation - Substances may be ingested directly by young children playing on contaminated soil, or by eating plants which have absorbed metals or are contaminated with soil or dust. Ingestion may also occur via contaminated water supplies. Metals and some organic material substances may be inhaled from dusts and soils. Land gas, radon and volatile organic compounds can be inhaled directly.

Skin contact - Soil containing tars, oils and corrosive substances may cause irritation to the skin through direct contact. Some substances (e.g. phenols) may be absorbed into the body through the skin or through cuts and abrasions.

Irradiation - As well as being inhaled and absorbed through the skin, radioactive materials emitting gamma rays can cause a radiation response.

Fire and explosion - Materials such as coal, coke particles, oil, tar, pitch, rubber, plastic and domestic waste are all combustible. Both underground fires and biodegradation of organic materials may produce toxic or flammable gases. Methane and other gases may explode if allowed to accumulate in confined spaces.

12.5 **Buildings (Pathways 7 and 8)**

Fire and explosion - Underground fires may cause ground subsidence and cause structural damage. Accumulations of flammable gases in confined space leads to a risk of explosion. Underground fires may damage services.

Chemical attack on building materials and services - Sulphates may attack concrete structures. Acids, oils and tarry substances may accelerate corrosion of metals or attack plastics, rubber and other polymeric materials used in pipework and service conduits or as jointing seals and protective coatings to concrete and metals.

Physical - Blast-furnace and steel-making slag (and some natural materials) may expand. Degradation of fills may cause settlement and voids in buried tanks and drums may collapse as corrosion occurs or under loading.

12.6 **Natural Environment (Pathway 6, Receptors D - E)**

Phytotoxicity (prevention/inhibition of plant growth) - Some metals essential for plant growth at low levels are phytotoxic at higher concentrations. Methane and other gases may give rise to phytotoxic effects.

Contamination of water resources - Soil has a limited capacity to absorb, degrade or attenuate the effects of pollutants. When this is exceeded, polluting substances may enter into surface and groundwaters.

Ecotoxological effects - Contaminants in soil may affect microbial, animal and plant populations. Ecosystems or individual species on the site, in surface waters or areas affected by migration from the site may be affected.

- 12.7 For any contaminant source identified, judgement is used regarding the probability of a pollution linkage occurring and the potential consequences of that linkage. Based on the probability and likely consequences, the overall risk (significance) can be established. The definitions that have been used for this purpose are given in Standard Appendix B. The probability of a hazard, combined with its consequences, can be used to assess risk. This forms the so-called Conceptual Site Model.
- 12.8 The site has had no previously recorded commercial or industrial use recorded on the historical maps. As such no specific potential contaminants have been identified. There is always the possibility of localised spillages of fuels and oils, lubricants.

Risk Assessment based on Conceptual Site Model

Summary of Hazards, Pathways and Receptors

Source	Potential Pollutant	Pathways	Receptor	Risk (1)
No specific contaminative sources identified Possible past minor spillages and metals.	Oils, fuels, grease, hydraulic fluid.	1 - 5	A. Present Occupants	Site Unoccupied.
			B. Groundworkers.	Low Risk involved with excavation work, providing personnel adopt suitable precautions, together with washing facilities.
			C. Future Occupants.	Low Risk for residential use, providing any Made Ground is capped by clean sub soil and topsoil.
		6	D. Controlled Waters.	Low Risk
			E. Ecosystems.	Low Risk
		7	F. Building Materials and Services.	Low Risk. Install pipes in clean bedding materials. Adequate precautions to be taken in respect of buried concrete.
Organic Material.	Landfill Gases, Radon, VOCs, SVOCs.	8	A - F	Low Risk. Low values of ground gases present during the investigation although basic gas protection measures are recommended.

(1) See Standard Appendix B. *The risk ratings are based on the results of the investigation.*

Pathways and Receptors

- 12.11 The principal receptors are groundworkers, future residents and controlled waters (Receptors B, C and D). However based on the past history of the site and the laboratory testing to date, the probability of contamination being present sufficient to affect the identified receptors is considered to be a low risk.
- 12.12 The overall risk is assessed to be low. At this stage it is not considered that there is likely to be any significant risk and further intrusive investigation in respect of contamination is not considered to be necessary.
- 12.13 With any site, the possibility of contaminants being present, sufficient to cause significant harm cannot be entirely precluded without extensive intrusive investigation, sampling and testing since it is not always possible to determine if contaminants have been tipped or buried on the site, or have seeped into the ground, or have migrated below the ground onto the site from adjacent pieces of land. However, based on the investigation carried out to date, this is considered unlikely.
- 12.14 It is recommended that if during construction any suspicious or unusual odours, colours, liquids or soils are uncovered, these should be brought to the attention of Michael D Joyce Associates LLP and appropriate advice sought.

13 RECOMMENDATIONS

- 13.1 It is proposed to redevelop the site for residential purposes. At present there do not appear to be any major geotechnical constraints to developing this site. However, there are a number of aspects that need to be taken into consideration when assessing the feasibility and design of this scheme.

13.2 Foundation Criteria

Normal Strip Footings

- 13.2.1 Normal strip footings will therefore be suitable for most of the new houses. They will have to be sited below any Made Ground (if encountered) and original topsoil still remaining after site clearance, and founded upon the underlying firm clay. This clay can be expected to exhibit moderate swelling and shrinkage properties. In order to allow for seasonal variations in the moisture content of this clay, foundation levels should be at least 0.9m below groundlevel. However, where new planting is proposed, or existing trees are present, this may have to increase. At this depth, for foundations sited upon the firm clay, allowable bearing pressures of up to 80kN/m² can be adopted. It would also be prudent to lightly reinforce the footings.
- 13.2.2 All foundation excavations must be inspected to ensure that no footings are sited upon any weak Made Ground, softer clays or other such weak materials that would be incapable of safely sustaining the applied foundation loads. This will be particularly important should any appreciable amounts of Made Ground occur. Wherever any suspect ground is encountered at proposed foundation level, then that footing must be deepened until a satisfactory bearing medium is obtained.

- 13.2.3 The footing should also be placed below the coal if the seam is encountered at foundation level. Should the coal seam be encountered in the sides of any foundation or service trench excavations, it should be blinded with concrete to prevent potential future combustion.

13.3 Building Near Trees

- 13.3.1 Wherever any houses are located near existing or proposed planting of new trees, their foundations must be sited below the potential root growth zone. Reference should therefore be made to the NHBC Standards Chapter 4.2 "Building Near Trees", which gives guidance on foundation criteria, depths and construction. All services will also have to be similarly protected.

13.4 Landfill and Radon Gas

- 13.4.1 The site is not in an area where radon protection measures are required for new properties, and no elevated levels of ground or landfill gases have been found on the site to date. However since a period of long-term gas monitoring was not possible, and in accordance with good practice, it would be prudent to incorporate basic gas protection measures in the new houses.
- 13.4.2 If suspended concrete beams and block ground floors are adopted for the houses, it is recommended that a layer of Visqueen 1200 gauge membrane or equivalent is laid over the concrete blocks and covered by a concrete screed in accordance with the manufacturer's recommendations.

- 13.4.3 Any void spaces beneath ground floors must be well ventilated both internally and externally with closely spaced air-bricks. Sleeper walls should either be of honeycomb structure or contain sufficient openings to ensure a through draught. Air-bricks must be placed at the top of the void space and not allowed to become blocked by soil or vegetation. They should be lined or cased through cavity walls.
- 13.4.4 British Standard BS8485: 2015 “Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings”, and Building Research Establishment Report BR414 “Protective Measures for Housing on Gas Contaminated Land”, together with the CIRIA Report 149 “Protecting Development from Methane” and BR211 (2015) “Radon: Guidance on Protective Measures for New Buildings” all give construction advice for preventing gases entering buildings, the principles of which are incorporated in the above recommendations. Advice is also given in respect of sealing services where they pass through impermeable membranes.

13.5 Existing Drains and Services

- 13.5.1 Should any redundant drains and other services channels are likely to underlie building foundations, they must be dug out and replaced by lean mix concrete, or compacted hardcore. Alternatively, long drainage runs can be grouted up, particularly where their alignments are uncertain but care is needed to ensure that no grout enters any live services. In the case of roads, they should be dug out and the areas infilled by properly compacted fill.

13.6 Road Construction

- 13.6.1 The new road should conform to The Technical Appendix of '*Better Places to Live in South Yorkshire – A guide to residential development*', which continues to be implemented by the district council. The new road should also conform to "The Specifications of Highway Works" and "The Notes for Guidance on the Specification for Highway Works".
- 13.6.2 The subgrade will comprise firm silty clay overlying weathered mudstone bedrock. The MEXE Cone Penetrometer tests recorded typical in-situ CBRs of 1½% to 2½% for these clays.
- 13.6.3 The design of trafficked pavements must take account of the ground conditions and likely traffic loads during the life of the development. Designs meeting the following requirements will normally be acceptable. At sites where particular poor ground conditions are encountered or where it is anticipated that there will be a particularly high frequency of commercial vehicle or abnormal load movements, further analysis in accordance with the "Design Manual for Roads and Bridges" will be required to demonstrate integrity of the design.
- 13.6.4 A preliminary design can be prepared using an "Equilibrium CBR" value based on the appropriate type of sub-grade material as set out in the table below. However, if this method of CBR estimation is used, testing by an approved laboratory will be required prior to construction in order to verify the CBR value used for design. Based on the in-situ and laboratory testing, a CBR of 2% would be appropriate.

Equilibrium CBR Value to be used for Design Purposes		
Type of Soil	Plasticity Index	Equilibrium CBR (%)
Heavy Clay	50 or greater	Less than 2
Heavy Clay	40 to 49	2
Heavy Clay	30 to 39	2
Silty Clay	20 to 29	3
Sandy Clay	10 to 19	4
Silt	Less than 10	1
Sand (Poorly graded)	Non-plastic	20
Sand (well graded)	Non-plastic	40
Gravel (poorly graded)	Non-plastic	40
Sandy Gravel (well graded)	Non-plastic	60

(Based on Design Manual for Roads and Bridges)

- 13.6.5 A granular foundation comprising sub-base or a combination of sub-base and a capping layer can be provided in accordance with the table below.

Pavement Foundation Design					
CBR (%)	Capping (mm)	+	Sub-Base (mm)	OR	Sub-Base (mm)
Less than 2	600	+	150		--
2	450	+	150		--
3	350	+	150	OR	300
4	300	+	150	OR	275
5 to 15	250	+	150	OR	225
> than 15	--	+	--		150

- 13.6.6 Prior to the application of any sub-base, all subgrades must be checked by proof rolling to ensure that an adequate CBR exists. Where any loose granular or soft clayey areas remain, these must be either dug out and replaced by compacted material or an additional 150mm of sub-base added. This will be especially important wherever trench works for drains, sewers and other services have been carried out. Any old foundations should be removed to a depth of 1m below subgrade level to prevent

hardspots occurring. It will also be necessary to prevent the deterioration of the subgrade due to the effects of wet weather and the site traffic.

13.7 Sustainable Surface Water Drainage

- 13.7.1 Given the virtually impermeable clays and mudstones which cover most of the site, it will be unsuitable for soakaways and consideration will have to be given to discharging surface water to a conventional piped system or possibly nearby watercourse.

13.8 Excavations and Groundwater

- 13.8.1 Soft ground plant should prove suitable for most of the excavations.
- 13.8.2 For all deep excavations in excess of 1.2m where vertical sides are necessary, trench supports should be provided as the soils will not be self-supporting for any appreciable length of time. It would also be prudent to monitor excavations for the presence of explosive or asphyxiating gases.
- 13.8.3 No groundwater seepages were noted in the near surface. However it should be remembered that trapped groundwater can be released from any areas of Made Ground when they are excavated. In addition seasonal variation in groundwater levels will occur and groundwater will be shallower during the winter months.

13.9 Re-use of Materials

13.9.1 In England, the SWMP Regulations 2008 came into force on 6th April 2008. They apply to 'construction projects', and to the whole life of a construction project, from design all the way through to completion. As well as including actual construction works, they include renovation projects, site preparation works, the installation of services, and all kinds of demolition. If you carry out a construction project where the value of the materials plus labour exceeds £300,000, it becomes a criminal offence (for both the project manager and the main contractor) not to produce a SWMP.

13.9.2 The Plans must include basic elements such as who prepared it, who's in charge of the project, who's the main contractor, what's the location, and what's the estimated value. But it must also include details of the decisions taken at the outset on (1) the design of the project, (2) the methods employed and (3) the materials employed in order to minimise the quantity of waste produced on site. It will therefore be necessary to have evidence of that thought process. The SWMP must describe each type of waste that will be produced, and estimate the volume.

13.10 Contamination

13.10.1 Laboratory testing to date has recorded no contaminants and as such, no special precautions are necessary. The existing topsoil can be reused.

13.11 Cement and Buried Concrete

13.11.1 The Made Ground has generally been found to contain low levels of soluble sulphates and near neutral pH values.

13.11.2 In accordance therefore with the Building Research Establishment Special Digest No. 1 “Concrete in Aggressive Ground”, a normal Portland cement in accordance with Group DS-1. Specifications should be used for all buried concrete, mortar, and pre-cast concrete pipes.

13.14 Further Monitoring and Inspection

13.14.1 Should any geotechnical or geoenvironmental problems arise on site or if ground conditions are different from those that we predicted, they should be referred back to Michael D Joyce Associates LLP.

A D Joyce

BSc MSc ARSM CEng CGeol CEnv MICE FGS SiLC

May 2018

This report is subject to the provisions of the Copyright Acts and is for the sole benefit of Alfa Homes Limited in respect of a preliminary assessment of geotechnical and contamination conditions on the site. It does not purport to provide specialist legal advice in respect of environmental issues. The report cannot be assigned to, or relied on, by any other party without prior permission.

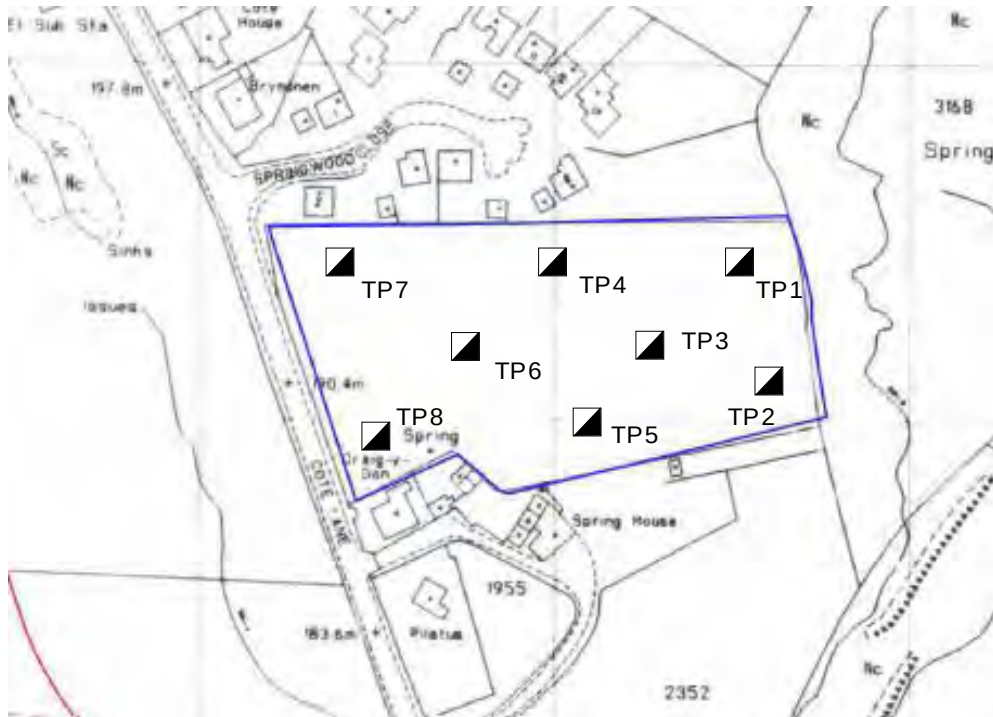
Procedure Notes

The desk study and ground investigation have been carried out in accordance with the principles of BS EN 1997-1: 2004 “Eurocode 7 - Geotechnical Design - Part 1: General Rules”, BS EN 1997-2: 2007 “Eurocode 7 - Geotechnical Design - Part 2: Ground Investigation and Testing”, BS5930: 1999 and BS10175: 2001, and the terms of the client’s brief. By its very nature any ground investigation only samples a small percentage of the ground. Consequently changes in ground conditions and soil properties can occur between any two exploratory points, for example local features such as soft ground, pockets of contamination and faults. This is also true of the exploration of mineworkings and such features can extend beneath parts of the site not investigated. Unrecorded bell pits and shafts can also exist between exploratory points. The ground investigation is designed to minimize such risks. Conclusions and recommendations are based on the information presented in this report, but unforeseen features may exist. Therefore, actual ground conditions should be noted during construction and further advice sought if they differ significantly from those predicted.

Further investigation can be carried out to further reduce uncertainty and risk but ultimately these risks cannot be eliminated. Similarly a desk study normally only considers readily available information and further information could be held by other sources. In commissioning further research or investigation the cost/benefit of doing so must be considered.

Where buildings are present on a site, structural and asbestos surveys have not been carried out, unless specifically stated. An unexploded ordnance survey has not been carried out. In relevant situations it would be prudent to commission such surveys.

Where information has been obtained from Third Parties, no liability can be accepted for the accuracy or completeness of this information. Where anecdotal evidence or speculations are presented, they must be treated as such and cannot be relied upon.



Cote Lane, Thurgoland
Site Plan with Trial Pit Positions

Michael D Joyce Associates LLP
Geotechnical and Geoenvironmental Consultants

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Scale: NTS

Figure: 2



Cote Lane, Thurgoland
Site Plan with Development Proposals

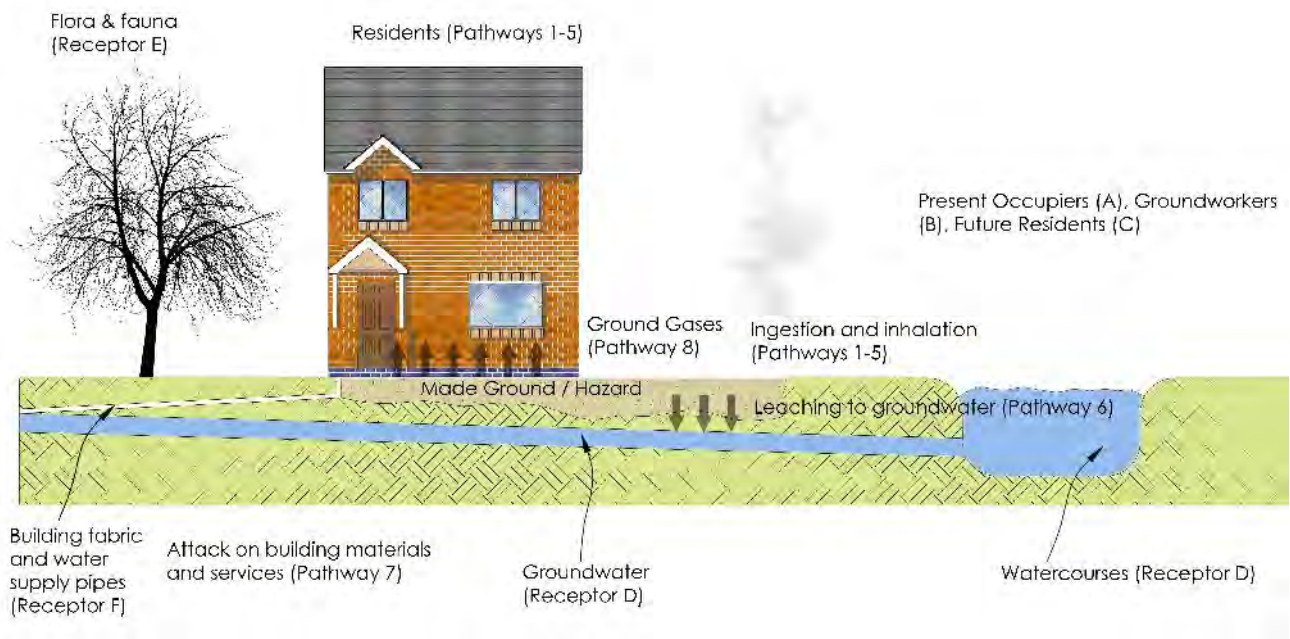
Michael D Joyce Associates LLP
Geotechnical and Geoenvironmental Consultants

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Scale: NTS

Figure: 3



Pathways

1. Ingestion of contaminated soil/dust
2. Ingestion of contaminated food
3. Ingestion of contaminated water
4. Inhalation of contaminated vapours
5. Dermal contact with contaminated soil/dust or water
6. Pollution of controlled water and off site migration
7. Attack on building materials and services
8. Migration of landfill gases and radon

Receptors

- A. Present site occupiers
- B. Site development personnel
- C. Future residents
- D. Controlled waters
- E. Flora and fauna
- F. Building and services

Schematic Representation of Conceptual Site Model

Schematic Representation of Conceptual Site Model

Michael D Joyce Associates LLP
Geotechnical and Geoenvironmental Consultants

Figure: 4

APPENDIX 1

Trial Pit Records

Site: Cote Lane [3819]

Location: Thurgoland, Bamsley

Excavated by: Mini Digger

Date: 20th July 2017

Client: Alfa Homes Limited

Trial Pit No: 1

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Depth (m)	Depth (m)	Description	Legend
0.10	ES		L x 3.00m / W x 0.60m D x 2.00m	0	0	Ground Surface Turf over dark brown dayey TOPSOIL.	
				-0.3			
1.00	D				1	Firm light brown and grey silty CLAY, grading into highly weathered mudstone.	
				-1.8			
				-2	2	Brown moderately weathered dayey shaly MUDSTONE.	
					2	End of Trial Pit	
					3		
					4		

Stability: Sides stable

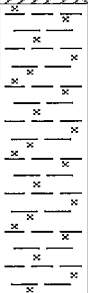
General: Refusal at 1.8m, full reach of digger

Groundwater: None encountered

Site: Cote Lane [3819]
Location: Thurgoland, Barnsley
Excavated by: Mini Digger
Date: 20th July 2017
Client: Alfa Homes Limited

Trial Pit No: 2

Michael D Joyce Associates LLP

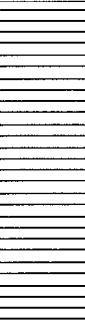
Depth (m)	Samples	Water Depth (m)	Field Records	Depth (m)	Depth (m)	Description	Legend
0.10	ES		L x 3.00m / W x 0.60m D x 1.80m	0	0	Ground Surface	
				-0.2		Turf over dark brown dayey TOPSOIL.	
						Firm light brown and grey silty CLAY, grading into highly weathered mudstone.	
1.40	D			-1.1	1		
				-1.3		Black intact COAL.	
						Brown moderately weathered clayey shaly MUDSTONE.	
				-1.8			
						End of Trial Pit	
					2		
					3		
					4		

Stability: Sides stable
 General: Refusal at 1.8m, full reach of digger
 Groundwater: None encountered

Site: Cote Lane [3819]
Location: Thurgoland, Barnsley
Excavated by: Mini Digger
Date: 20th July 2017
Client: Alfa Homes Limited

Trial Pit No: 3

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Depth (m)	Depth (m)	Description	Legend
0.40	D		L x 3.00m / W x 0.60m D x 1.90m	0	0	Ground Surface	
				-0.15		Turf over dark brown dayey TOPSOIL.	
						Firm light brown and grey silty CLAY, grading into highly weathered mudstone.	
				-0.9	1	Brown moderately weathered dayey shaly MUDSTONE.	
				-1.9	2	End of Trial Pit	
					3		
					4		

Stability: Sides stable

General: Refusal at 1.8m, full reach of digger

Groundwater: None encountered

Site: Cote Lane [3819]

Location: Thurgoland, Barnsley

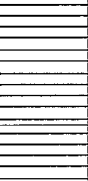
Excavated by: Mini Digger

Date: 20th July 2017

Client: Alfa Homes Limited

Trial Pit No: 4

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Depth (m)	Depth (m)	Description	Legend
0.15	ES		L x 3.00m / W x 0.60m D x 1.80m	0	0	Ground Surface	
				-0.2		Turf over dark brown dayey TOPSOIL.	
0.90	D					Firm light brown and grey silty CLAY, grading into highly weathered mudstone.	
				-1.2			
						Brown moderately weathered dayey shaly MUDSTONE.	
				-1.6			
				-1.8		Grey and brown moderately weathered MUDSTONE.	
						End of Trial Pit	
					2		
					3		
					4		

Stability: Sides stable

General: Refusal at 1.8m on intact bedrock

Groundwater: None encountered

Site: Cote Lane [3819]

Location: Thurgoland, Barnsley

Excavated by: Mini Digger

Date: 20th July 2017

Client: Alfa Homes Limited

Trial Pit No: 5

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Depth (m)	Depth (m)	Description	Legend
0.10	ES		L x 3.00m / W x 0.60m D x 1.60m	0	0	Ground Surface	
				-0.15		Turf over dark brown clayey TOPSOIL.	
						Firm light brown and grey silty CLAY, grading into highly weathered mudstone.	
1.40	D			-0.8			
				-1		Black intact COAL.	
					1	Brown moderately weathered clayey shaly MUDSTONE.	
				-1.5			
				-1.6		Grey moderately weathered MUDSTONE.	
						End of Trial Pit	
					2		
					3		
					4		

Stability: Sides stable

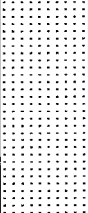
General: Refusal at 1.6m on intact bedrock

Groundwater: None encountered

Site: Cote Lane [3819]
Location: Thurgoland, Barnsley
Excavated by: Mini Digger
Date: 20th July 2017
Client: Alfa Homes Limited

Trial Pit No: 6

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Depth (m)	Depth (m)	Description	Legend
0.05	ES		L x 3.00m / W x 0.60m D x 1.80m	0	0	Ground Surface	
				-0.1		Turf over dark brown clayey TOPSOIL.	
1.00	D					Light brown medium weathered fine and medium grained SANDSTONE.	
				-0.8			
						Orange and brown clayey MUDSTONE.	
				-1.4			
				-1.6		Grey brown clayey MUDSTONE.	
				-1.8		Grey intact moderately weathered MUDSTONE.	
						End of Trial Pit	
					2		
					3		
					4		

Stability: Sides stable
 General: Refusal at 1.8m on intact bedrock
 Groundwater: None encountered

Groundwater: None encountered

Site: Cote Lane [3819]

Location: Thurgoland, Barnsley

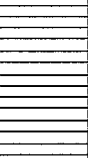
Excavated by: Mini Digger

Date: 20th July 2017

Client: Alfa Homes Limited

Trial Pit No: 8

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Depth (m)	Depth (m)	Description	Legend
0.10	ES		L x 3.00m / W x 0.60m D x 1.80m	0	0	Ground Surface	
				-0.2		Turf over dark brown dayey TOPSOIL.	
						Firm light brown and grey silty CLAY, grading into highly weathered mudstone.	
				-1.3			
				-1.8		Brown moderately weathered dayey shaly MUDSTONE.	
						End of Trial Pit	
					2		
					3		
					4		

Stability: Sides stable

General: Refusal at 1.8m on intact bedrock

Groundwater: None encountered

APPENDIX 2

Geotechnical Laboratory Test Results



Contract Number: 36057

Client's Reference:

Report Date: **31-07-2017**

Client **Michael D Joyce Associates LLP**
Michael D Joyce Associates LLP
Charnock Court 6
South Parade
Wakefield
West Yorkshire
WF1 1LR

Contract Title: **Thurgoland**
For the attention of: **Anthony D Joyce**

Date Received: **25-07-2017**
Date Commenced: **25-07-2017**
Date Completed: **31-07-2017**

Test Description	Qty
Moisture Content 1377 : 1990 Part 2 : 3.2 - * UKAS	4
4 Point Liquid & Plastic Limit (LL/PL) 1377 : 1990 Part 2 : 4.3 & 5.3 - * UKAS	4
Water Soluble Sulphate 2:1 extract 1377 : 1990 Part 3 : 5 - @ Non Accredited Test	4
pH Value of Soil. 1377 : 1990 Part 3 : 9 - @ Non Accredited Test	4
Disposal of Samples on Project	1

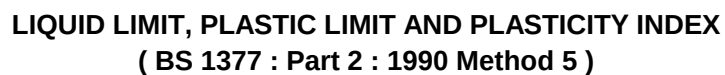
Notes: **Observations and Interpretations are outside the UKAS Accreditation**
* - denotes test included in laboratory scope of accreditation
- denotes test carried out by approved contractor
@ - denotes non accredited tests

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 except in full, without the prior written approval of the laboratory.

Approved Signatories:

Alex Wynn (Associate Director) - Ben Sharp (Contracts Manager) - Emma Sharp (Office Manager)
Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager) - Sean Penn (Administrative/Quality Assistant)
Vaughan Edwards (Managing Director) - Wayne Honey (Administrative/Quality Assistant)





Contract Number

36057

Site Name

Thurgoland

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

The Plasticity Chart (Figure 1) is a graph with Plasticity Index (%) on the vertical axis (0 to 90) and Liquid Limit (%) on the horizontal axis (0 to 120). The chart is divided into regions labeled CL, CI, CH, CV, CE, ML, MI, MH, MV, and ME. A solid line represents the A-line, and a dashed line represents the U-line. Data points are plotted at (0, 0), (30, 14), (35, 13), (35, 19), and (58, 31).





APPENDIX 3

Contamination Laboratory Test Results

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 17/05021
Issue Number: 1

Date: 28 July, 2017

Client: Michael D Joyce Associates LLP
Charnock Court
6 South Parade
Wakefield
WF1 1LR

Project Manager: Mr Anthony Joyce
Project Name: Cote Lane, Thurgoland
Project Ref: Not specified
Order No: N/A
Date Samples Received: 21/07/17
Date Instructions Received: 24/07/17
Date Analysis Completed: 28/07/17

Prepared by:

A handwritten signature in blue ink that reads "M Marshall".

Melanie Marshall
Laboratory Coordinator

Approved by:

A handwritten signature in blue ink that reads "John Gustafson".

John Gustafson
Director

Envirolab Job Number: 17/05021

Client Project Name: Cote Lane, Thurgoland

Client Project Ref: Not specified

Lab Sample ID	17/05021/1	17/05021/2	17/05021/3	17/05021/4	17/05021/5	17/05021/6	17/05021/7		Units	Method ref
Client Sample No										
Client Sample ID	TP1	TP2	TP4	TP5	TP6	TP7	TP8			
Depth to Top	0.10	0.10	0.15	0.10	0.05	0.05	0.10			
Depth To Bottom										
Date Sampled	20-Jul-17	20-Jul-17	20-Jul-17	20-Jul-17	20-Jul-17	20-Jul-17	20-Jul-17			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	4E	6E	6E	6E	6E	6E	6E			
% Stones >10mm _A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		% w/w	A-T-044
pH _D ^{M#}	7.45	7.08	6.67	6.71	6.73	6.87	6.77		pH	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.01	<0.01	0.01	<0.01	0.04	<0.01	<0.01		g/l	A-T-026s
Cyanide (total) _A ^{M#}	<1	<1	<1	<1	<1	<1	<1		mg/kg	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		mg/kg	A-T-050s
Arsenic _D ^{M#}	2	5	7	2	5	4	3		mg/kg	A-T-024s
Cadmium _D ^{M#}	2.7	2.4	2.9	2.8	2.6	2.8	4.2		mg/kg	A-T-024s
Copper _D ^{M#}	27	51	28	31	34	44	23		mg/kg	A-T-024s
Chromium (hexavalent) _D	<5	<5	<5	<1	<1	<1	<1		mg/kg	A-T-040s
Lead _D ^{M#}	80	60	65	56	60	68	41		mg/kg	A-T-024s
Mercury _D	<0.17	0.18	<0.17	0.18	<0.17	<0.17	<0.17		mg/kg	A-T-024s
Nickel _D ^{M#}	25	26	23	30	28	33	40		mg/kg	A-T-024s
Selenium _D	3	3	3	3	3	3	4		mg/kg	A-T-024s
Zinc _D ^{M#}	120	100	105	120	131	133	97		mg/kg	A-T-024s

Envirolab Job Number: 17/05021

Client Project Name: Cote Lane, Thurgoland

Client Project Ref: Not specified

Lab Sample ID	17/05021/1	17/05021/2	17/05021/3	17/05021/4	17/05021/5	17/05021/6	17/05021/7		Units	Method ref
Client Sample No										
Client Sample ID	TP1	TP2	TP4	TP5	TP6	TP7	TP8			
Depth to Top	0.10	0.10	0.15	0.10	0.05	0.05	0.10			
Depth To Bottom										
Date Sampled	20-Jul-17	20-Jul-17	20-Jul-17	20-Jul-17	20-Jul-17	20-Jul-17	20-Jul-17			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	4E	6E	6E	6E	6E	6E	6E			
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD	NAD	NAD	NAD	NAD	NAD			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	N/A	N/A	N/A	N/A	N/A			

Envirolab Job Number: 17/05021

Client Project Name: Cote Lane, Thurgoland

Client Project Ref: Not specified

Lab Sample ID	17/05021/1	17/05021/2	17/05021/3	17/05021/4	17/05021/5	17/05021/6	17/05021/7		Units	Method ref
Client Sample No										
Client Sample ID	TP1	TP2	TP4	TP5	TP6	TP7	TP8			
Depth to Top	0.10	0.10	0.15	0.10	0.05	0.05	0.10			
Depth To Bottom										
Date Sampled	20-Jul-17	20-Jul-17	20-Jul-17	20-Jul-17	20-Jul-17	20-Jul-17	20-Jul-17			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	4E	6E	6E	6E	6E	6E	6E			
PAH 16										
Acenaphthene _A ^{M#}	0.15	0.05	0.11	0.12	0.07	0.14	<0.01		mg/kg	A-T-019s
Acenaphthylene _A ^{M#}	0.01	<0.01	0.01	0.02	0.01	0.03	<0.01		mg/kg	A-T-019s
Anthracene _A ^{M#}	0.27	0.11	0.24	0.22	0.16	0.27	<0.02		mg/kg	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.82	0.41	0.75	0.69	0.57	1.01	<0.04		mg/kg	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.73	0.41	0.62	0.62	0.54	0.92	<0.04		mg/kg	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.72	0.42	0.60	0.60	0.50	0.89	<0.05		mg/kg	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.29	0.15	0.23	0.23	0.22	0.36	<0.05		mg/kg	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.25	0.14	0.23	0.20	0.20	0.37	<0.07		mg/kg	A-T-019s
Chrysene _A ^{M#}	0.81	0.47	0.72	0.69	0.61	1.01	<0.06		mg/kg	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.08	<0.04	0.06	0.06	0.05	0.10	<0.04		mg/kg	A-T-019s
Fluoranthene _A ^{M#}	1.54	0.78	1.48	1.33	1.00	1.96	<0.08		mg/kg	A-T-019s
Fluorene _A ^{M#}	0.12	0.04	0.11	0.11	0.07	0.11	<0.01		mg/kg	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.41	0.20	0.34	0.32	0.30	0.50	<0.03		mg/kg	A-T-019s
Naphthalene _A ^{M#}	0.09	<0.03	0.09	0.13	0.07	0.04	<0.03		mg/kg	A-T-019s
Phenanthrene _A ^{M#}	1.27	0.55	1.25	1.16	0.81	1.38	0.03		mg/kg	A-T-019s
Pyrene _A ^{M#}	1.33	0.69	1.30	1.14	0.87	1.68	<0.07		mg/kg	A-T-019s
PAH (total 16) _A ^{M#}	8.91	4.43	8.15	7.66	6.06	10.7	<0.08		mg/kg	A-T-019s

REPORT NOTES

General:

This report shall not be reproduced, except in full, without written approval from Envirolab.

All samples contained within this report, and any received with the same delivery, will be disposed of one month after the date of this report.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure and there is insufficient sample to repeat the analysis. These are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

APPENDIX 4

GroundSure Geo-Insight and Enviro-Insight Reports



Michael D Joyce Associates LLP

6, South Parade,
Wakefield, WF1 1LR

Report Reference: HMD-354-4038824

Your Reference: Cote_Lane_-_Thurgoland

Report Date 3 Jul 2017

Report Delivery Email - pdf
Method:

Geo Insight

Address: 429222, 400661,

Dear Sir/ Madam,

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

If you need any further assistance, please do not hesitate to contact our helpline on (0)1924 360458 quoting the above report reference number.

Yours faithfully,

Michael D Joyce Associates LLP

Enc.
Groundsure Geo Insight

Address: 429222, 400661,
Date: 3 Jul 2017
Reference: HMD-354-4038824
Client: Michael D Joyce Associates LLP



Aerial Photograph Capture date: 07-Jun-2013
Grid Reference: 429205,400624
Site Size: 0.97ha

Contents Page

Contents Page.....	3
Overview of Findings.....	5
1:10,000 Scale Availability.....	8
Availability of 1:10,000 Scale Geology Mapping.....	9
1 Geology (1:10,000 scale).....	10
1.1 Artificial Ground Map (1:10,000 scale).....	10
1. Geology 1:10,000 scale.....	11
1.1 Artificial Ground.....	11
1.2 Superficial Deposits and Landslips Map (1:10,000 scale).....	12
1.2 Superficial Deposits and Landslips.....	13
1.2.1 Superficial Deposits/ Drift Geology.....	13
1.2.2 Landslip.....	13
1.3 Bedrock and Faults Map (1:10,000 scale).....	14
1.3 Bedrock and Faults.....	15
1.3.1 Bedrock/ Solid Geology.....	15
1.3.2 Faults.....	15
2 Geology 1:50,000 Scale.....	17
2.1 Artificial Ground Map.....	17
2. Geology 1:50,000 scale.....	18
2.1 Artificial Ground.....	18
2.1.1 Artificial/ Made Ground	18
2.1.2 Permeability of Artificial Ground.....	18
2.2 Superficial Deposits and Landslips Map (1:50,000 scale).....	19
2.2 Superficial Deposits and Landslips.....	20
2.2.1 Superficial Deposits/ Drift Geology.....	20
2.2.2 Permeability of Superficial Ground	20
2.2.3 Landslip.....	20
2.2.4 Landslip Permeability.....	20
2.3 Bedrock and Faults Map (1:50,000 scale).....	21
2.3 Bedrock, Solid Geology & Faults.....	22
2.3.1 Bedrock/Solid Geology.....	22
2.3.2 Permeability of Bedrock Ground.....	22
2.3.3 Faults.....	23
3 Radon Data.....	24
3.1 Radon Affected Areas.....	24
3.2 Radon Protection.....	24
4 Ground Workings Map.....	25
4 Ground Workings.....	26
4.1 Historical Surface Ground Working Features derived from Historical Mapping.....	26
4.2 Historical Underground Working Features derived from Historical Mapping.....	26
4.3 Current Ground Workings.....	27
5 Mining, Extraction & Natural Cavities.....	29
5.1 Historical Mining.....	29
5.2 Coal Mining.....	29
5.3 Johnson Poole and Bloomer.....	29
5.4 Non-Coal Mining.....	30
5.5 Non-Coal Mining Cavities.....	30
5.6 Natural Cavities.....	30
5.7 Brine Extraction.....	30
5.8 Gypsum Extraction.....	31
5.9 Tin Mining.....	31
5.10 Clay Mining.....	31
6 Natural Ground Subsidence.....	32
6.1 Shrink-Swell Clay Map.....	32
6.2 Landslides Map.....	33
6.3 Ground Dissolution of Soluble Rocks Map.....	34
6.4 Compressible Deposits Map.....	35
6.5 Collapsible Deposits Map.....	36
6.6 Running Sand Map.....	37

6 Natural Ground Subsidence.....	38
6.1 Shrink-Swell Clays.....	38
6.2 Landslides.....	39
6.3 Ground Dissolution of Soluble Rocks.....	40
6.4 Compressible Deposits.....	40
6.5 Collapsible Deposits.....	40
6.6 Running Sands.....	40
7 Borehole Records.....	42
8 Estimated Background Soil Chemistry.....	43
9 Railways and Tunnels Map.....	44
9 Railways and Tunnels.....	45
9.1 Tunnels	45
9.2 Historical Railway and Tunnel Features	45
9.3 Historical Railways.....	46
9.4 Active Railways.....	46
9.5 Railway Projects.....	46

Overview of Findings

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

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

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

Section 1: Geology 1:10,000 Scale

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

Section 2: Geology 1:50,000 Scale

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

Section 2: Geology 1:50,000 Scale

2.3 Bedrock, Solid Geology and Faults

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

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

Yes

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

Yes

Section 3: Radon

3. Radon

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

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

3.2 Radon Protection

No radon protective measures are necessary.

Section 4: Ground Workings

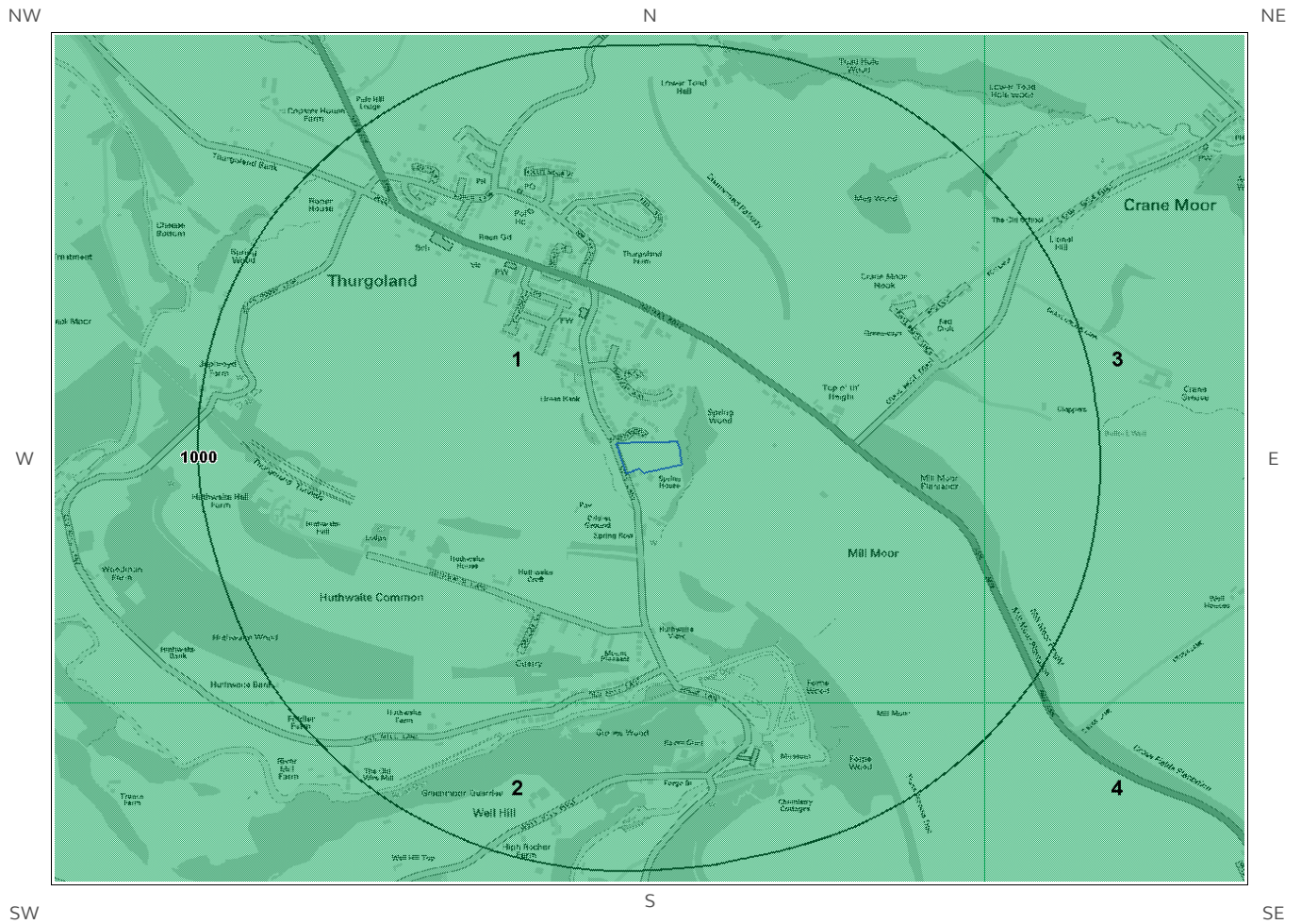
	On-site	0-50m	51-250	251-500	501-1000
4.1 Historical Surface Ground Working Features from Small Scale Mapping	0	0	5	Not Searched	Not Searched
4.2 Historical Underground Workings from Small Scale Mapping	0	0	0	0	11
4.3 Current Ground Workings	0	0	0	1	6

Section 5: Mining, Extraction & Natural Cavities

	On-site	0-50m	51-250	251-500	501-1000
5.1 Historical Mining	0	0	0	0	4
5.2 Coal Mining	1	0	0	0	0
5.3 Johnson Poole and Bloomer Mining Area	0	0	0	0	0
5.4 Non-Coal Mining*	1	0	0	0	3
5.5 Non-Coal Mining Cavities	0	0	0	0	0
5.5 Natural Cavities	0	0	0	0	0

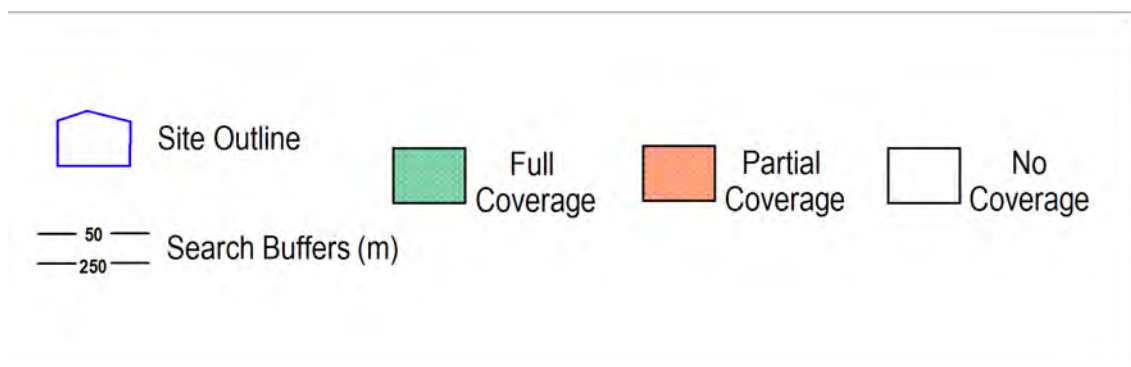
Section 5: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
5.6 Brine Extraction	0	0	0	0	0
5.7 Gypsum Extraction	0	0	0	0	0
5.8 Tin Mining	0	0	0	0	0
5.9 Clay Mining	0	0	0	0	0
Section 6: Natural Ground Subsidence	On-site				
6.1 Shrink-Swell Clay	Very Low				
6.2 Landslides	Low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

1:10,000 Scale Availability



1_10,000 Availability Legend

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Availability of 1:10,000 Scale Geology Mapping

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

ID	Distance	Artificial Coverage	Superficial Coverage	Bedrock Coverage	Mass Movement Coverage
1	0.0	Some deposits are mapped	Full	Full	Some deposits are mapped
2	577.0	Some deposits are mapped	Full	Full	Some deposits are mapped
3	723.0	Some deposits are mapped	Full	Full	Some deposits are mapped
4	940.0	Some deposits are mapped	Full	Full	No coverage

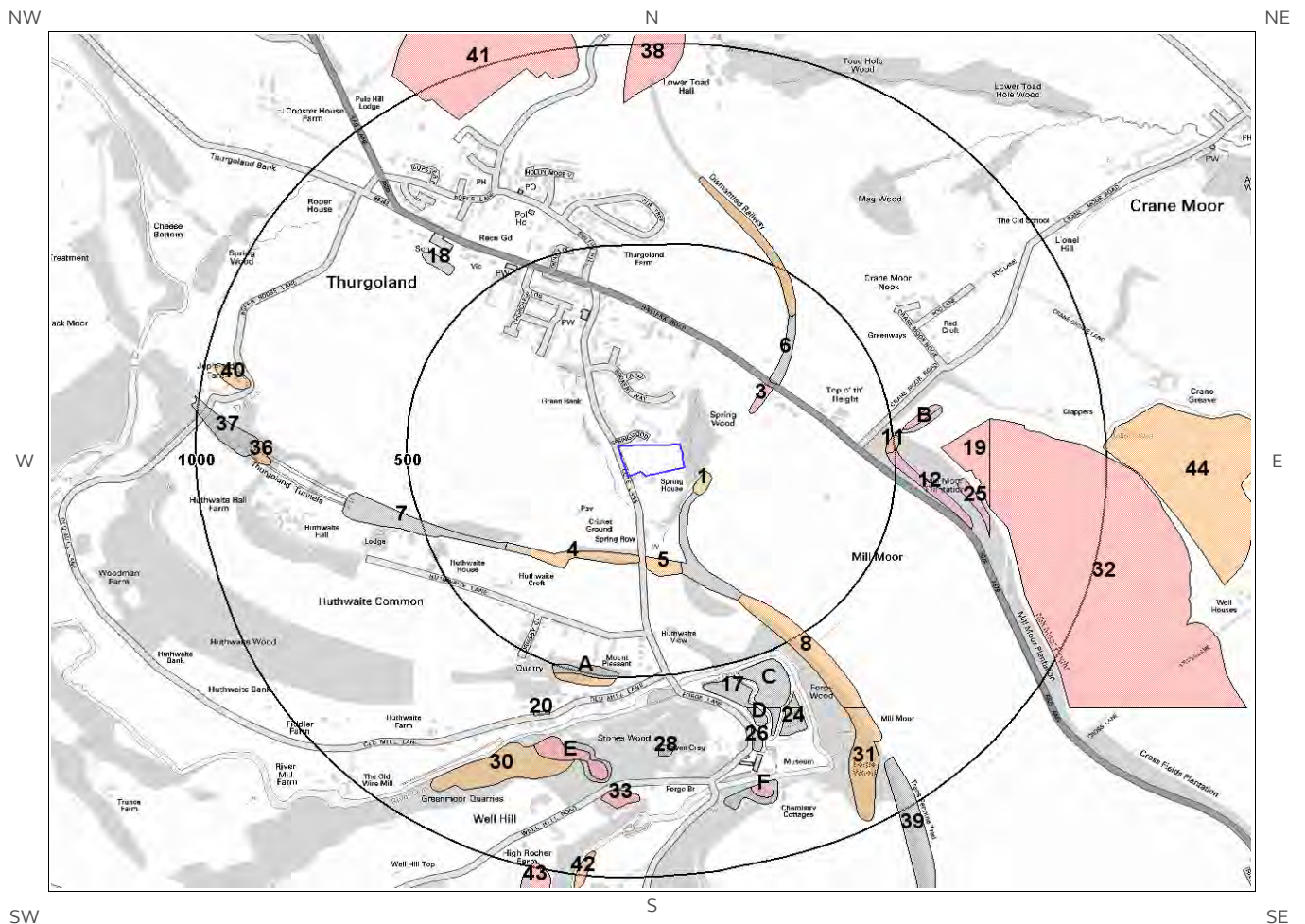
Guidance: The 1:10,000 scale geological interpretation is the most detailed generally available from BGS and is the scale at which most geological surveying is carried out in the field. The database is presented as four types of geology (artificial, mass movement, superficial and bedrock), although not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

The definitions of coverage are as follows:

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

1 Geology (1:10,000 scale).

1.1 Artificial Ground Map (1:10,000 scale)



Artificial Ground Legend

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1. Geology 1:10,000 scale

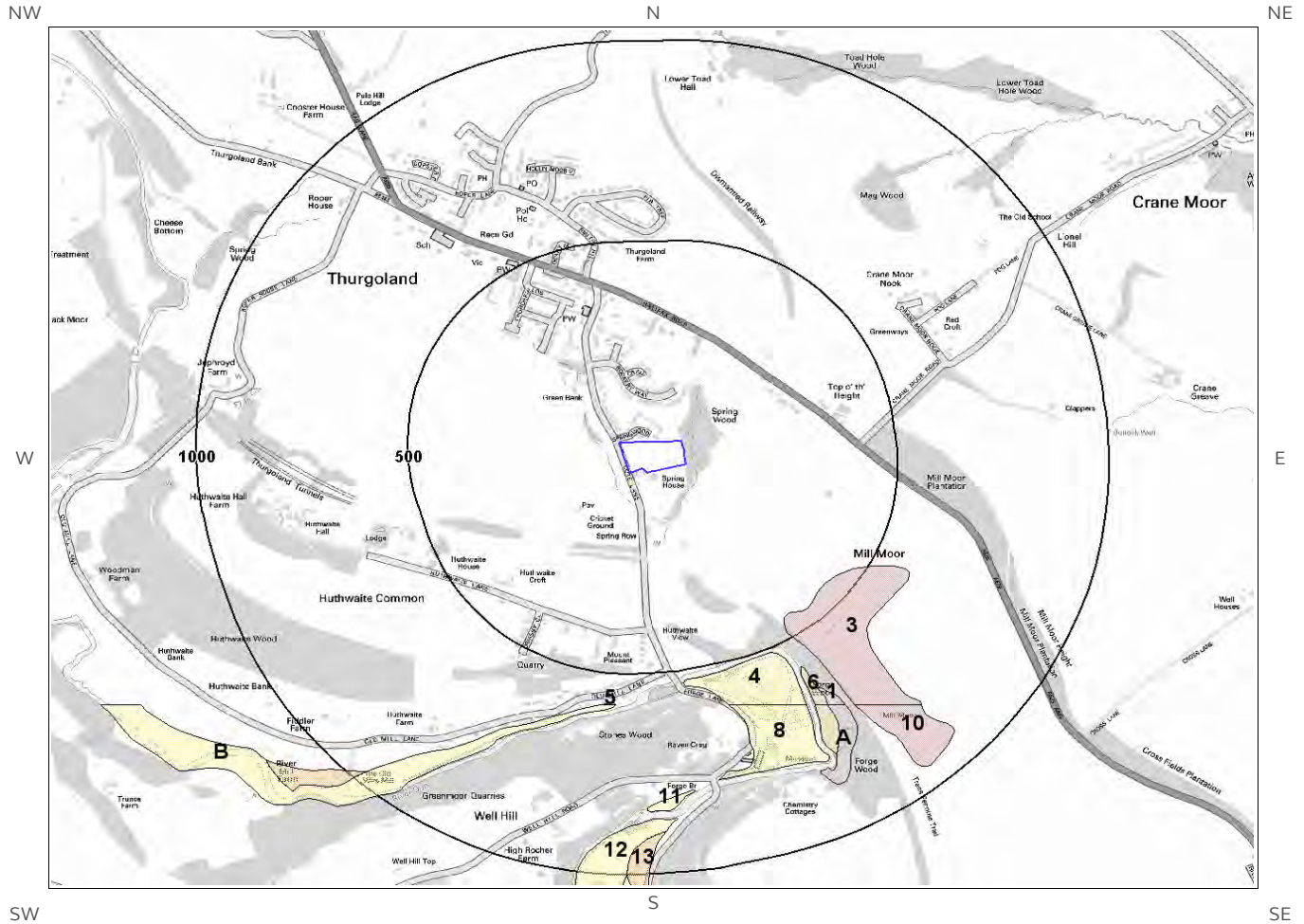
1.1 Artificial Ground

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

Are there any records of Artificial/ Made Ground within 500m of the study site boundary at 1:10,000 scale? Yes

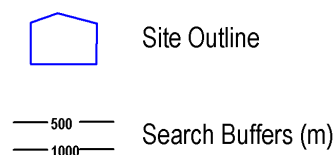
ID	Distance	Direction	LEX Code	Description	Rock Description
1	43.0	SE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
2	63.0	S	WGR-VOID	Worked Ground (Undivided)	Void
3	183.0	NE	WMGR-ARTDP	Infilled Ground	Artificial Deposit
4	191.0	S	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
5	201.0	S	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
6	266.0	NE	WGR-VOID	Worked Ground (Undivided)	Void
7	329.0	SW	WGR-VOID	Worked Ground (Undivided)	Void
8	343.0	SE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
9	414.0	NE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
10A	477.0	S	WGR-VOID	Worked Ground (Undivided)	Void
11	477.0	E	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
12	480.0	E	DDGR-UNKNOWN	Disturbed Ground (Undivided)	Unknown/unclassified Entry

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



Artificial Ground Legend

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1.2 Superficial Deposits and Landslips

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

1.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary at 1:10,000 scale? Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
3	442.0	SE	HEAD-DMTN	Head - Diamicton	Diamicton

1.2.2 Landslip

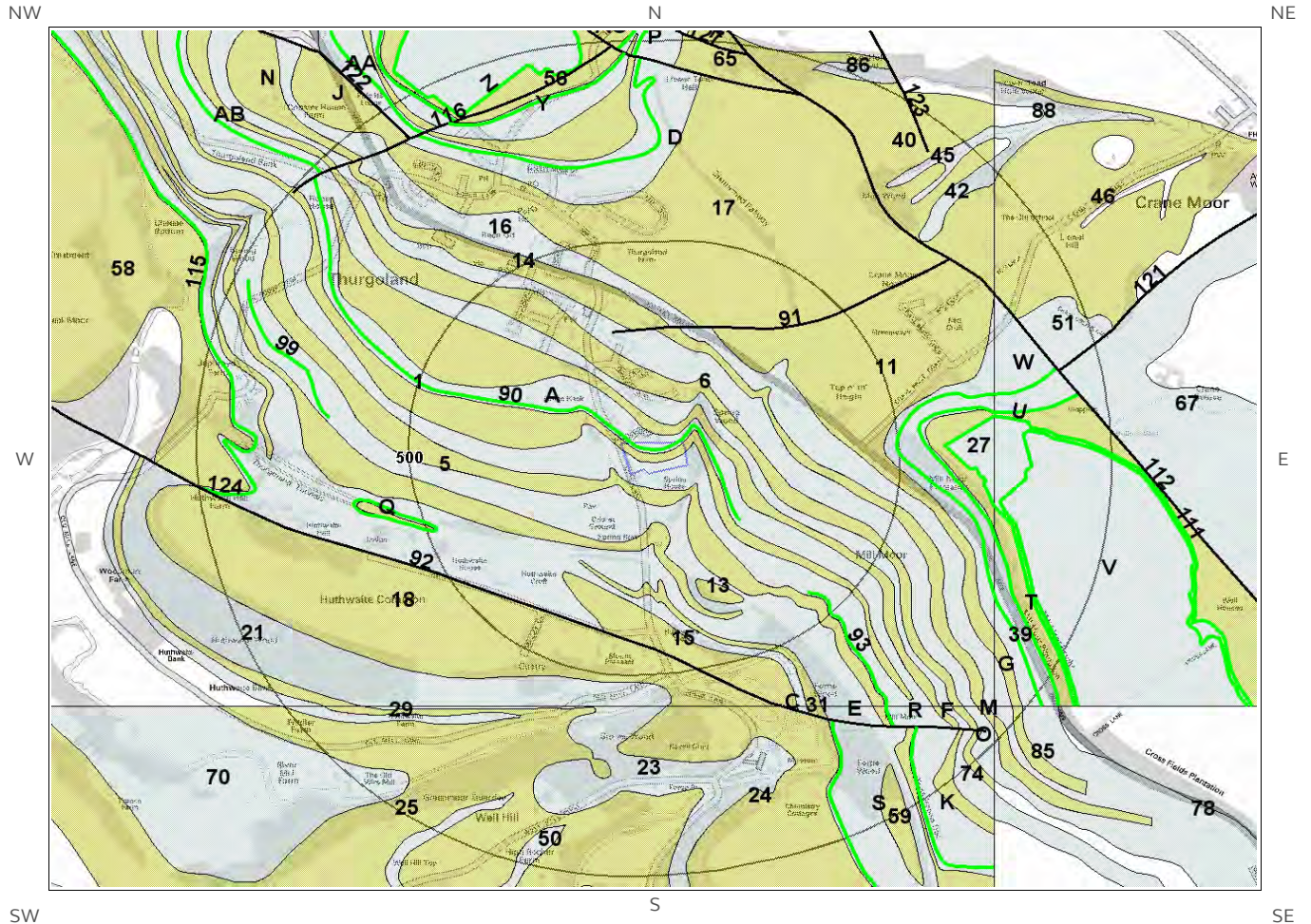
Are there any records of Landslip within 500m of the study site boundary at 1:10,000 scale? No

Database searched and no data found.

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

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

1.3 Bedrock and Faults Map (1:10,000 scale)

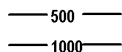


Bedrock and Faults Legend

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Site Outline



Search Buffers (m)

1.3 Bedrock and Faults

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

1.3.1 Bedrock/ Solid Geology

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

ID	Distance (m)	Direction	LEX Code	Description	Rock Age
1	0.0	On Site	PF-SDST	Penistone Flags - Sandstone	Langsettian Sub-age
2A	0.0	On Site	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
3	20.0	SW	PF-SDST	Penistone Flags - Sandstone	Langsettian Sub-age
4A	20.0	N	PF-SDST	Penistone Flags - Sandstone	Langsettian Sub-age
5	40.0	SW	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
6	102.0	N	PF-SDST	Penistone Flags - Sandstone	Langsettian Sub-age
7	121.0	S	PF-SDST	Penistone Flags - Sandstone	Langsettian Sub-age
8	133.0	NE	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
9	191.0	NE	PF-SDST	Penistone Flags - Sandstone	Langsettian Sub-age
10	209.0	NE	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
11	243.0	NE	PF-SDST	Penistone Flags - Sandstone	Langsettian Sub-age
12	245.0	SW	PF-SDST	Penistone Flags - Sandstone	Langsettian Sub-age
13	281.0	S	PF-SDST	Penistone Flags - Sandstone	Langsettian Sub-age
14	282.0	N	PF-SDST	Penistone Flags - Sandstone	Langsettian Sub-age
15	283.0	SW	GR-SDST	Grenoside Sandstone - Sandstone	Langsettian Sub-age
16	287.0	N	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
17	290.0	N	PF-SDST	Penistone Flags - Sandstone	Langsettian Sub-age
18	389.0	S	GR-SDST	Grenoside Sandstone - Sandstone	Langsettian Sub-age
19B	464.0	E	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
20Q	486.0	W	GR-SDST	Grenoside Sandstone - Sandstone	Langsettian Sub-age

1.3.2 Faults

Are there any records of Faults within 500m of the study site boundary at 1:10,000 scale? Yes

ID	Distance (m)	Direction	Category Description	Feature Description
90	0.0	On Site	ROCK	Coal seam, inferred
91	277.0	N	FAULT	Normal fault, inferred
92	389.0	S	FAULT	Normal fault, inferred

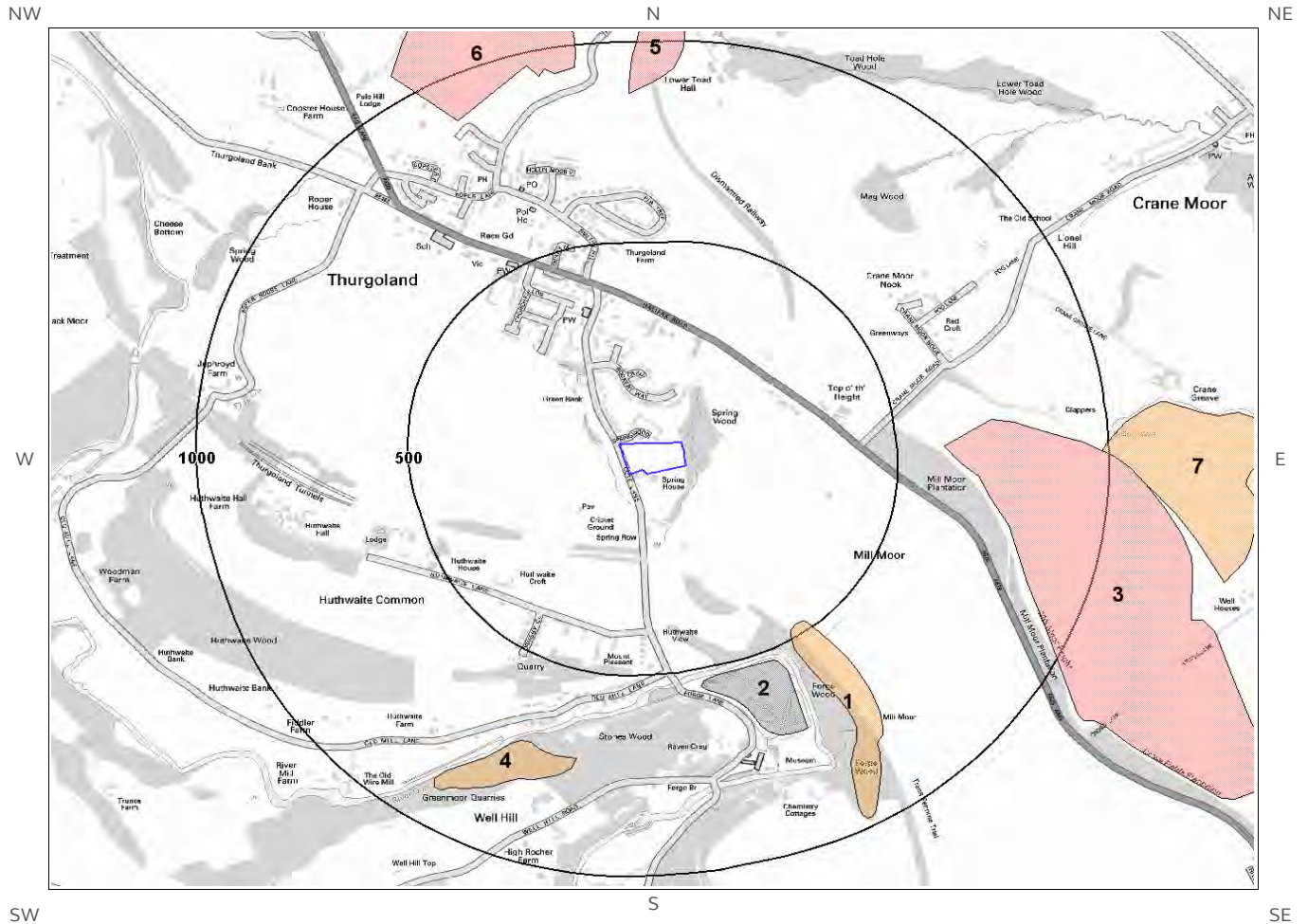
ID	Distance (m)	Direction	Category Description	Feature Description
93	425.0	SE	ROCK	Coal seam, inferred
94Q	479.0	W	ROCK	Coal seam, inferred
95B	496.0	E	ROCK	Coal seam, inferred

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

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

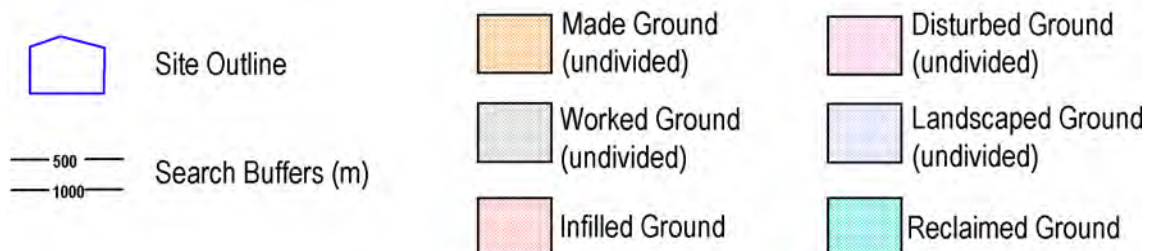
2 Geology 1:50,000 Scale

2.1 Artificial Ground Map



Ground Workings Legend

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2. Geology 1:50,000 scale

2.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 087

2.1.1 Artificial/ Made Ground

Are there any records of Artificial/ Made Ground within 500m of the study site boundary? Yes

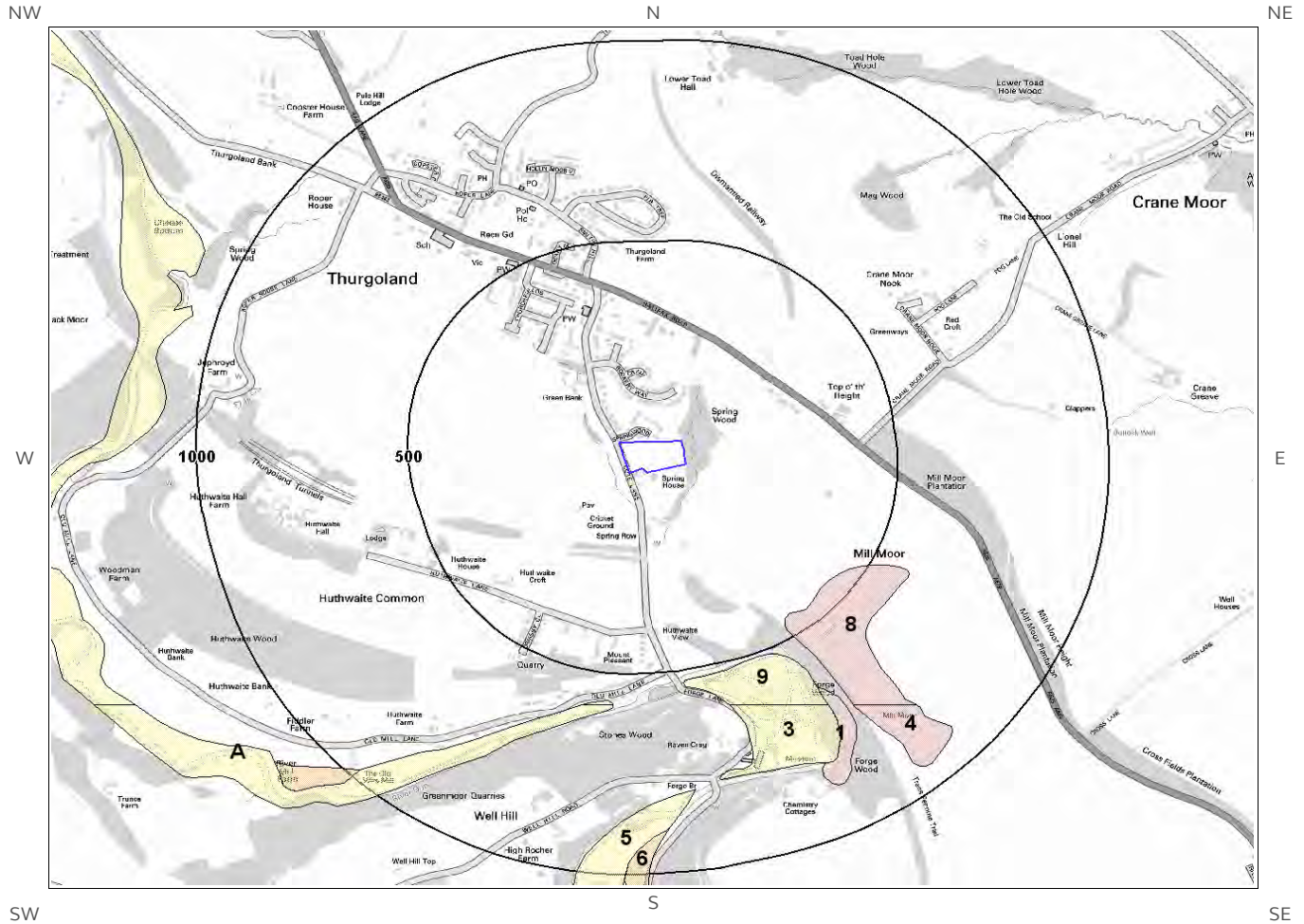
ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	471.0	SE	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

2.1.2 Permeability of Artificial Ground

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

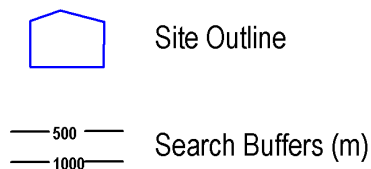
Database searched and no data found.

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



Ground Workings Legend

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2.2 Superficial Deposits and Landslips

2.2.1 Superficial Deposits/ Drift Geology

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

ID	Distance	Direction	LEX Code	Description	Rock Description
8	443.0	SE	HEAD-DMTN	HEAD	DIAMICTON

2.2.2 Permeability of Superficial Ground

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

Database searched and no data found.

2.2.3 Landslip

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

Database searched and no data found.

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

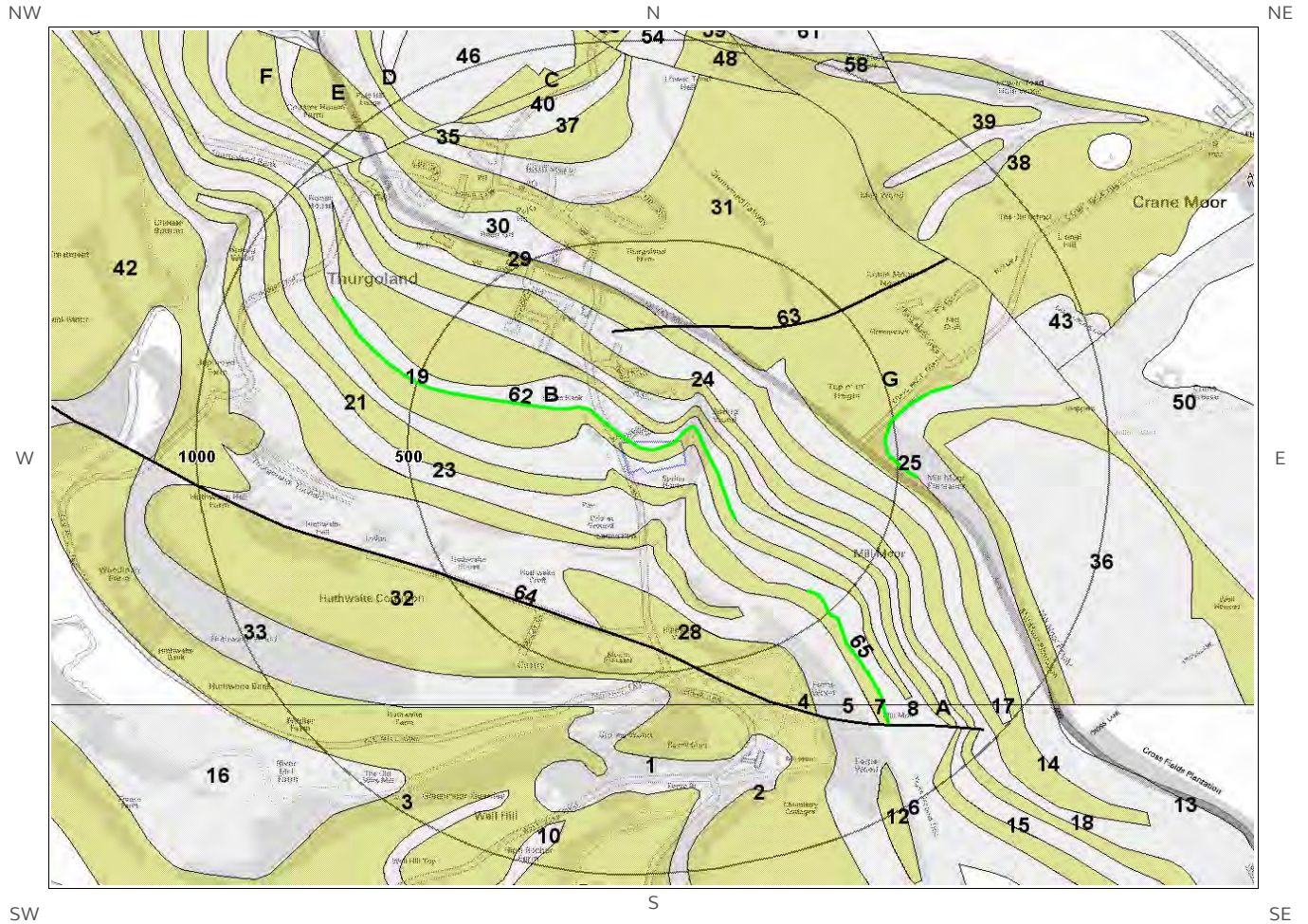
This Geology shows the main components as discrete layers, there are: Artificial/ Made Ground, Superficial/ Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

2.2.4 Landslip Permeability

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

Database searched and no data found.

2.3 Bedrock and Faults Map (1:50,000 scale)

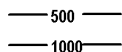


Ground Workings Legend

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Site Outline



Search Buffers (m)

2.3 Bedrock, Solid Geology & Faults

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 087

2.3.1 Bedrock/Solid Geology

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

ID	Distance	Direction	LEX Code	Rock Description	Rock Age
19	0.0	On Site	PF-SDST	PENISTONE FLAGS - SANDSTONE	WESTPHALIAN
20B	0.0	On Site	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
21	14.0	SW	PF-SDST	PENISTONE FLAGS - SANDSTONE	WESTPHALIAN
22B	21.0	N	PF-SDST	PENISTONE FLAGS - SANDSTONE	WESTPHALIAN
23	42.0	SW	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
24	104.0	N	PF-SDST	PENISTONE FLAGS - SANDSTONE	WESTPHALIAN
25	130.0	NE	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
26G	190.0	NE	PF-SDST	PENISTONE FLAGS - SANDSTONE	WESTPHALIAN
27	220.0	NE	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
28	261.0	S	GR-SDST	GRENOSIDE SANDSTONE - SANDSTONE	WESTPHALIAN
29	281.0	N	PF-SDST	PENISTONE FLAGS - SANDSTONE	WESTPHALIAN
30	287.0	N	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
31	290.0	N	PF-SDST	PENISTONE FLAGS - SANDSTONE	WESTPHALIAN
32	389.0	S	GR-SDST	GRENOSIDE SANDSTONE - SANDSTONE	WESTPHALIAN

2.3.2 Permeability of Bedrock Ground

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

Distance	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Fracture	High	Low
0.0	On Site	Fracture	High	Moderate
14.0	SW	Fracture	High	Moderate
21.0	N	Fracture	High	Moderate

2.3.3 Faults

Are there any records of Faults within 500m of the study site boundary?

Yes

ID	Distance	Direction	Category Description	Feature Description
62	0.0	On Site	ROCK	Coal seam, inferred
63	277.0	N	FAULT	Fault, inferred
64	389.0	S	FAULT	Fault, inferred
65	425.0	SE	ROCK	Coal seam, inferred
66G	474.0	E	ROCK	Coal seam, inferred

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

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

3 Radon Data

3.1 Radon Affected Areas

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

3.2 Radon Protection

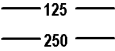
Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? No radon protective measures are necessary.

4 Ground Workings Map



Ground Workings Legend

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

4 Ground Workings

4.1 Historical Surface Ground Working Features derived from Historical Mapping

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

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

ID	Distance (m)	Direction	NGR	Use	Date
1A	190.0	NE	429499 400864	Cuttings	1891
2A	222.0	NE	429487 400836	Cuttings	1903
3	227.0	NE	429493 400858	Cuttings	1932
4	234.0	NE	429468 400801	Cuttings	1951
5	249.0	SW	428954 400371	Unspecified Heap	1951

4.2 Historical Underground Working Features derived from Historical Mapping

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

Are there any Historical Underground Working Features within 1000m of the study site boundary? Yes

The following Historical Underground Working Features are provided by Groundsure:

ID	Distance (m)	Direction	NGR	Use	Date
Not shown	631.0	E	429935 400475	Unspecified Old Levels	1932
Not shown	641.0	W	428360 400589	Tunnel	1987
Not shown	641.0	W	428360 400589	Tunnel	1951
Not shown	641.0	W	428360 400589	Tunnel	1965
Not shown	643.0	W	428348 400591	Tunnel	1891
Not shown	643.0	W	428348 400591	Tunnel	1932
Not shown	643.0	W	428348 400591	Tunnel	1903

ID	Distance (m)	Direction	NGR	Use	Date
Not shown	646.0	W	428334 400582	tunnel	1987
Not shown	676.0	E	429950 400478	Unspecified Old Levels	1951
Not shown	686.0	S	428952 399915	Unspecified Shaft	1951
Not shown	696.0	S	428913 399917	Unspecified Shaft	1932

4.3 Current Ground Workings

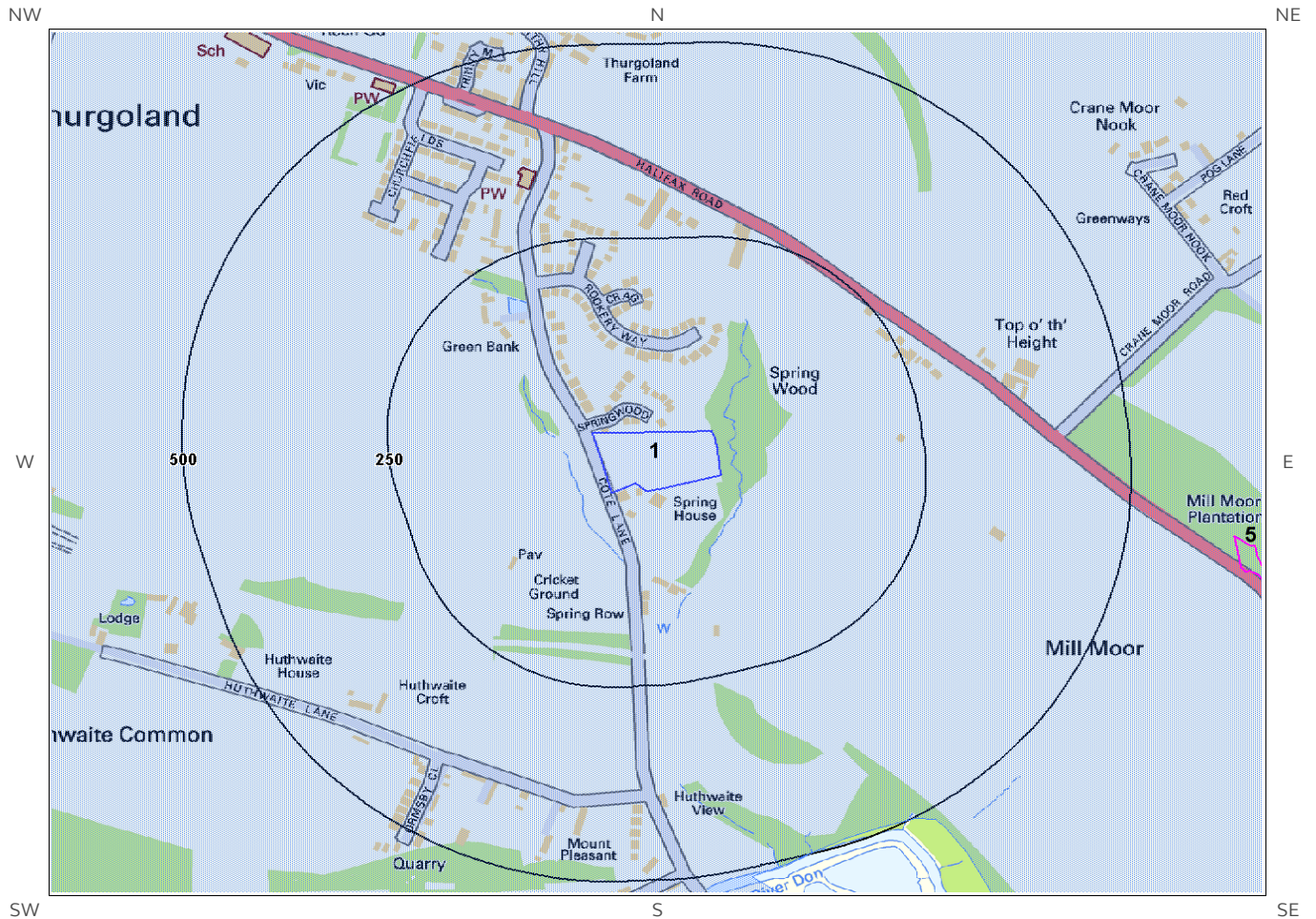
This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary? Yes

The following Current Ground Workings information is provided by British Geological Survey:

ID	Distance (m)	Direction	NGR	Commodity Produced	Pit Name	Type of working	Status
Not shown	487.0	S	429155 400090	Sandstone	Huthwaite Quarries	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	506.0	S	429074 400076	Sandstone	Huthwaite	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	513.0	S	429000 400085	Sandstone	Huthwaite	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	714.0	S	428990 399880	Sandstone	Victoria	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	745.0	S	429080 399835	Sandstone	Greenmoor	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	813.0	S	429121 399764	Sandstone	Well Hill Road	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	948.0	NE	430089 401127	Sandstone	Crane Moor	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased

5 Mining, Extraction & Natural Cavities Map



Mining, Extraction and Natural Cavities Legend

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5 Mining, Extraction & Natural Cavities

5.1 Historical Mining

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

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

The following Historical Mining information is provided by Groundsure:

ID	Distance (m)	Direction	NGR	Details	Date
5	631.0	E	429935 400475	Unspecified Old Levels	1932
Not shown	676.0	E	429950 400478	Unspecified Old Levels	1951
Not shown	686.0	S	428952 399915	Unspecified Shaft	1951
Not shown	696.0	S	428913 399917	Unspecified Shaft	1932

5.2 Coal Mining

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

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

The following Coal Mining information provided by the Coal Authority is not represented on Mapping:

Distance (m)	Direction	Details
0.0	On Site	The study site is located within the specified search distance of an identified mining area. Further details concerning this can be obtained from the Coal Authority Helpline on 0845 762 6848.

5.3 Johnson Poole and Bloomer

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

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

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

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

Are there any Non-Coal Mining areas within 1000m of the study site boundary? Yes

The following non-coal mining information is provided by the BGS:

ID	Distance (m)	Direction	Name	Commodity	Assessment of likelihood
1	0.0	On Site	Sheffield Area	Vein Mineral/Iron ore	Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered
Not shown	577.0	S	Sheffield Area	Vein Mineral/Iron ore	Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered
Not shown	723.0	E	Sheffield Area	Vein Mineral/Iron ore	Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered
Not shown	940.0	SE	Sheffield Area	Vein Mineral/Iron ore	Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered

5.5 Non-Coal Mining Cavities

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

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

Database searched and no data found.

5.6 Natural Cavities

This dataset provides information based on Peter Brett Associates natural cavities database.

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

Database searched and no data found.

5.7 Brine Extraction

This data provides information from the Coal Authority issued on behalf of the Cheshire Brine Subsidence Compensation Board.

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

Database searched and no data found.

5.8 Gypsum Extraction

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

Are there any Gypsum Extraction areas within 1000m of the study site boundary?

No

Database searched and no data found.

5.9 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level..

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

No

Database searched and no data found.

5.10 Clay Mining

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

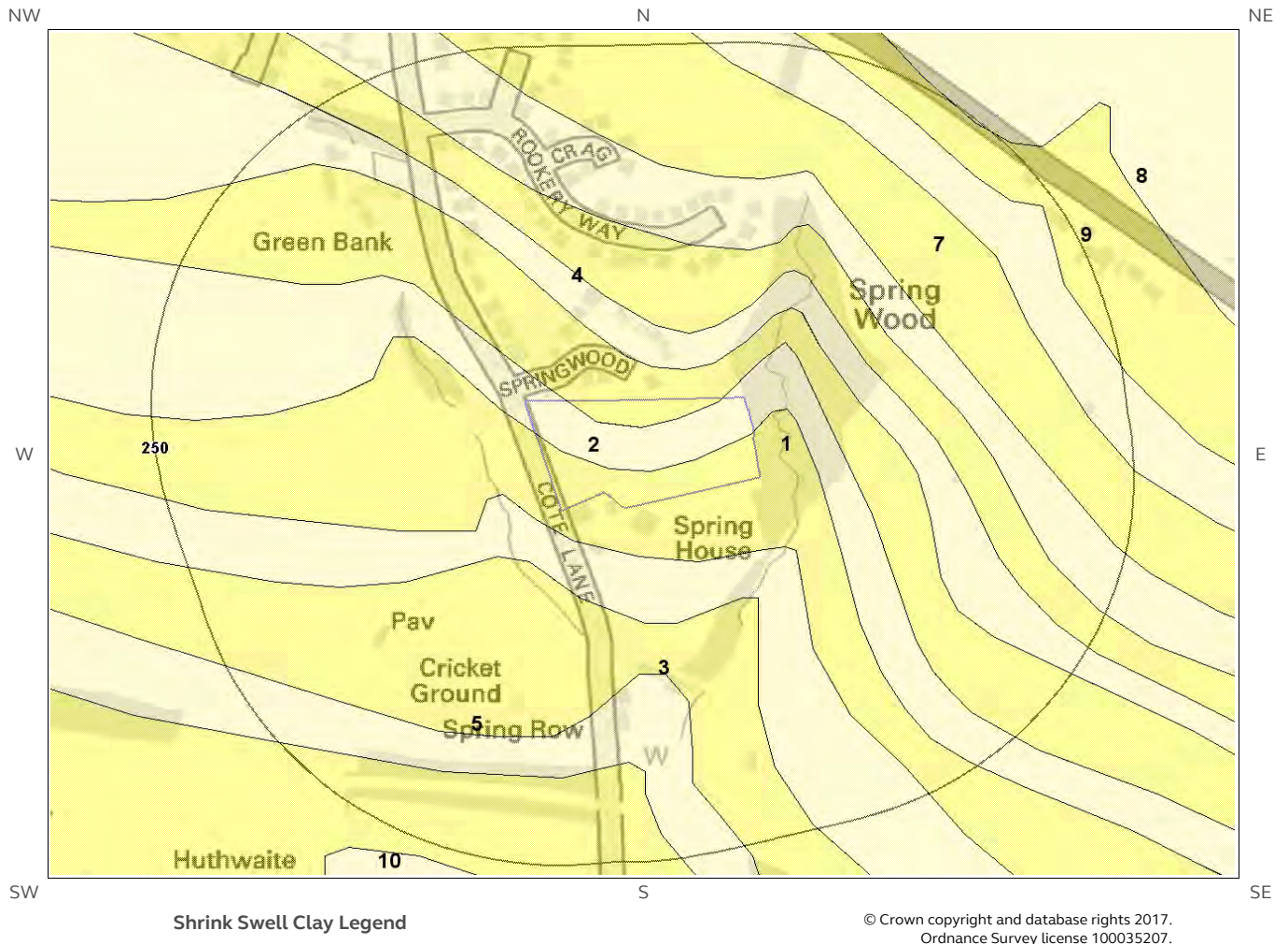
Are there any Clay Mining areas within 1000m of the study site boundary?

No

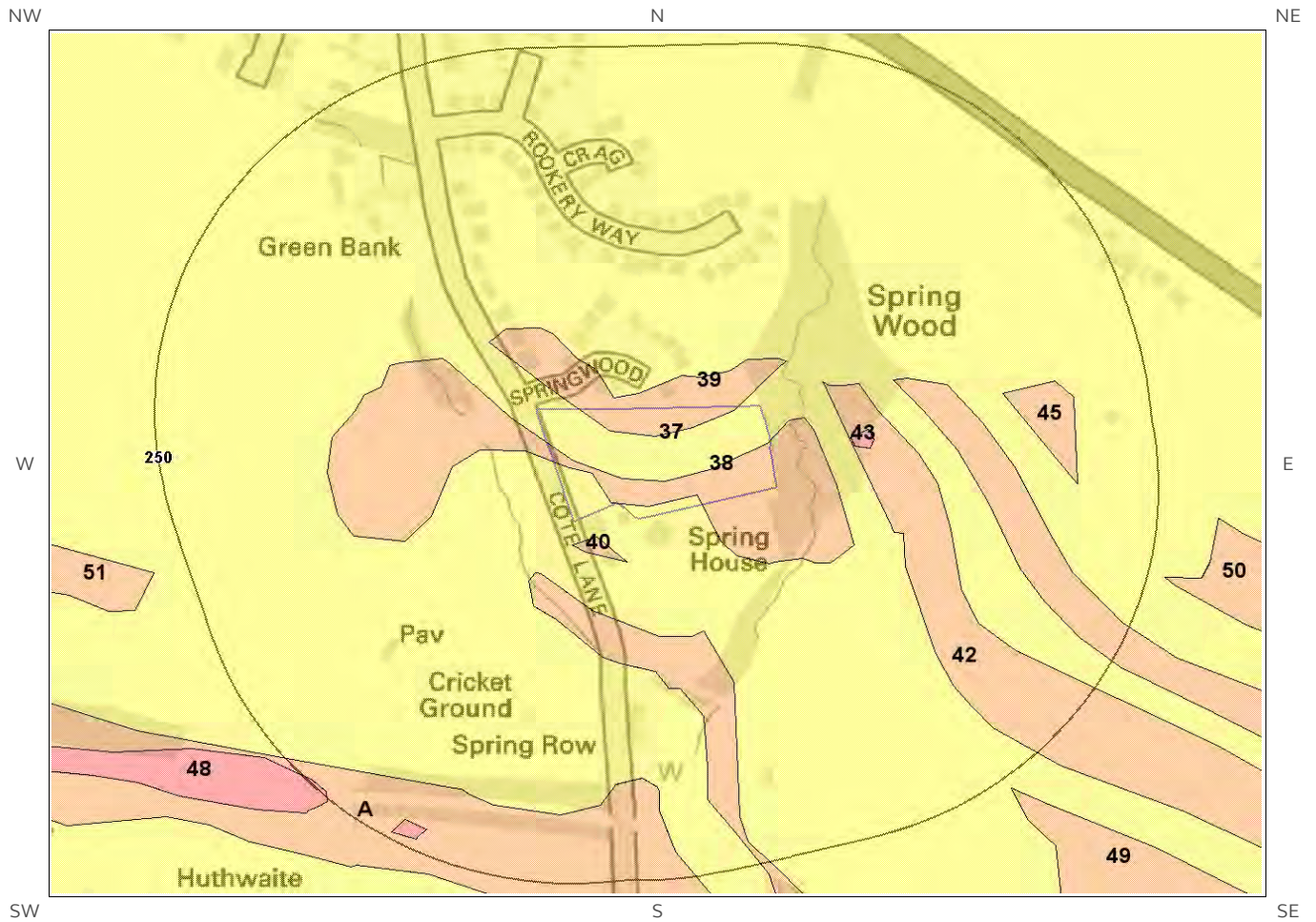
Database searched and no data found.

6 Natural Ground Subsidence

6.1 Shrink-Swell Clay Map



6.2 Landslides Map

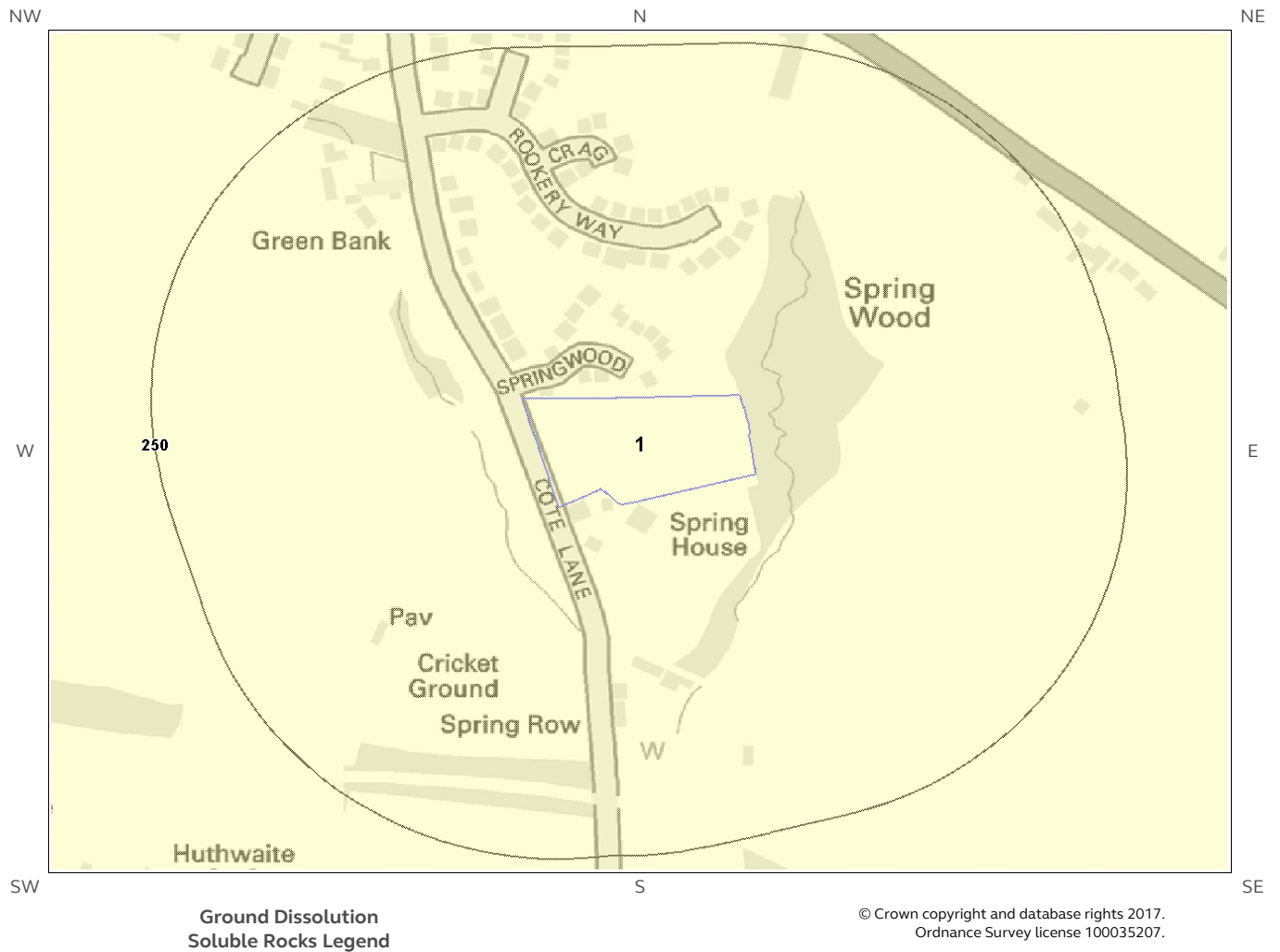


Landslides Legend

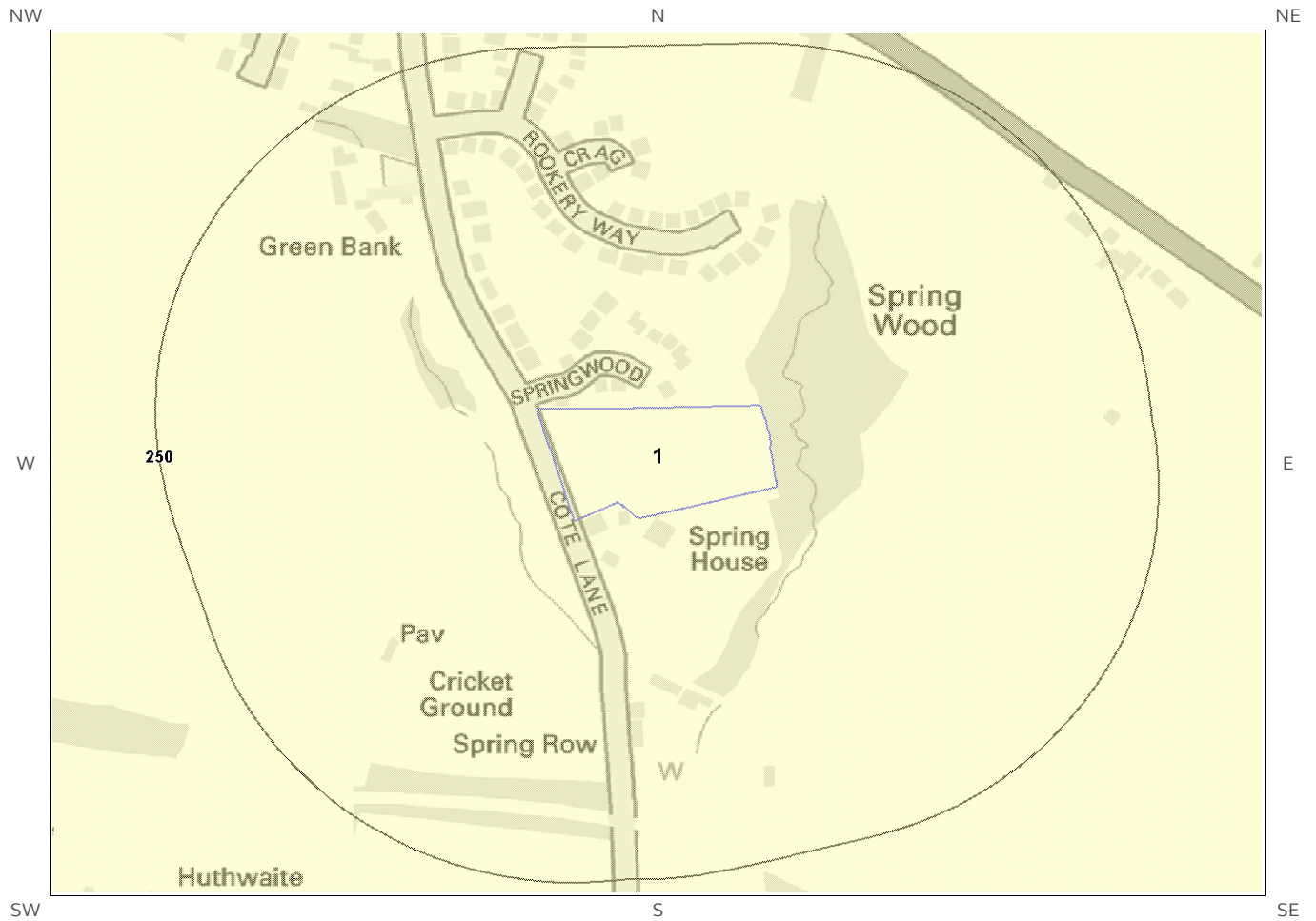
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6.3 Ground Dissolution of Soluble Rocks Map



6.4 Compressible Deposits Map

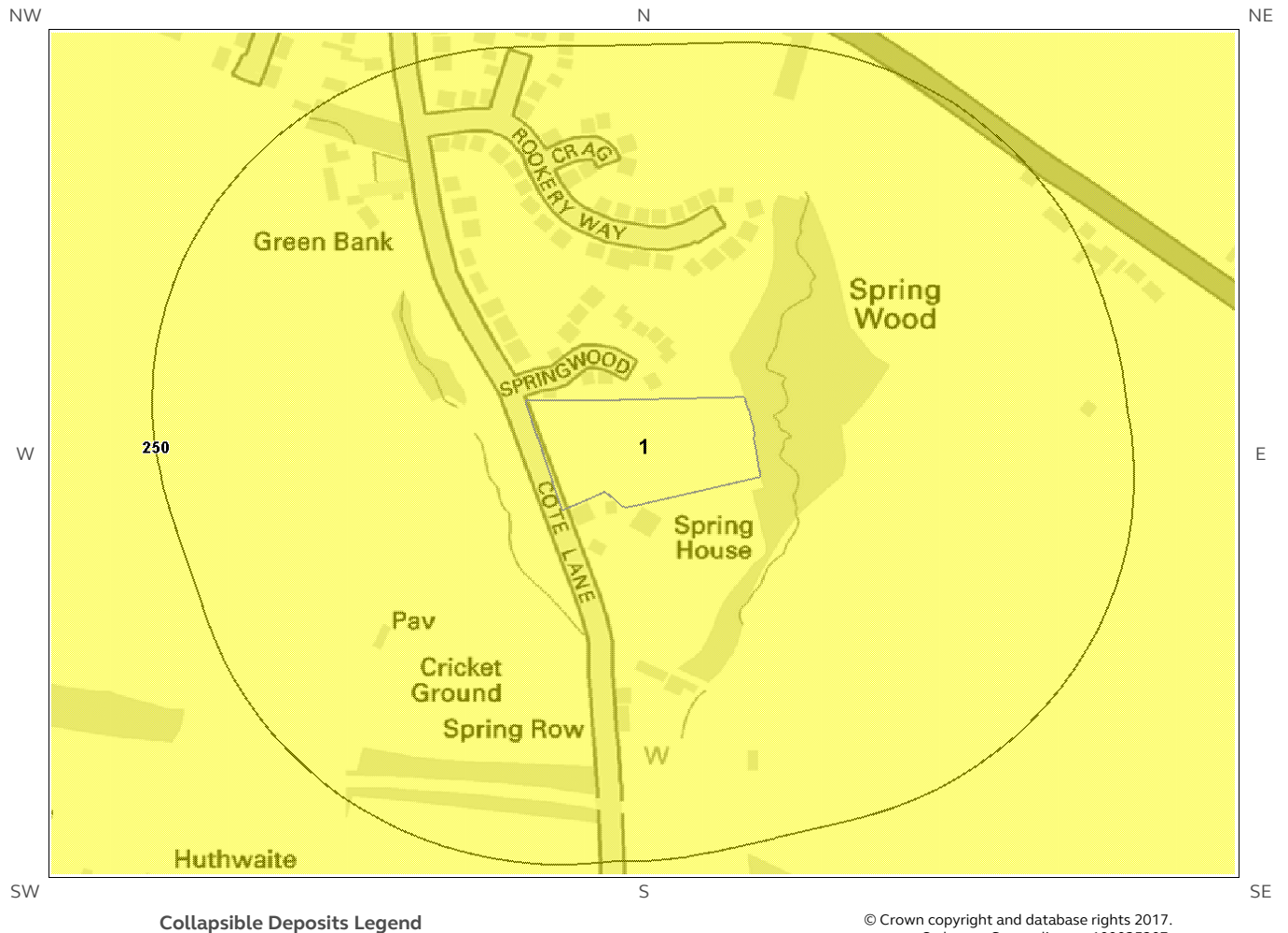


Compressible Deposits Legend

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6.5 Collapsible Deposits Map

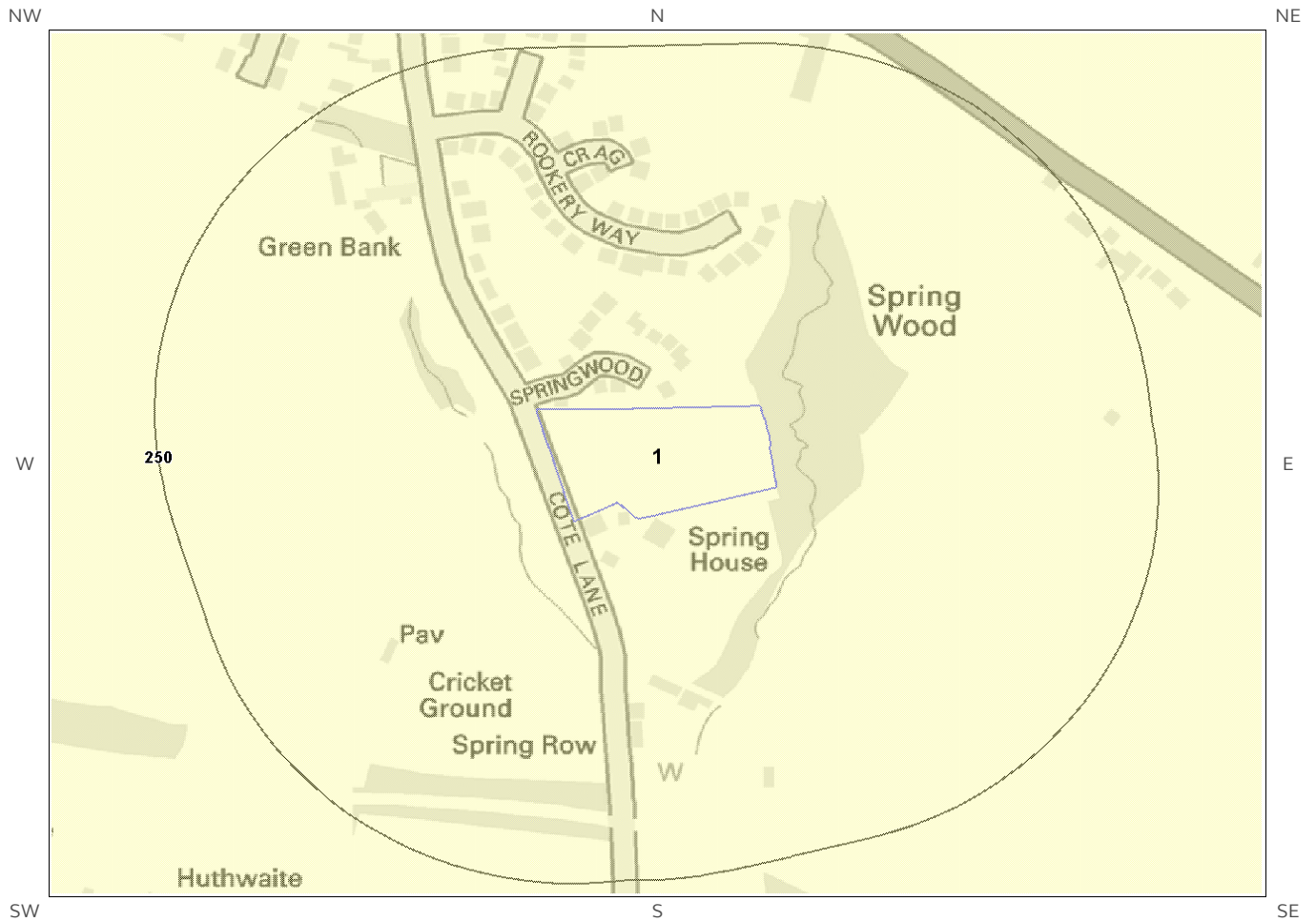


Collapsible Deposits Legend

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6.6 Running Sand Map



Running Sand Legend

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6 Natural Ground Subsidence

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

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

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

6.1 Shrink-Swell Clays

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

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.
2	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
3	14.0	SW	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
4	21.0	N	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
5	42.0	SW	Very Low	Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.

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

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
37	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.
38	0.0	On Site	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property - no significant increase in insurance risk due to natural slope instability problems.
39	0.0	On Site	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property - no significant increase in insurance risk due to natural slope instability problems.
40	15.0	S	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property - no significant increase in insurance risk due to natural slope instability problems.
41	42.0	SW	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property - no significant increase in insurance risk due to natural slope instability problems.
42	44.0	E	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property - no significant increase in insurance risk due to natural slope instability problems.

6.3 Ground Dissolution of Soluble Rocks

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

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

6.4 Compressible Deposits

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

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

6.5 Collapsible Deposits

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

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

6.6 Running Sands

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

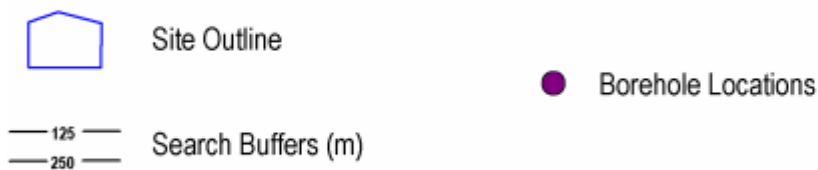
ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due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

7 Borehole Records Map



Borehole Records Legend

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7 Borehole Records

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

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

6

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
1	5.0	N	429200 400660	SE20SE50	-1.0	COTE LANE THURGOLAND TP 1
2	15.0	N	429170 400670	SE20SE53	-1.0	COTE LANE THURGOLAND TP 4
3	24.0	N	429220 400680	SE20SE52	-1.0	COTE LANE THURGOLAND TP 3
4	35.0	N	429190 400690	SE20SE51	-1.0	COTE LANE THURGOLAND TP 2
5	35.0	N	429150 400690	SE20SE54	-1.0	COTE LANE THURGOLAND TP 5
6	55.0	N	429140 400710	SE20SE55	-1.0	COTE LANE THURGOLAND TP 6

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

8 Estimated Background Soil Chemistry

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

6

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

Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg	<100 mg/kg
14.0	SW	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
32.0	N	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
39.0	SW	RuralSoil	<15 mg/kg	<1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg	<100 mg/kg

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

9 Railways and Tunnels

9.1 Tunnels

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

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

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

Database searched and no data found.

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

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

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

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

Database searched and no data found.

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

9.2 Historical Railway and Tunnel Features

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

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

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

ID	Distance (m)	Direction	NGR	Details	Date
1	32	SE	429261 400450	Railway Sidings	1951
2	39	SE	429391 400683	Railway Sidings	1903
3	193	S	429289 400330	Railway Sidings	1932
4	194	S	429279 400334	Railway Sidings	1903

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

9.3 Historical Railways

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

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

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

Distance (m)	Direction	Status
204	S	Abandoned
207	S	Abandoned
211	S	Abandoned

Multiple sections of the same track may be listed in the detail above
Any records that have been identified are represented on the Railways and Tunnels Map.

9.4 Active Railways

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

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

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

Database searched and no data found.

Multiple sections of the same track may be listed in the detail above
Any records that have been identified are represented on the Railways and Tunnels Map.

9.5 Railway Projects

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

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

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

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

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

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

Contact Details

e.Michael D Joyce Associates LLP
Telephone: (0)1924 360458
mdja@geoenvironmental.co.uk



British Geological Survey Enquiries

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email: enquiries@bgs.ac.uk
Web: www.bgs.ac.uk

BGS Geological Hazards Reports and general geological enquiries



British Gypsum

British Gypsum Ltd
East Leake
Loughborough
Leicestershire
LE12 6HX



The Coal Authority

200 Lichfield Lane
Mansfield
Notts NG18 4RG
Tel: 0345 7626 848
DX 716176 Mansfield 5
www.coal.gov.uk



Public Health England

Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
<https://www.gov.uk/government/organisations/public-health-england>
Email: enquiries@phe.gov.uk
Main switchboard: 020 7654 8000



Johnson Poole & Bloomer Limited

Harris and Pearson Building, Brettell Lane
Brierley Hill, West Midlands
DY5 3LH
Tel: +44 (0) 1384 262 000
Email: enquiries.gs@jpb.co.uk
Website: www.jpb.co.uk



Ordnance Survey

Adanac Drive, Southampton
SO16 0AS
Tel: 08456 050505
Website: <http://www.ordnancesurvey.co.uk/>



Getmapping PLC

Virginia Villas, High Street, Hartley Witney,
Hampshire RG27 8NW
Tel: 01252 845444
Website: <http://www1.getmapping.com/>



Peter Brett Associates

Caversham Bridge House
Waterman Place
Reading
Berkshire RG1 8DN

Tel: +44 (0)118 950 0761 E-mail: reading@pba.co.uk
Website: <http://www.peterbrett.com/home>



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Standard Terms and Conditions

Groundsure's Terms and Conditions can be viewed online at this link:
<https://www.groundsure.com/terms-and-conditions-sept-2016/>



Michael D Joyce Associates LLP
6, South Parade,
Wakefield, WF1 1LR

Groundsure Reference: HMD-354-4038823

Your Reference: Cote_Lane_-_Thurgoland

Report Date 3 Jul 2017

Report Delivery Method: Email - pdf

Enviro Insight

Address: 429222, 400661,

Dear Sir/ Madam,

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

If you need any further assistance, please do not hesitate to contact our helpline on (0)1924 360458 quoting the above report reference number.

Yours faithfully,

Michael D Joyce Associates LLP

Enc.
Groundsure Enviroinsight

Address: 429222, 400661,
Date: 3 Jul 2017
Reference: HMD-354-4038823
Client: Michael D Joyce Associates LLP



Aerial Photograph Capture date: 07-Jun-2013
Grid Reference: 429205,400624
Site Size: 0.97ha

Report Reference: HMD-354-4038823
Client Reference: Cote_Lane_-_Thurgoland

Contents Page

Contents Page	3
Overview of Findings	6
Using this report	10
1. Historical Land Use	11
1. Historical Industrial Sites	12
1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping	12
1.2 Additional Information – Historical Tank Database	13
1.3 Additional Information – Historical Energy Features Database	13
1.4 Additional Information – Historical Petrol and Fuel Site Database	13
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	13
1.6 Potentially Infilled Land	14
2. Environmental Permits, Incidents and Registers Map	15
2. Environmental Permits, Incidents and Registers	16
2.1 Industrial Sites Holding Licences and/or Authorisations	16
2.1.1 Records of historic IPC Authorisations within 500m of the study site	16
2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site	16
2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site	16
2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site	16
2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site	16
2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site	17
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	17
2.1.8 Records of Licensed Discharge Consents within 500m of the study site	17
2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site	18
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	18
2.2 Dangerous or Hazardous Sites	18
2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents	18
2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site	18
2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site	18
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	19
3. Landfill and Other Waste Sites Map	20
3. Landfill and Other Waste Sites	21
3.1 Landfill Sites	21
3.1.1 Records from Environment Agency/Natural Resources Wales landfill data within 1000m of the study site	21
3.1.2 Records of Environment Agency/Natural Resources Wales historic landfill sites within 1500m of the study site	21
3.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site	22
3.1.4 Records of Landfills from Local Authority and Historical Mapping Records within 1500m of the study site	22
3.2 Other Waste Sites	22
3.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site	22
3.2.2 Records of Environment Agency/Natural Resources Wales licensed waste sites within 1500m of the study site	22
4. Current Land Use Map	24
4. Current Land Uses	25
4.1 Current Industrial Data	25
4.2 Petrol and Fuel Sites	25
4.3 National Grid High Voltage Underground Electricity Transmission Cables	25
4.4 National Grid High Pressure Gas Transmission Pipelines	26

5. Geology	27
5.1 Artificial Ground and Made Ground.....	27
5.2 Superficial Ground and Drift Geology	27
5.3 Bedrock and Solid Geology	27
6 Hydrogeology and Hydrology	28
6a. Aquifer Within Superficial Geology	28
6b. Aquifer Within Bedrock Geology and Abstraction Licenses	29
6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses	30
6d. Hydrogeology – Source Protection Zones within confined aquifer	31
6e. Hydrology – Detailed River Network and River Quality	32
6. Hydrogeology and Hydrology	33
6.1 Aquifer within Superficial Deposits.....	33
6.2 Aquifer within Bedrock Deposits.....	33
6.3 Groundwater Abstraction Licences.....	34
6.4 Surface Water Abstraction Licences.....	34
6.5 Potable Water Abstraction Licences.....	35
6.6 Source Protection Zones.....	35
6.7 Source Protection Zones within Confined Aquifer.....	35
6.8 Groundwater Vulnerability and Soil Leaching Potential.....	35
6.9 River Quality.....	36
6.9.1 Biological Quality:.....	36
6.9.2 Chemical Quality:.....	36
6.10 Detailed River Network.....	36
6.11 Surface Water Features.....	37
7a. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)	38
7b. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS)	39
Map	39
7 Flooding	40
7.1 River and Coastal Zone 2 Flooding.....	40
7.2 River and Coastal Zone 3 Flooding.....	40
7.3 Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating.....	40
7.4 Flood Defences.....	40
7.5 Areas benefiting from Flood Defences.....	40
7.6 Areas benefiting from Flood Storage.....	41
7.7 Groundwater Flooding Susceptibility Areas.....	41
7.7.1 Are there any British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site? Yes.....	41
7.7.2 What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions?.....	41
7.8 Groundwater Flooding Confidence Areas.....	41
8. Designated Environmentally Sensitive Sites Map	42
8. Designated Environmentally Sensitive Sites	43
8.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:.....	43
8.2 Records of National Nature Reserves (NNR) within 2000m of the study site:.....	43
8.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:.....	43
8.4 Records of Special Protection Areas (SPA) within 2000m of the study site:.....	43
8.5 Records of Ramsar sites within 2000m of the study site:.....	43
8.6 Records of Ancient Woodland within 2000m of the study site:	44
8.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:.....	45
8.8 Records of World Heritage Sites within 2000m of the study site:.....	45
8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:	45

8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:	45
8.11 Records of National Parks (NP) within 2000m of the study site:	45
8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:.....	45
8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:.....	46
8.14 Records of Green Belt land within 2000m of the study site:.....	46
9. Natural Hazards Findings	47
9.1 Detailed BGS GeoSure Data.....	47
9.1.1 Shrink Swell.....	47
9.1.2 Landslides.....	47
9.1.3 Soluble Rocks.....	47
9.1.4 Compressible Ground.....	48
9.1.5 Collapsible Rocks.....	48
9.1.6 Running Sand.....	48
9.2 Radon.....	48
9.2.1 Radon Affected Areas.....	48
9.2.2 Radon Protection.....	49
10. Mining	50
10.1 Coal Mining.....	50
10.2 Non-Coal Mining.....	50
10.3 Brine Affected Areas	50
Contact Details	51
Standard Terms and Conditions	53

Overview of Findings

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

Section 1: Historical Industrial Sites	On-site	0-50	51-250	251-500
1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping	0	2	10	20
1.2 Additional Information – Historical Tank Database	0	0	0	3
1.3 Additional Information – Historical Energy Features Database	0	0	3	3
1.4 Additional Information – Historical Petrol and Fuel Site Database	0	0	0	0
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	0	0	4	0
1.6 Potentially Infilled Land	0	0	5	16
Section 2: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	0
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	0
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	0	0	0
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	0	0	0	1
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
2.1.8 Records of Licensed Discharge Consents	0	0	0	3
2.1.9 Records of Water Industry Referrals	0	0	0	0
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	0	0	0	0
2.2 Records of COMAH and NIHHS sites	0	0	0	0
2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents				
2.3.1 National Incidents Recording System, List 2	0	0	0	1
2.3.2 National Incidents Recording System, List 1	0	0	0	0
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0

Section 3: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000-1500
3.1 Landfill Sites						
3.1.1 Environment Agency/Natural Resources Wales Registered Landfill Sites	0	0	0	0	0	Not searched
3.1.2 Environment Agency/Natural Resources Wales Historic Landfill Sites	0	0	0	1	1	2
3.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	0	0
3.1.4 Records of Landfills in Local Authority and Historical Mapping Records	0	0	0	0	0	0
3.2 Landfill and Other Waste Sites Findings						
3.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	Not searched	Not searched
3.2.2 Environment Agency/Natural Resources Wales Licensed Waste Sites	0	0	0	0	0	3

Section 4: Current Land Use	On-site	0-50m	51-250	251-500
4.1 Current Industrial Sites Data	0	0	1	Not searched
4.2 Records of Petrol and Fuel Sites	0	0	0	2
4.3 National Grid Underground Electricity Cables	0	0	0	0
4.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 5: Geology						
5.1 Are there any records of Artificial Ground and Made Ground present beneath the study site?	No					
5.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site?	None					
5.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.						

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

Section 6: Hydrogeology and Hydrology

0-500m

	On-site	0-50m	51-250	251-500	501-1000	1000-1500
6.9 Is there any Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site?	No	No	No	No	No	Yes
6.10 Detailed River Network entries within 500m of the site	0	2	4	6	Not searched	Not searched
6.11 Surface water features within 250m of the study site	No	Yes	Yes	Not searched	Not searched	Not searched

Section 7: Flooding

7.1 Are there any Environment Agency Zone 2 floodplains within 250m of the study site?	No					
7.2 Are there any Environment Agency/Natural Resources Wales Zone 3 floodplains within 250m of the study site	No					
7.3 What is the Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site?	Very Low					
7.4 Are there any Flood Defences within 250m of the study site?	No					
7.5 Are there any areas benefiting from Flood Defences within 250m of the study site?	No					
7.6 Are there any areas used for Flood Storage within 250m of the study site?	No					
7.7 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Potential at Surface					
7.8 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	Low					

Section 8: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	0
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
8.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
8.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
8.5 Records of Ramsar sites	0	0	0	0	0	0
8.6 Records of Ancient Woodlands	0	0	0	0	6	18
8.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	0
8.8 Records of World Heritage Sites	0	0	0	0	0	0
8.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0

Section 8: Designated Environmentally Sensitive Sites	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0
8.11 Records of National Parks	0	0	0	0	0	0
8.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
8.13 Records of Nitrate Vulnerable Zones	0	0	0	1	1	1
8.14 Records of Green Belt land	0	1	0	0	3	1

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

Section 10: Mining	
10.1 Are there any coal mining areas within 75m of the study site?	Yes
10.2 Are there any Non-Coal Mining areas within 50m of the study site boundary?	Yes
10.3 Are there any brine affected areas within 75m of the study site?	No

Using this report

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

1. Historical Industrial Sites

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

2. Environmental Permits, Incidents and Registers

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

3. Landfills and Other Waste Sites

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

4. Current Land Uses

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

5. Geology

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

6. Hydrogeology and Hydrology

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

7. Flooding

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

8. Designated Environmentally Sensitive Sites

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

9. Natural Hazards

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

10. Mining

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

11. Contacts

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

Note: Maps

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

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

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