Environmental
Geotechnical
Specialists

GEOTECHNICAL REPORT

job number	C2752/22/E/4199
date	July 2022
site address	,South View Paddock, Huddersfield HD1 4UE
written by	S. Alexander
checked by	R. Palmer
issued by	S. Alexander

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<ENVIRONMENTAL> <GEOTECHNICAL>

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Appendices

Report on a Geotechnical Investigation

Location:	South View, Paddock Huddersfield, HD1 4UE
For:	Mr. M Saleem
Report No.	C2752/22/E/4199
Report date:	July 2022

For and on behalf of **Rogers Geotechnical Services Ltd**

Scott Alexander BSc FGS
Geo-environmental Engineer

Rob Palmer MSc FGS ACIEH
Senior Geo-environmental Engineer

Report Summary[1]

Item	Comments	Section
Development	Construction of a single residential dwelling.	1.
Geology	No superficial geology over Rough Rock Sandstone.	4.
Strata Conditions	Nominal thickness of topsoil overlying variable thickness of made ground. Natural deposits comprise wholly of sandstone bedrock.	5. & 5.1
Groundwater	None recorded.	5.2
Foundation Design	Shallow strip or spread foundations constructed within the natural bedrock.	8.1
Rock Face Stability	Analysis suggest rock face is inherently stable with respect to developments on the site.	8.2
Ground-floor	Suspended ground-floor slab.	8.3
Pavement Design	Assumed CBR = <1%	8.4
Effect of Sulphates	DS-2 AC-1s.	8.5

[1] This summary should not be relied upon to provide a comprehensive review. All of the information contained in this document should be considered.

1. Introduction

It is understood that the land at South View, Paddock is to be developed by the construction of a single residential dwelling with front and rear gardens. It should be noted that the site is situated at the top of a near vertical rock face; a cutting that was created for the railway. Consequently, a site investigation has been undertaken in accordance with the instruction from the client. This work was required in order to determine the nature of the underlying soils and rock, to assess their engineering properties and to assist in the design of safe and economical foundations for the proposed development. The stability of the rock face has also been assessed to decide whether the development shall affect the integrity and stability. This report describes the work undertaken, presents the data obtained and discusses the ground conditions in relation to the proposed works.

2. Limitations

The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of the laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between borehole positions, these are for guidance only and no liability can be accepted for their accuracy.

This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue. It should be appreciated that this report only considers the geotechnical aspects of the site and not environmental or ground gas (carbon dioxide, or methane) issues.

3. Fieldworks

It should be appreciated that a site visit was complete by an RGS engineer prior to the fieldworks phase commencing. A walkover was undertaken to assess the site conditions, and also to visually inspect the rock face from the grounds of Paddock Bowling Club, which is on the southern side of the railway line.

The fieldworks were undertaken on the 17th June 2022 and included the following:

- Four windowless sample boreholes (WS1 to WS4).
- Standard Penetration Tests (SPT) within two boreholes (WS3 and WS4).
- Three dynamic probes adjacent to WS1, WS3, and WS4.

The investigatory locations are shown on the site plan which is presented in Appendix 1 to this report.

3.1 Windowless Sample Boreholes

These boreholes were sunk using a drive-in windowless sampler. The cores were undertaken in 1m lengths and reduced in diameter from 90mm for the first 1m through 80mm, 70mm and 60mm

for subsequent 1m increments. The recovered cores were sealed and returned to the laboratory for logging and subsequent testing. The soils were described in general accordance with BS5930: 2015+A1: 2020, and full descriptions are given on the windowless sample records which are presented in Appendix 2. Also included on these records are the core diameters and percentages of core recovered.

3.2 Standard Penetration Tests

Standard penetration tests (SPT) were undertaken at regular depth increments within windowless sample borehole WS02. The SPT was conducted in accordance with the procedures given in BS EN ISO 22476: Part 3: 2005 +A1: 2011, and the results are summarised on the borehole record. During this work an automatic trip hammer of 63.5kg falling through 750mm was employed to drive either a cone or split barrel sampler assembly into the ground and the recovered barrel samples were retained in air tight plastic containers.

3.3 Dynamic Probes

Dynamic penetration tests were undertaken adjacent to the windowless sample boreholes in accordance with the procedure given in BS EN ISO 22476: Part 2: 2005 +A1: 2011, using the super heavy penetrometer (DPSH). This probe consists of a 63.5kg mass falling through 750mm onto an anvil, which drives a 50mm diameter cone into the ground. The number of blows required to drive the cone through successive 100mm increments are recorded as the N_{100} values. The results of the dynamic penetration tests are tabulated and presented as bar charts of N_{100} values versus depth in Appendix 3.

4. Review and Summary of Published Data

As a part of this desk study the following data has been considered:

- Site Plan - Appendix 1
- Groundsure GeoInsight Report - Appendix 2

The data obtained from the above-mentioned sources has been summarised below[2].

Table 1: Geological Data for the Site

BGS MAPPING DATA			
Strata Type	**Strata Name[3]**	**Previous Name[4]**	**Description[4]**
Made Ground/Fill	N/A	N/A	Not indicated on site although previous construction may have resulted in the presence of made ground.
Superficial Geology	N/A	N/A	Not indicated to underlie the site.

[2] This report is a summary only and reference must be made in full to the information provided in the Groundsure Report.
3 Sources: British Geological Survey (NERC) Map Sheets 77; Huddersfield; Solid and Drift Edition, and Geology of Britain Viewer [*online resource from www.bgs.ac.uk*]
4 Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [*online resource from www.bgs.ac.uk*]

Solid Geology	Rough Rock Sandstone	-	Coarse-grained feldspathic sandstone, cross-bedded.
GEOLOGICAL FEATURES			
Type	**Location**	**Features**	**Comments**
Mining Activity	On-site	Coal mining	The site is not located within coal mining affected area as defined by The Coal Authority.
		Non-coal Mining	Vein Minerals - Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered
Faults	462m SW	Fault	Normal fault, displacement unknown. This fault is not anticipated to affect the site.
Landslip Deposits	No data	No data	No records of landslip deposits.
BGS BOREHOLE DATA			
Reference[5]	**Location**	**Strata Description**	**Depth**
No records within 250m of the site.			
NATURAL GROUND SUBSIDENCE & HAZARDS[6]			
Type		**Risk Rating**	
Potential for shrinking or swelling clay ground stability		Negligible.	
Potential for running sand ground stability		Negligible.	
Potential for compressible ground stability		Very Low.	
Potential for collapsible ground stability hazards		Very Low.	
Potential for landslide ground stability		Very Low.	
Potential for ground dissolution stability		Negligible.	
Radon		The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level. No radon protective measures are necessary.	

The Groundsure report indicates that there is a cutting related to the railway to the south of the site. The boundary of the cutting is shown to be 3m from the boundary of the site.

[5] http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html
[6] See Groundsure report

5. Strata Conditions

In accordance with the geology of the area, the succession has been shown to include the following:

Table 2: Generalised Strata Profile

Depth m below ground level to underside of layer	Strata Type	Positions Layer Revealed	Groundwater Strikes m below ground level
0.10 - 0.20	Topsoil (Dark brown sandy gravelly SILT).	ALL	None
0.40 – 1.40	Made Ground (Loose fine to medium SAND).	ALL	None
2.45	MADE GROUND. (Medium dense very gravelly SAND).	WS4	None
+0.87 - +3.60	Extremely weak SANDSTONE.	WS2 and WS4	None

'+' denotes that the strata extended below the termination depth of the investigated positions, thus the extent of the deposit is only proven to the depths indicated.

5.1 General Strata

In general, below a thin capping of topsoil, variable thicknesses of made ground generally comprising of sand were encountered between 0.40m and 2.45m depth. These deposits were locally thickest towards the centre of the site. Weathered sandstone was then recovered at WS2 and WS4 below the made ground. Abrupt refusal was met below the made ground in WS1 and WS3. Given the abrupt nature of the refusal, which was likely due to the presence and hardness of the underlying rock, the windowless sampling equipment was unable to recover any deposits of the rock, thus it is only inferred that the refusal correlates to sandstone bedrock.

5.2 Groundwater

No groundwater was observed during this investigation. However, it should be appreciated that the normal rate of boring does not permit the recording of an equilibrium water level for any one strike. Moreover, groundwater levels are subject to seasonal variation or changes on local drainage conditions.

6. Insitu Testing

6.1 Standard Penetration Tests

The standard penetration tests carried out in WS3 and WS4 are summarised in the following table:

Table 3: Summary of Standard Penetration Tests

Strata	Depth Range (m)	SPT 'N' (Blows/300mm)		Comments
		Granular soils	Cohesive soils	
MADE GROUND. (Granular)	0.22m to 1.5m	9 - 17	-	SPT's indicate granular material is in a loose to medium dense in-situ condition

6.2 Dynamic Penetration Tests

Dynamic penetration tests were undertaken adjacent to selected windowless sample borehole positions and a summary of the results is presented below:

Table 4: Summary of Dynamic Penetration Tests

Position	Blows/100mm			Refusal type (Effective/ Abrupt)[7]	Comments
	0 - 2	3 - 10	10+		
	Depth to which blow count range was observed (m)				
DP1	1.6	-	1.7	Abrupt	Low and variable blow counts to abrupt refusal at 1.61m
DP3	0.7	-	0.8	Abrupt	Low and variable blow counts to abrupt refusal at 0.82m
DP4	0.2 1.3	0.4 3.3	0.7 4.3	Effective	Variable blow counts at shallow depth. Gradual increase ein blow counts from 1.30m to effective refusal at 4.30m

7. Laboratory Testing - Geotechnical

The following programme of laboratory testing has been undertaken on samples obtained during this investigation:

- Soluble sulphate content — BS 1377-3:2018+A1:2021: Pt3: 7.3
- pH value — BS 1377-3:2018+A1:2021: Pt3: 12

[7] Abrupt refusal: obstruction or bedrock encountered. Effective refusal: +25 blows/100mm.

The test results are presented in Appendix 4 and are summarised below:

Table 5: Summary of Geotechnical Test Results

Test type	Number of tests	Range of results		Comments
Soluble sulphate & pH	3	SO_4 pH	0.061 to 0.74g/l 8.2 to 9.1	DS-2 AC1 concrete. Mobile water conditions.

8. Discussion of Ground Conditions - Geotechnical

It is understood that this site is to be developed by the construction of a single residential dwelling with front and rear gardens. The precise structural details are not currently known, thus the discussion below is of a generalised nature. However, it is evident that the building will be placed approximately 14m from the rock face edge, with a at least a 3m easement between the top of the face and southern site boundary.

8.1 Foundations

It cannot be recommended that foundations be constructed directly within the topsoil or made ground revealed at this site. These soils are present in a weak and variable condition such that excessive total and or differential settlement could occur under moderately light surface loading. The foundations should be extended through the unsuitable overburden and extend to deposits of suitable bearing capacity. On this basis, it is considered that foundations could include the provision of strip and spread footings placed upon the underlying rock. The results of this investigation indicate that extremely weak sandstone will be revealed at a shallowest depth of around 0.60m. However, the made ground has been proven to be variable across the site and therefore foundations should be stepped accordingly to penetrate fully through the fill. The sandstone would possess a significant bearing capacity, probably being in excess of 250kN/m^2. Therefore, at a typical foundation load for a house the factor of safety against general shear failure will be high, probably exceeding 10. In addition, it is considered that nominal settlements will occur under the action of the proposed increase in load.

Should seepages of groundwater be encountered it is considered that they could be dealt with using a simple form of de-watering. Such a system could include the excavation of sumps from which the water could be pumped.

The stability of the excavation faces cannot be guaranteed thus temporary support to the excavation faces may become necessary unless the foundations are constructed using trench-fill techniques. In this method the foundation trenches should be excavated, inspected and backfilled with concrete as a continuous operation. Under no circumstances should operatives be allowed to enter unsupported excavations.

8.2 Rock Face Stability

Towards the south of the proposed development area, a cutting for a railway with exposed sandstone rock faces is present. The rock face falls outside the landownership of the client. As such a visual inspection only has been carried out from the top of the slope and from the opposite (southern) side of the cutting. In addition, it was not possible to undertake boreholes, or take

physical measurements, upon the slope or face itself. The inspection was undertaken to determine any presence of inherent weakness or potential areas of failure within the rock face.

During the site walkover, it became apparent that the southern boundary of the property is marked by a chain link fence. The area to the south of the fence is outside of the boundary of the site. There is around a 4m wide area of heavily vegetated soft landscaping from the chain link boundary fence to the top of the rock face where several mature trees were observed. This is inferred to be an easement to the top of the slope under the ownership of Network Rail.

Observations of the slope from the opposite side of the cutting revealed the rock face immediately south of the site has been battered approximately 75°, and the face had been treated with netting to control rockfall. Presumably, such measures have been completed by Network Rail to protect their assets.

Inspection of topographic data suggest that the slope is approximately 11m in height. With regards to the slope approximately 20% of the slope was obscured by heavy vegetation and tree cover predominantly towards the top of the slope. The remainder of the face was covered by netting further obscuring the view of the face.

Approximately 10m further along the slope to the east, a section became generally free from vegetation and uncovered by netting. An inspection of the rock face at this section indicated the cutting face comprised entirely of medium to thickly bedded sandstone bedrock, with sub-horizontal dipping beds towards the east, south-east trending approximately parallel to the direction of the cutting. This bedrock is inferred to be representative of the Rough Rock sandstone shown to be exposed in the cutting in the published geological data.

It was apparent that jointing is present within the rock, with near vertical joints trending approximately north-north-west to south-south-east and north-north-east to south-south-west, both sets of which intersect with the sub-horizontal bedding planes. No significant cobbles or boulders were observed at the base of the slope to indicate that recent rockfall had occurred. It is reasoned that the netting coincides with the location of the heavily vegetated areas where tree root action may loosen some blocks.

The proposed development is expected to be in the centre of the site, with the southernmost supporting wall positioned a minimum of 10m from the southern boundary. As a result, the proposed building is likely to be a minimum of 14m from the top of the cutting.

As no direct information for the face is available, the following parameters have been assumed from the in-situ nature of the rock from established literature sources[8].

Table 6: Assumed Effective Stress Parameters

Description	Bulk unit weight, γ (kN/m^3)	Angle of friction, ϕ' (°)	Effective cohesion c' (kN/m^2)
SANDSTONE (Rough Rock)	21	40	0

The following potential modes of failure[9] are outlined in the sections below.

[8] Waltham A.C., *Foundations of Engineering Geology*, Chapter 23, Strength Properties of Rocks, Page 48, Blackie Academic & Professional, 1994.
[9] Hoek E. & Bray J.W., *Rock Slope Engineering*, Chapters 5, 7 and 8, Institution of Minerals, Mining and Metallurgy, 1974.

8.2.1 Rotational Failure

It must be appreciated that the slope appears to be in a relatively stable condition at present. Due to the presence of rock at relatively shallow depths beneath the site, the risks of deep seated rotational failures is reduced. Any planes of rotation would have to shear the rock below the site which would not be expected given the likely forces on such planes. It is estimated that the friction angle of the rock will be approximately 40°. This friction angle exceeds the near horizontal dip of the rocks, therefore it has been determined that the rock is highly unlikely to slip along any bedding planes.

8.2.2 Plane Failure

For Plane Failure to occur on the slope, four conditions are required to be met:

I. The plane on which sliding occurs must strike parallel or nearly parallel (within approximately ± 20°) to the slope face.
II. The failure plane must 'daylight' in the slope face. The dip of a potential failure plane must be smaller than the slope face.
III. The dip of the failure plane must be *greater* than the angle of friction of the plane
IV. Release surfaces must provide negligible resistance to sliding in the rock mass to define lateral boundaries of the slide.

The above conditions have been compared to those observed for the rock face, to quantify the risk from plane failure.

I. The beds have been observed to dip approximately sub-horizontal towards the east generally parallel to the cutting. This suggests the strike is likely to be perpendicular to the cutting and sliding is unlikely to occur out of the rock face.
II. The bedding has been observed to be sub-horizontal, thus potential 'daylighting fractures' are unlikely to affect the slope.
III. The dip of the beds are approximately horizontal. The angle of internal friction is likely to be approximately 40°. As such the angle of internal friction, is greater than any potential failure planes.
IV. Joints have been observed in the rock which outline distinct blocks which could define lateral boundaries of failure and allow release of frictional forces between blocks.

In summary three of the main factors which contribute to plane failure (I, II, and III) have not been fulfilled on this occasion. Therefore, plane failure is unlikely to occur.

8.2.3 Wedge Failure

For Wedge Failure to occur the following geometric profile is required:

- Inclination of the slope face > inclination of the line of intersection > angle of internal friction.

In this occasion the line of intersection of the two sets of vertical joints is likely to be approximately vertical and greater than the inclination of the slope face therefore the required geometry for wedge failure has not been fulfilled. Furthermore, the batter of the slope and the stepped nature of the bedrock in the cutting suggests that unless undermining of a bedding plane occurs, failure cannot occur. In addition to this as outlined in 8.2.2 the geometry is not favourable for plane failure due to sliding.

8.2.4 Failure Summary

To summarise the face is generally in a stable condition at present and failure along each of the planes is unlikely to occur due to the geometric profile of the cutting, the shallow dip and direction of the beds, and the engineering and geological properties of the sandstone. Major failure of the slope is unlikely to occur due to surcharging of the top of the slope by the construction of a new residential dwelling placed a minimum of 14m from the top of the slope. Furthermore, due to the approximately horizontal dip of the beds, surcharging of the strata above is likely to improve the friction between bedding planes.

Notwithstanding the above, treatment of the slope including netting and supporting has been observed and limited small-scale spalling from weathering of the rock faces cannot be ruled out for which the protection measures are likely to be attributed. It is considered that the rock face is likely to be routinely inspected by a third party to protect assets. However, such movement is not anticipated to be detrimental to the stability of the proposed property and garden areas.

8.3 Ground-floors

In light of the variability of made ground, it is not recommended that ground bearing ground floor slabs be employed. In this instance it would be necessary to suspend floors between foundation positions, such that the floor loads are transmitted via the foundations to competent soils at depth.

8.4 Access Roads, Drive-ways and Hard-standing

It is considered that any roads or hard-standing at the site could be constructed employing traditional pavement design. A design California Bearing Ratio (CBR) of <2% could be employed in the pavement design[10]. However, it is recommended that proof rolling of the sub-grade be undertaken to establish the suitability of the soils, to expose any soft or weak ground and to ensure the sub-grade is well compacted prior to construction. Any areas of soft or weak ground should be remediated by increasing the sub-base thickness. Alternatively, weak material could be locally removed and replaced with a compacted granular capping layer. If construction were to be undertaken during the winter or after periods of prolonged rainfall, it may be prudent to employ a geotextile and/or a geogrid between the sub-base and sub-grade.

8.5 Effect of Sulphates

In view of the nature of the underlying soils it is considered that the design sulphate class be assessed with reference to Table C1[11], which is provided in BRE Special Digest 1, *Concrete in aggressive ground*: Part C. On the basis of this table and considering the soluble sulphate contents recorded, it can be shown that well compacted buried concrete should be designed in accordance with Class DS-2 requirements. Assuming static groundwater, the table also indicates that the aggressive chemical environment for concrete (ACEC) classification is AC-1s.

In order to evaluate the design chemical (DC) class for the buried concrete at this site reference should be made to Table D1[12], which can be found in Part D, *Specifying concrete for general cast-*

[10] Table 13/2 Design Manual for Roads and Bridges (1995), HA44/9: Volume 4 Section 1 Part 1, Highways Agency.
[11] Table C1, *Aggressive Chemical Environment for Concrete (ACEC) classification for green field locations*
[12] Table D1, *Selection of the DC Class and the number of APMs for concrete elements where the hydraulic gradient due to groundwater is 5 or less: for general in-situ use of concrete.*

in-situ use, of BRE Special Digest 1. From this table it may be shown that for an intended working life of at least 50 years the concrete design class DC-2 is required.

9. Further Work

- This report should be forwarded to the relevant authorities as soon as practicable to ensure they have sufficient time to review and discuss any issues.
- Discussions with groundworkers and service providers for inclusion of services.
- Detailed design of the sub-structure.

10. References

- British Standards Institution (1990) BS1377: *British standard methods of test for soils for civil engineering purposes,* B.S.I., London.
- British Standards Institution (2015) BS5930: *Code of practice for site investigations*, B.S.I., London.
- British Geological Survey (NERC) (2022), BGS, Keyworth.
  - Geology of Britain Viewer: (*http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html)*
  - Lexicon of Named Rock Units: (*http://www.bgs.ac.uk/lexicon/)*
- Building Research Establishment (BRE) Special Digest 1 (2005), Third Edition: Concrete in aggressive ground.
  - Part C: *Assessing the aggressive chemical environment.*
  - Part D: *Specifying concrete for general cast-in-situ use.*
- NHBC Standards, Chapter 4.2, *Building near trees*
- Design Manual for Roads and Bridges (1995), HA44/9: Volume 4 Section 1 Part 1, Highways Agency

Appendix 1

Site Plan

Notes:

Investigation positions approximated from site operative's notes.
WS04 moved away from corner due to encountering Japanese Knotweed

Environmental Geotechnical Specialists

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Client:

Mr Saleem

Job Number:

C2752/22/E/4199

Project Details:

South View, Paddock

Scale: Not to scale - reference only

Appendix 2

Groundsure Geo-Insight Report

Groundsure LOCATION INTELLIGENCE

Geo Insight

SOUTH VIEW, PADDOCK, HUDDERSFIELD, HD1 4UE

Order Details

Date: 07/06/2022

Your ref: C2752_22_E_4199_PO-2172

Our Ref: GS-8802725

Site Details

Location: 412508 416215

Area: 0.05 ha

Authority: Kirklees Council

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

Summary of findings

Page	Section	Geology 1:10,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
10	1.1	10k Availability	Identified (within 500m)				
11	1.2	Artificial and made ground (10k)	0	1	3	8	-
13	1.3	Superficial geology (10k)	0	0	1	0	-
14	1.4	Landslip (10k)	0	0	0	0	-
15	1.5	Bedrock geology (10k)	1	1	2	3	-
16	1.6	Bedrock faults and other linear features (10k)	0	0	1	1	-
Page	Section	Geology 1:50,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
17	2.1	50k Availability	Identified (within 500m)				
18	2.2	Artificial and made ground (50k)	0	0	2	2	-
19	2.3	Artificial ground permeability (50k)	0	0	-	-	-
20	2.4	Superficial geology (50k)	0	0	1	0	-
21	2.5	Superficial permeability (50k)	None (within 50m)				
21	2.6	Landslip (50k)	0	0	0	0	-
21	2.7	Landslip permeability (50k)	None (within 50m)				
22	2.8	Bedrock geology (50k)	1	1	2	3	-
23	2.9	Bedrock permeability (50k)	Identified (within 50m)				
23	2.10	Bedrock faults and other linear features (50k)	0	0	1	1	-
Page	Section	Boreholes	On site	0-50m	50-250m	250-500m	500-2000m
24	3.1	BGS Boreholes	0	0	0	-	-
Page	Section	Natural ground subsidence					
25	4.1	Shrink swell clays	Negligible (within 50m)				
26	4.2	Running sands	Negligible (within 50m)				
27	4.3	Compressible deposits	Negligible (within 50m)				
28	4.4	Collapsible deposits	Very low (within 50m)				
29	4.5	Landslides	Very low (within 50m)				
30	4.6	Ground dissolution of soluble rocks	Negligible (within 50m)				

Page	Section	Mining, ground workings and natural cavities	On site	0-50m	50-250m	250-500m	500-2000m
31	5.1	Natural cavities	0	0	0	0	-
32	**5.2**	**BritPits**	0	0	2	8	-
33	**5.3**	**Surface ground workings**	0	9	17	-	-
35	**5.4**	**Underground workings**	0	0	0	0	18
36	5.5	Historical Mineral Planning Areas	0	0	0	0	-
36	**5.6**	**Non-coal mining**	1	0	0	0	0
36	5.7	Mining cavities	0	0	0	0	0
36	5.8	JPB mining areas	None (within 0m)				
37	5.9	Coal mining	None (within 0m)				
37	5.10	Brine areas	None (within 0m)				
37	5.11	Gypsum areas	None (within 0m)				
37	5.12	Tin mining	None (within 0m)				
37	5.13	Clay mining	None (within 0m)				

Page	Section	Radon	
38	**6.1**	**Radon**	Less than 1% (within 0m)

Page	Section	Soil chemistry	On site	0-50m	50-250m	250-500m	500-2000m
39	**7.1**	**BGS Estimated Background Soil Chemistry**	2	1	-	-	-
39	7.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
39	7.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-

Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
40	8.1	Underground railways (London)	0	0	0	-	-
40	8.2	Underground railways (Non-London)	0	0	0	-	-
41	8.3	Railway tunnels	0	0	0	-	-
41	**8.4**	**Historical railway and tunnel features**	0	3	4	-	-
41	8.5	Royal Mail tunnels	0	0	0	-	-
42	8.6	Historical railways	0	0	0	-	-
42	**8.7**	**Railways**	0	3	11	-	-
43	8.8	Crossrail 1	0	0	0	0	-

43	8.9	Crossrail 2	0	0	0	0	-
43	8.10	HS2	0	0	0	0	-

Recent aerial photograph

Capture Date: 30/05/2021

Site Area: 0.05ha

Recent site history - 2018 aerial photograph

Capture Date: 01/07/2018

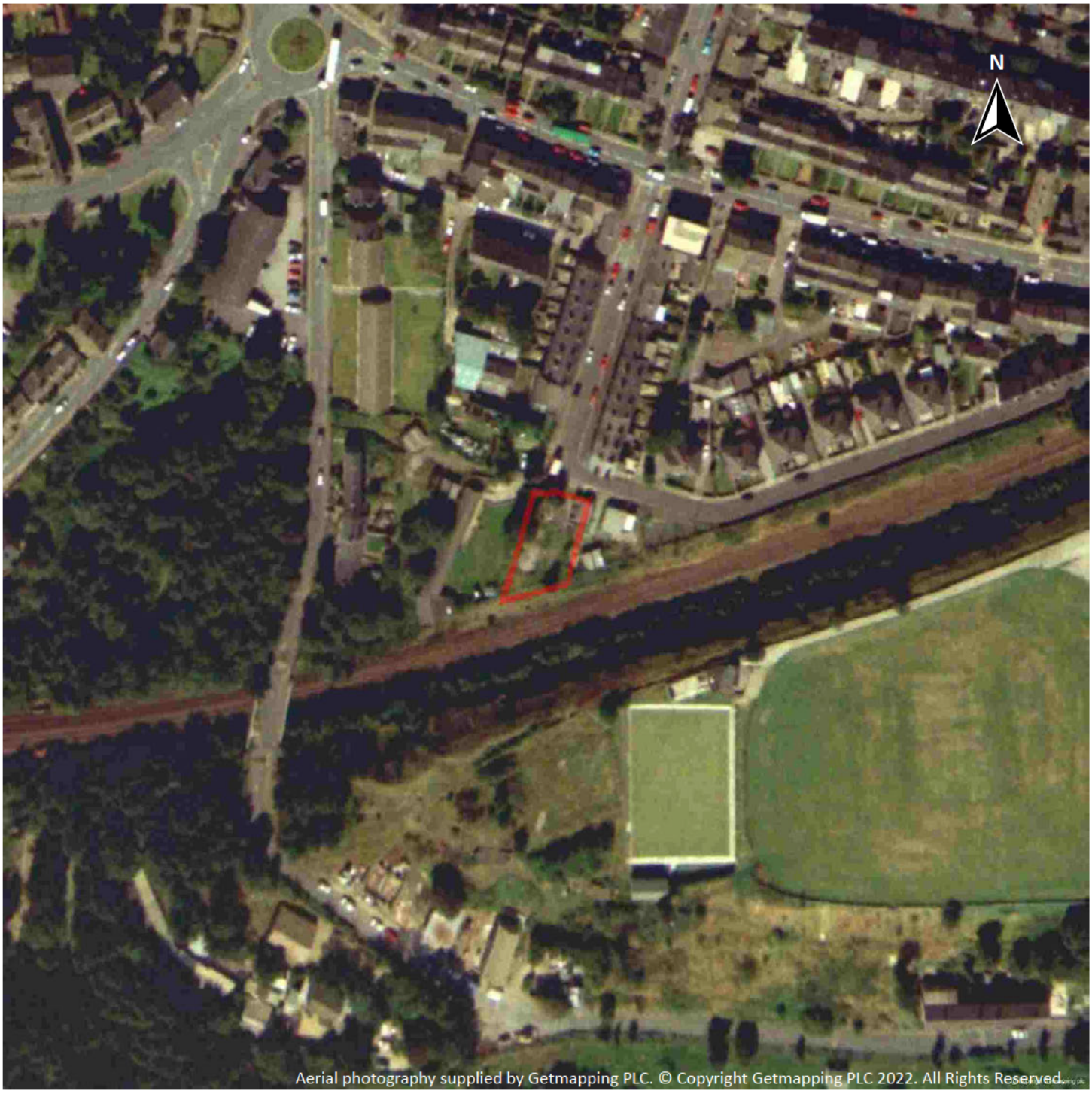
Site Area: 0.05ha

Recent site history - 2012 aerial photograph

Capture Date: 26/03/2012

Site Area: 0.05ha

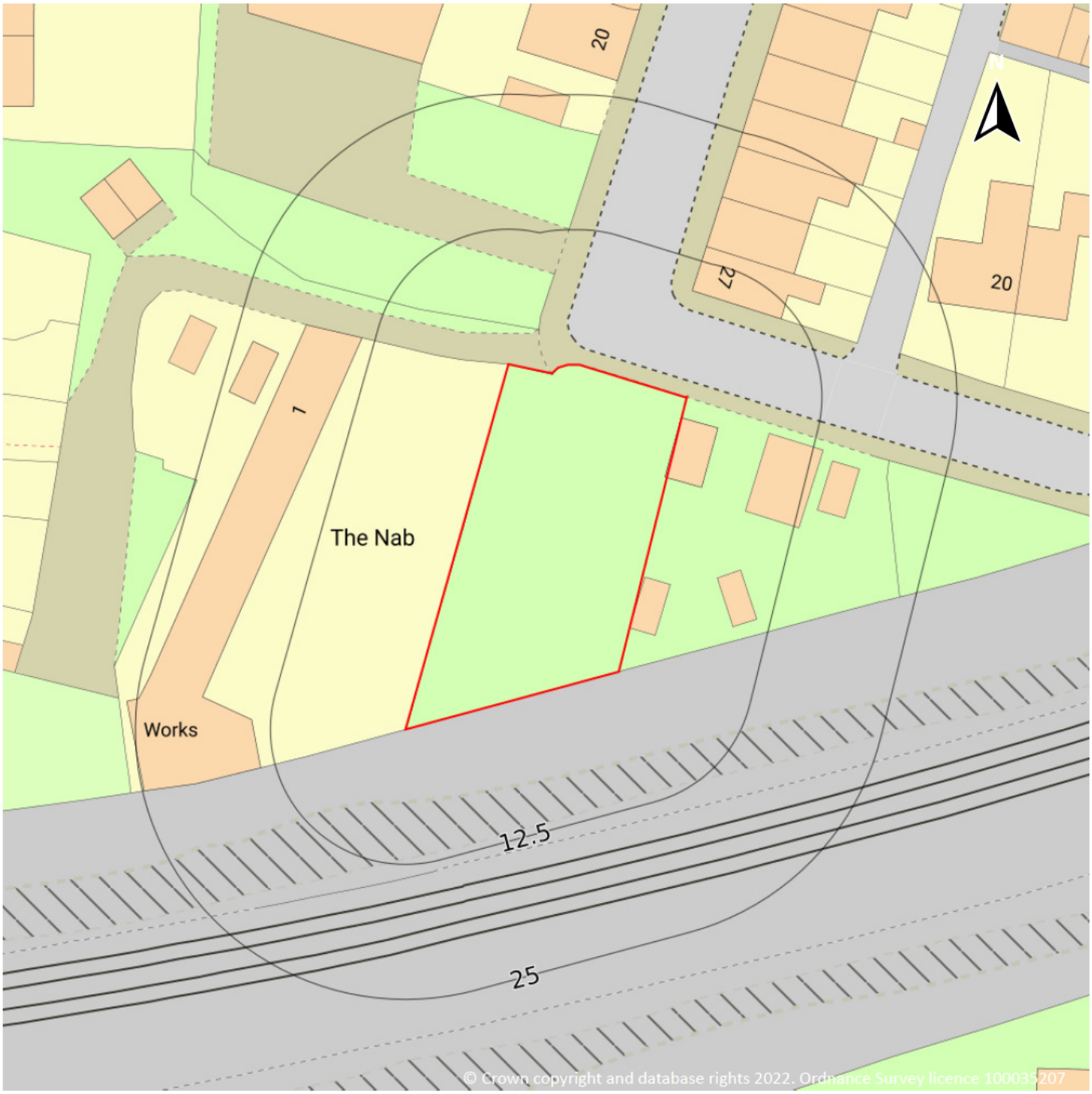
Recent site history - 2000 aerial photograph



Capture Date: 25/08/2000

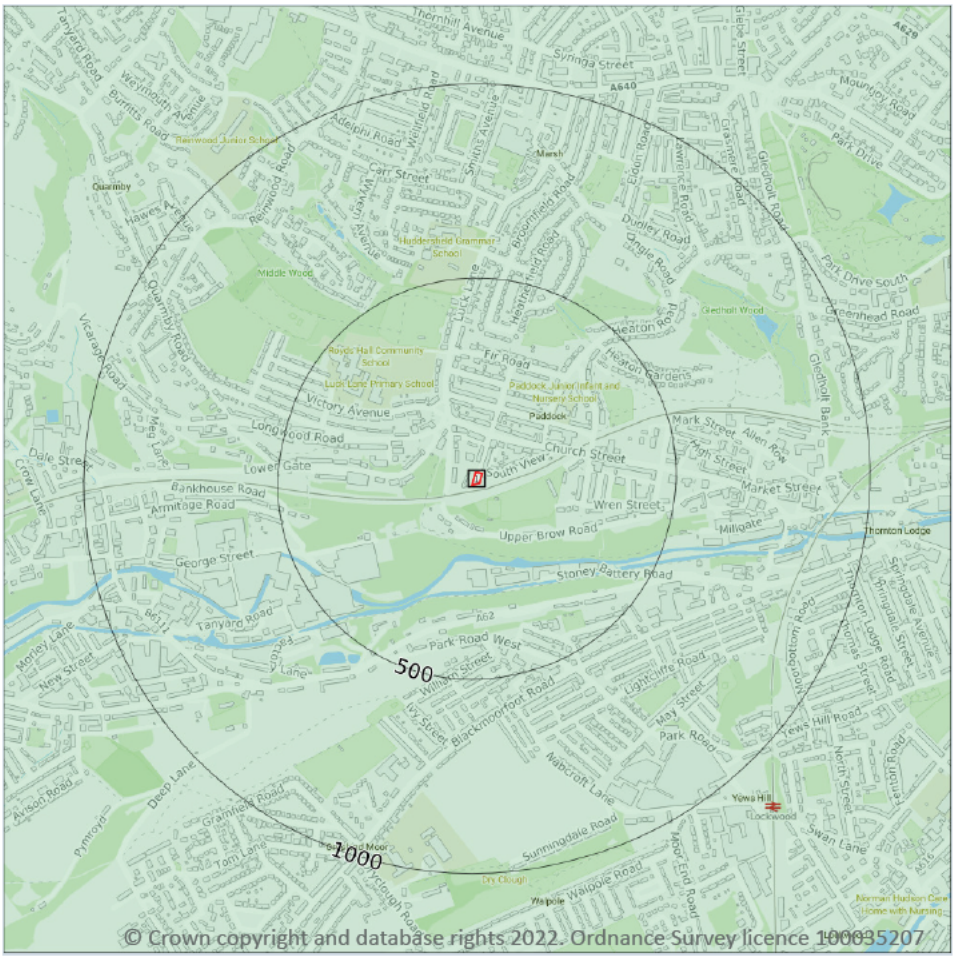
Site Area: 0.05ha

OS MasterMap site plan



Site Area: 0.05ha

1 Geology 1:10,000 scale - Availability



Site Outline

Search buffers in metres (m)

- Full coverage
- Partial coverage
- No coverage

1.1 10k Availability

Records within 500m	1

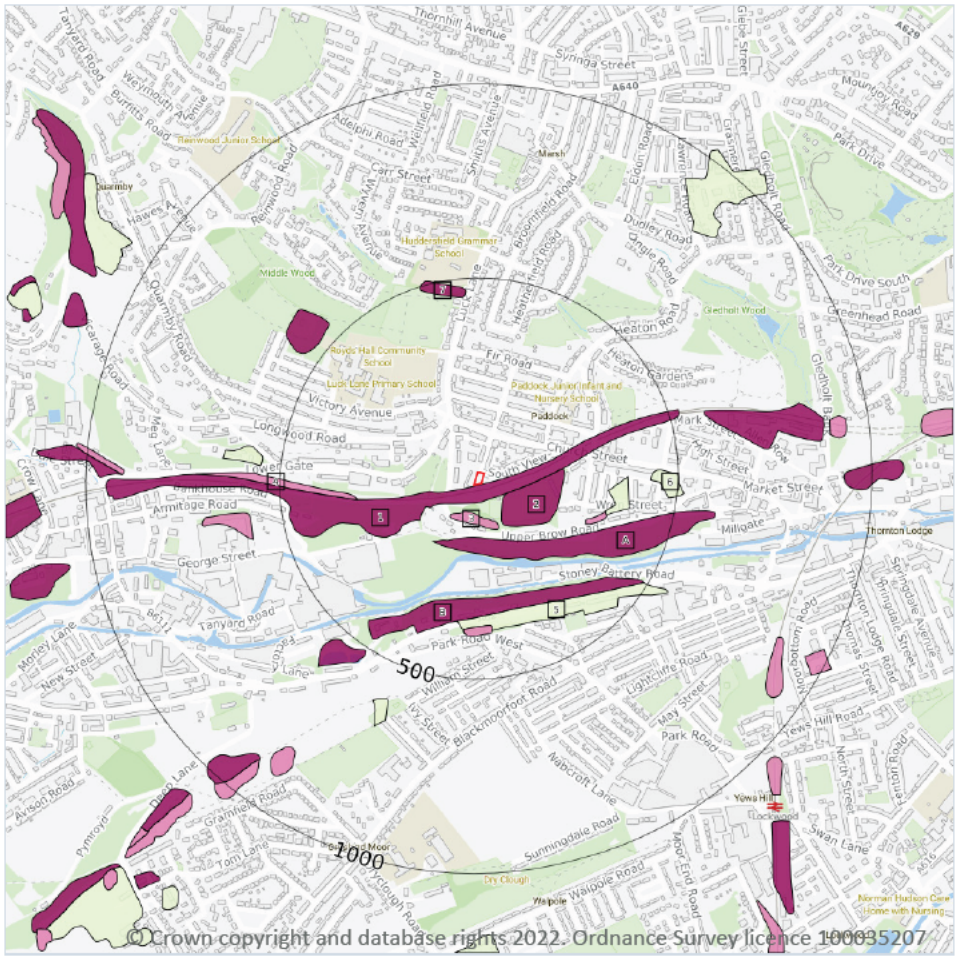
An indication on the coverage of 1:10,000 scale geology data for the site, the most detailed dataset provided by the British Geological Survey. Either 'Full', 'Partial' or 'No coverage' for each geological theme.

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

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	Full	Full	Full	Full	SE11NW

This data is sourced from the British Geological Survey.

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



Site Outline

Search buffers in metres (m)

- Reclaimed ground
- Made ground
- Worked ground
- Infilled ground
- Disturbed ground
- Landscaped ground

1.2 Artificial and made ground (10k)

Records within 500m	12

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

Features are displayed on the Geology 1:10,000 scale - Artificial and made ground map on **page 11**

ID	Location	LEX Code	Description	Rock description
1	3m S	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
2	67m SE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
3	69m S	WGR-VOID	Worked Ground (Undivided)	Void
A	134m S	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit

ID	Location	LEX Code	Description	Rock description
A	285m E	WGR-VOID	Worked Ground (Undivided)	Void
B	291m S	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
4	303m W	WGR-VOID	Worked Ground (Undivided)	Void
A	324m E	WMGR-ARTDP	Infilled Ground	Artificial Deposit
5	334m S	WMGR-ARTDP	Infilled Ground	Artificial Deposit
B	362m S	WGR-VOID	Worked Ground (Undivided)	Void
6	430m E	WMGR-ARTDP	Infilled Ground	Artificial Deposit
7	453m N	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Superficial

Site Outline

Search buffers in metres (m)

Landslip (10k)

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

1.3 Superficial geology (10k)

Records within 500m	1

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

Features are displayed on the Geology 1:10,000 scale - Superficial map on **page 13**

ID	Location	LEX Code	Description	Rock description
1	171m S	ALV-XCSV	Alluvium - Clay, Sand And Gravel	Clay, Sand And Gravel

This data is sourced from the British Geological Survey.

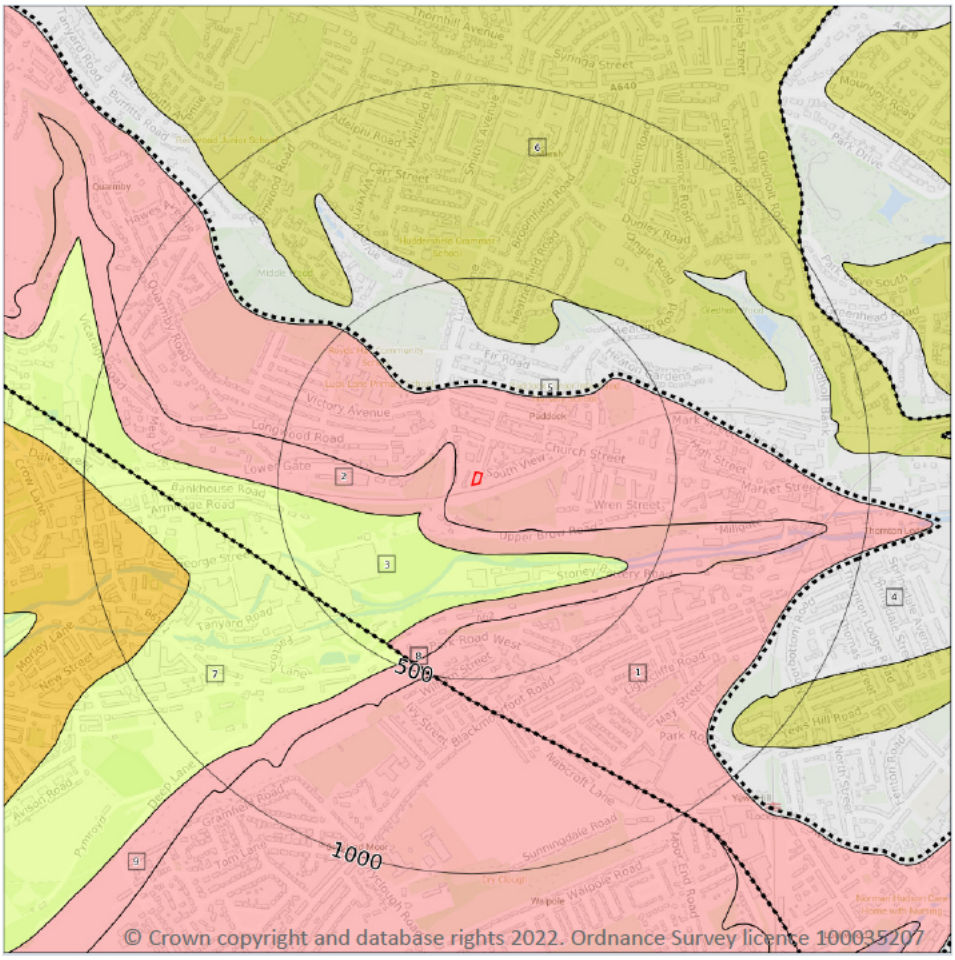
1.4 Landslip (10k)

Records within 500m	0

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

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Bedrock



Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (10k)

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

1.5 Bedrock geology (10k)

Records within 500m **7**

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

Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 15**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**RR-SDST**	**Rough Rock - Sandstone**	**Yeadonian Sub-age**
2	48m W	RF-SDST	Rough Rock Flags - Sandstone	Yeadonian Sub-age
3	151m SW	MG-MDSS	Millstone Grit Group [see Also Migr] - Mudstone, Siltstone And Sandstone	Namurian Age

ID	Location	LEX Code	Description	Rock age
4	219m N	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
6	347m N	SBF-SDST	Soft Bed Flags - Sandstone	Langsettian Sub-age
7	462m SW	MG-MDSS	Millstone Grit Group [see Also Migr] - Mudstone, Siltstone And Sandstone	Namurian Age
9	478m S	RF-SDST	Rough Rock Flags - Sandstone	Yeadonian Sub-age

This data is sourced from the British Geological Survey.

1.6 Bedrock faults and other linear features (10k)

Records within 500m	2

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

Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 15**

ID	Location	Category	Description
5	232m N	FOSSIL_HORIZON	Fossil horizon, marine band
8	462m SW	FAULT	Normal fault, inferred; crossmarks on downthrow side

This data is sourced from the British Geological Survey.

2 Geology 1:50,000 scale - Availability

Site Outline

Search buffers in metres (m)

Geological map tile

2.1 50k Availability

Records within 500m	1

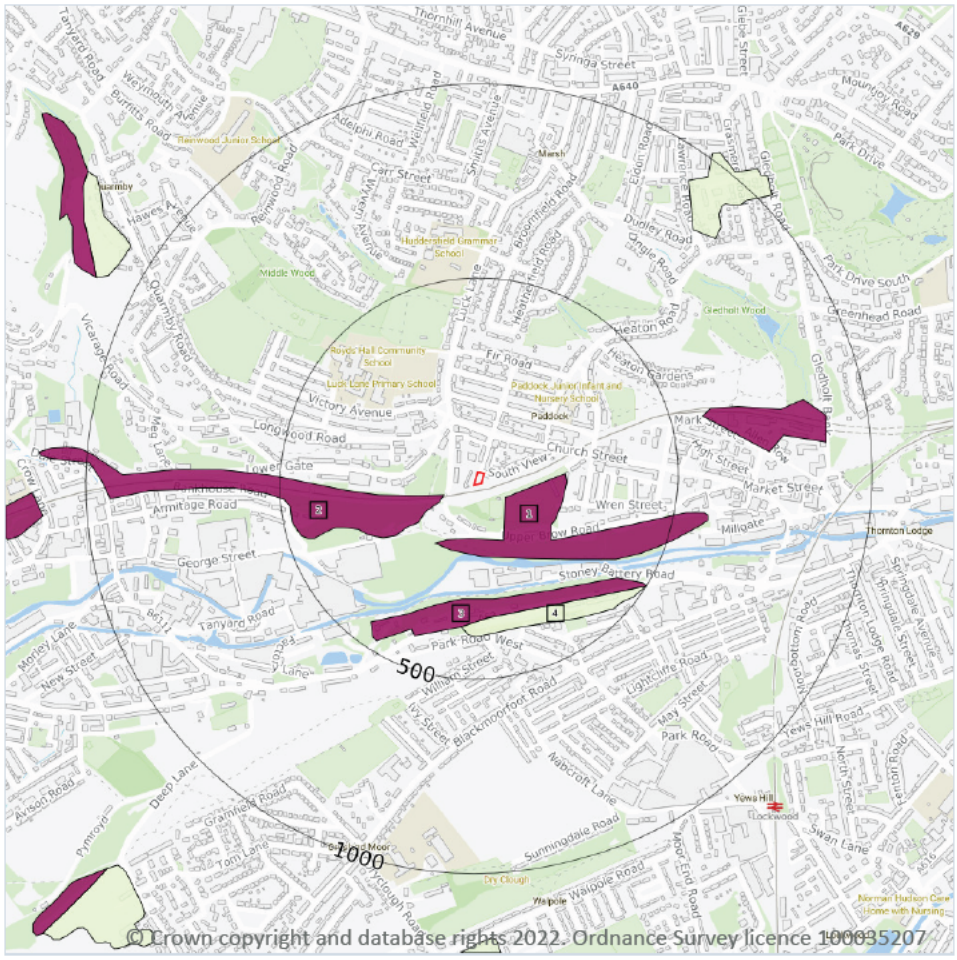
An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:50,000 scale - Availability map on **page 17**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	Full	Full	Full	Full	EW077_huddersfield_v4

This data is sourced from the British Geological Survey.

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



Site Outline

Search buffers in metres (m)

- Made ground
- Worked ground
- Infilled ground
- Disturbed ground
- Landscaped ground

2.2 Artificial and made ground (50k)

Records within 500m	4

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

Features are displayed on the Geology 1:50,000 scale - Artificial and made ground map on **page 18**

ID	Location	LEX Code	Description	Rock description
1	71m SE	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
2	82m W	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
3	293m S	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
4	342m S	WMGR-ARTDP	INFILLED GROUND	ARTIFICIAL DEPOSIT

This data is sourced from the British Geological Survey.

2.3 Artificial ground permeability (50k)

Records within 50m	0

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

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Superficial

Site Outline

Search buffers in metres (m)

Landslip (50k)

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

2.4 Superficial geology (50k)

Records within 500m	1

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

Features are displayed on the Geology 1:50,000 scale - Superficial map on **page 20**

ID	Location	LEX Code	Description	Rock description
1	176m S	ALV-XCZSV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL

This data is sourced from the British Geological Survey.

2.5 Superficial permeability (50k)

Records within 50m	0

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

This data is sourced from the British Geological Survey.

2.6 Landslip (50k)

Records within 500m	0

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

This data is sourced from the British Geological Survey.

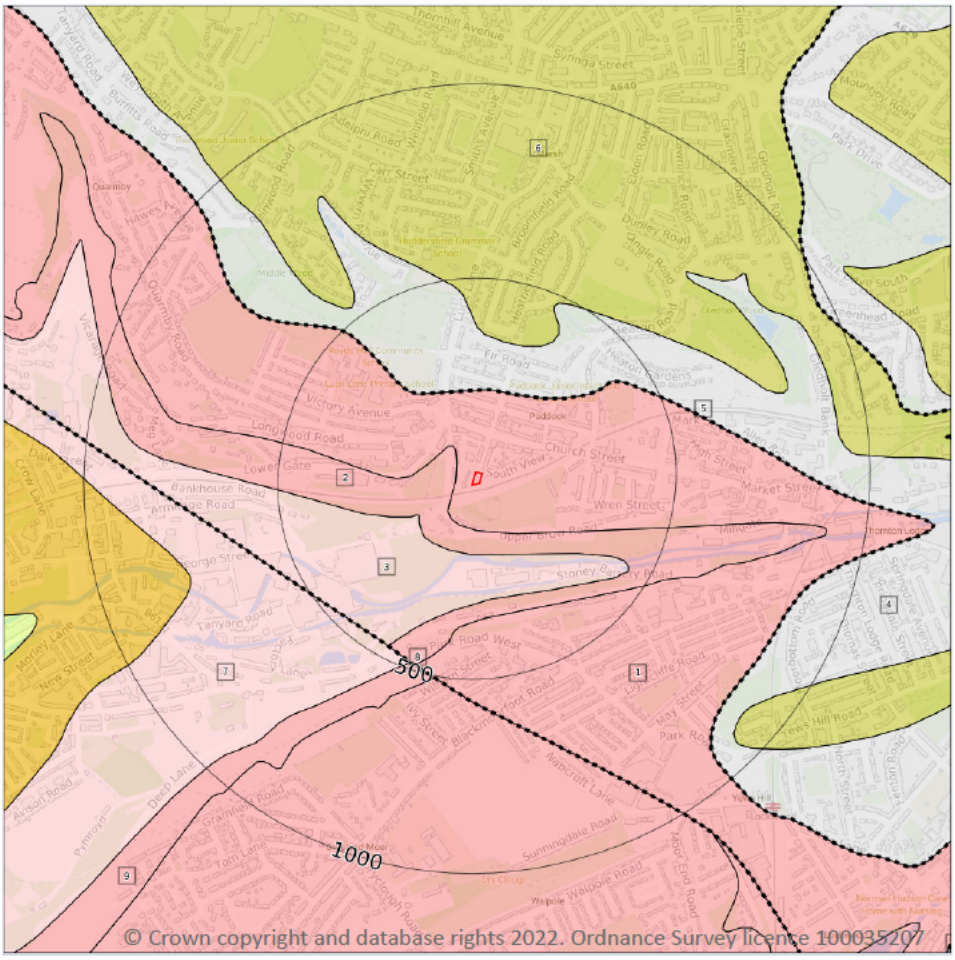
2.7 Landslip permeability (50k)

Records within 50m	0

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

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Bedrock



Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (50k)

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

2.8 Bedrock geology (50k)

Records within 500m **7**

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

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 22**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**RR-SDST**	**ROUGH ROCK - SANDSTONE**	**NAMURIAN**
2	43m W	RF-SDST	ROUGH ROCK FLAGS - SANDSTONE	NAMURIAN
3	157m SW	ROSSE-MDSI	ROSSENDALE FORMATION - MUDSTONE AND SILTSTONE	NAMURIAN

ID	Location	LEX Code	Description	Rock age
4	211m N	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
6	342m N	SBF-SDST	SOFT BED FLAGS - SANDSTONE	WESTPHALIAN
7	463m SW	ROSSE-MDSI	ROSSENDALE FORMATION - MUDSTONE AND SILTSTONE	NAMURIAN
9	482m S	RF-SDST	ROUGH ROCK FLAGS - SANDSTONE	NAMURIAN

This data is sourced from the British Geological Survey.

2.9 Bedrock permeability (50k)

Records within 50m **2**

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

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Fracture**	**High**	**Moderate**
43m W	Fracture	High	Moderate

This data is sourced from the British Geological Survey.

2.10 Bedrock faults and other linear features (50k)

Records within 500m **2**

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

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 22**

ID	Location	Category	Description
5	211m N	FOSSIL_HORIZON	Marine band
8	463m SW	FAULT	Fault, inferred

This data is sourced from the British Geological Survey.

3 Boreholes

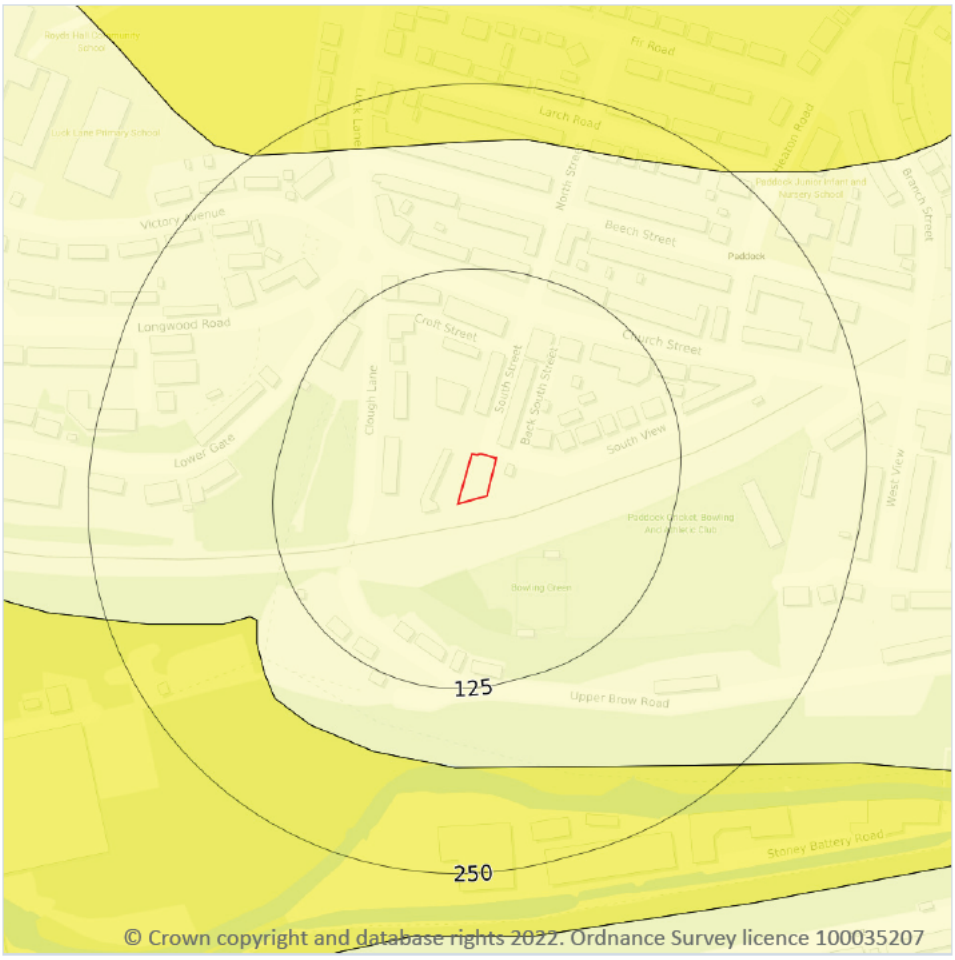
3.1 BGS Boreholes

Records within 250m	0

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

This data is sourced from the British Geological Survey.

4 Natural ground subsidence - Shrink swell clays



Site Outline

Search buffers in metres (m)

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

4.1 Shrink swell clays

Records within 50m	1

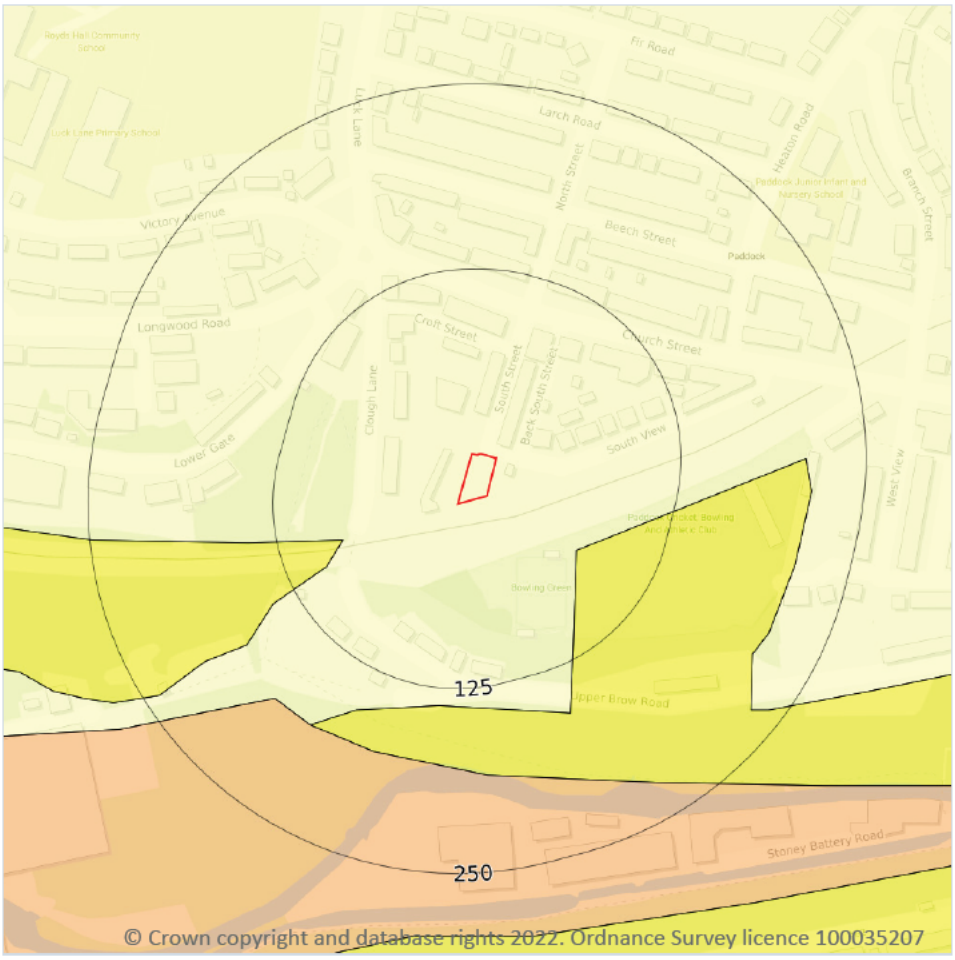
The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and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

Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 25**

Location	Hazard rating	Details
On site	**Negligible**	**Ground conditions predominantly non-plastic.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Running sands



Site Outline

Search buffers in metres (m)

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

4.2 Running sands

Records within 50m	1

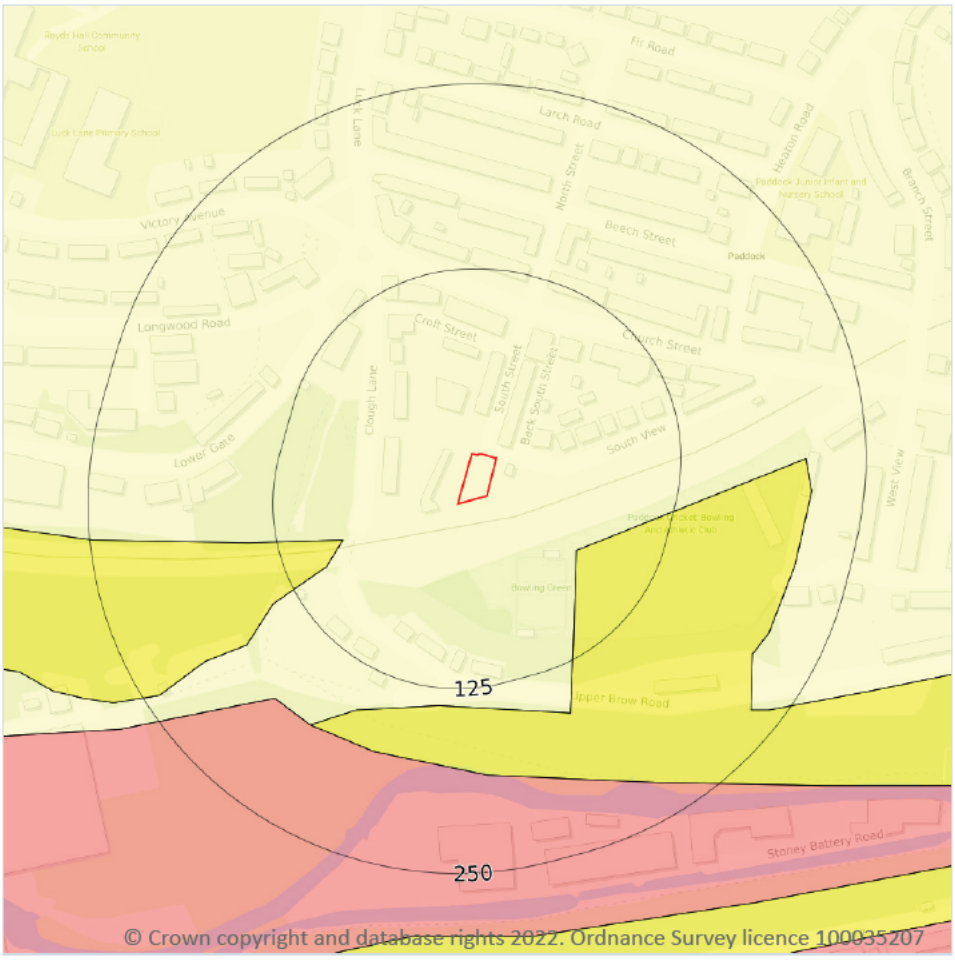
The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

Features are displayed on the Natural ground subsidence - Running sands map on **page 26**

Location	Hazard rating	Details
On site	**Negligible**	**Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Compressible deposits



Site Outline

Search buffers in metres (m)

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

4.3 Compressible deposits

Records within 50m	1

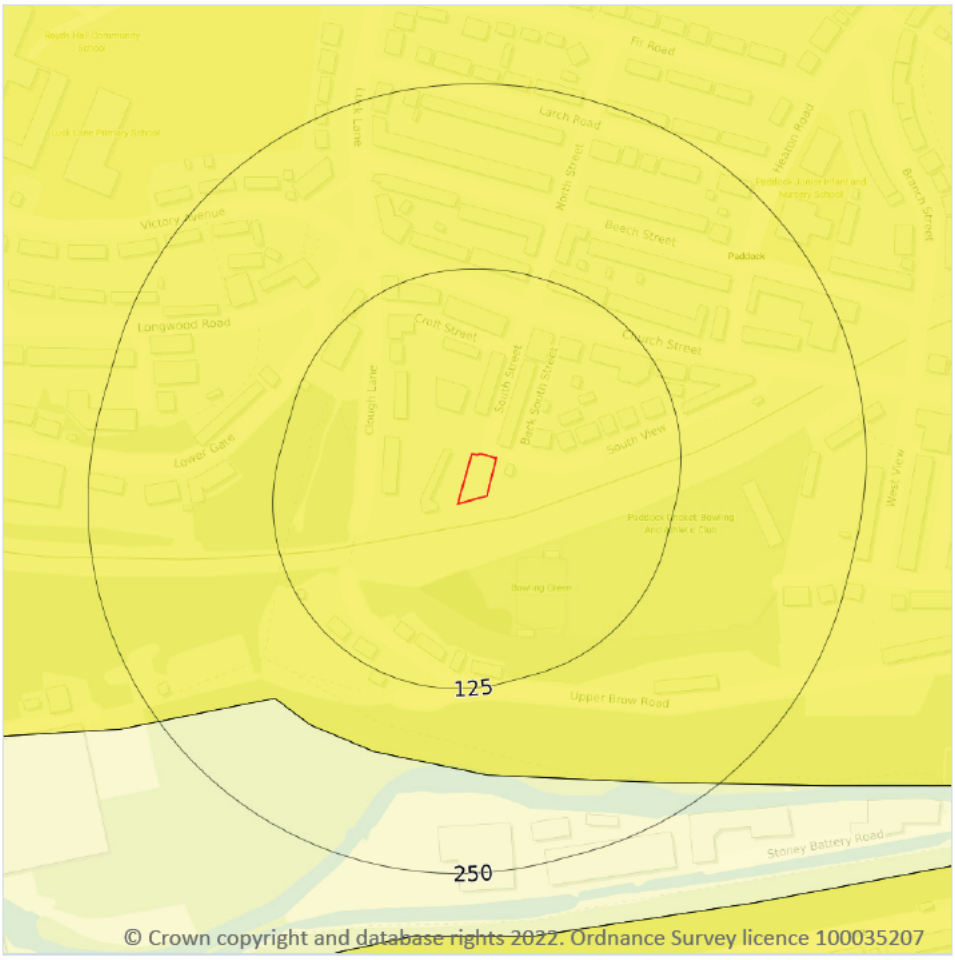
The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 27**

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

This data is sourced from the British Geological Survey.

Natural ground subsidence - Collapsible deposits



Site Outline

Search buffers in metres (m)

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

4.4 Collapsible deposits

Records within 50m	1

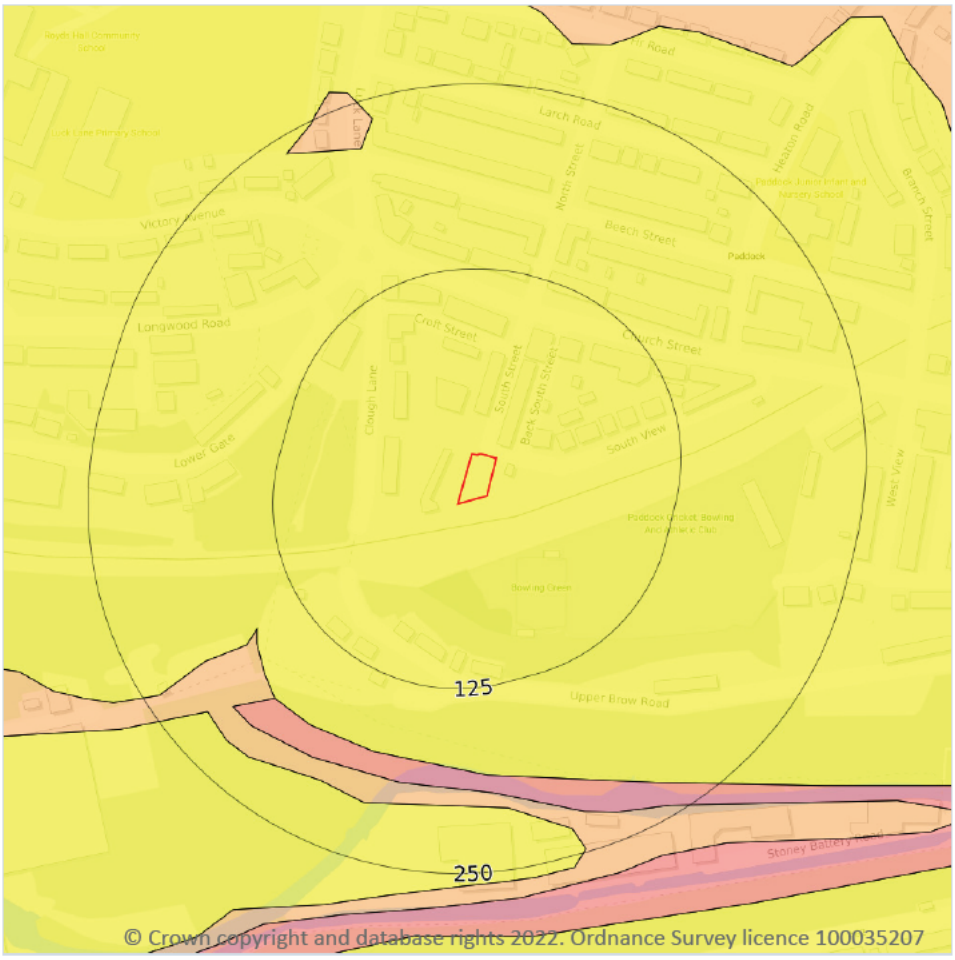
The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 28**

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

This data is sourced from the British Geological Survey.

Natural ground subsidence - Landslides



Site Outline

Search buffers in metres (m)

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

4.5 Landslides

Records within 50m	1

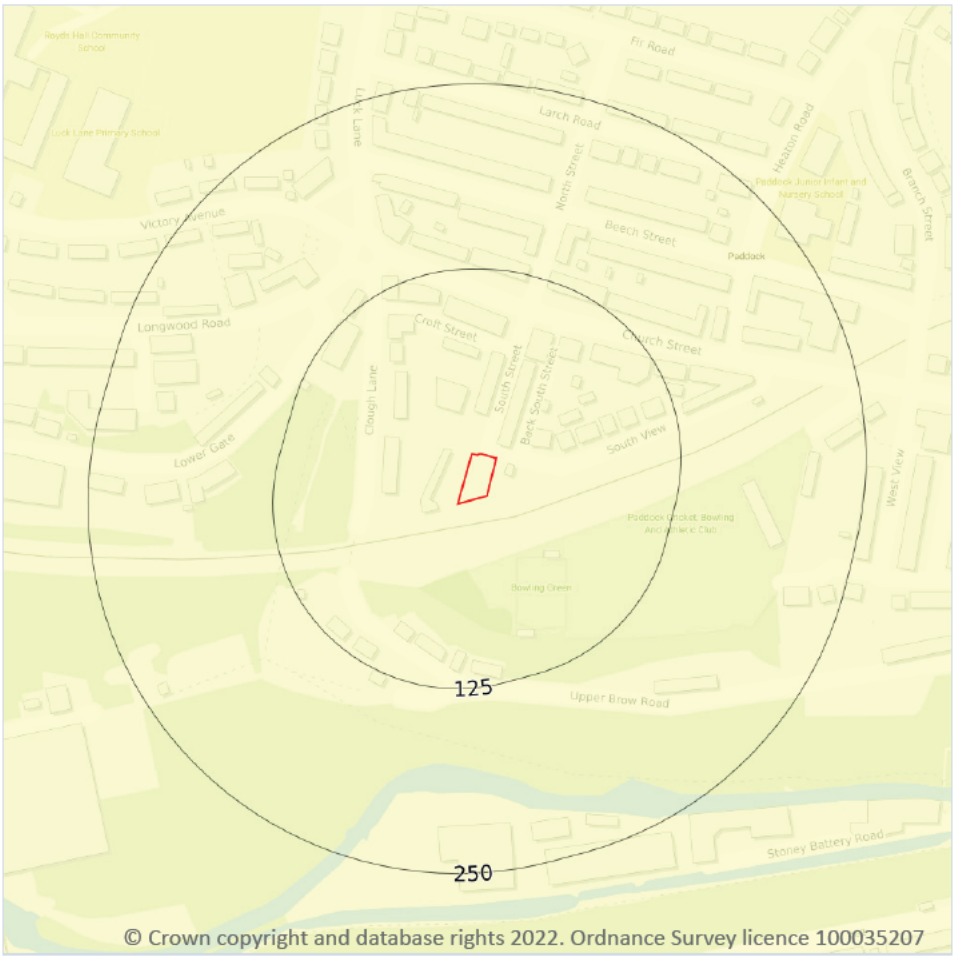
The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on **page 29**

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

This data is sourced from the British Geological Survey.

Natural ground subsidence - Ground dissolution of soluble rocks



Site Outline

Search buffers in metres (m)

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

4.6 Ground dissolution of soluble rocks

Records within 50m	1

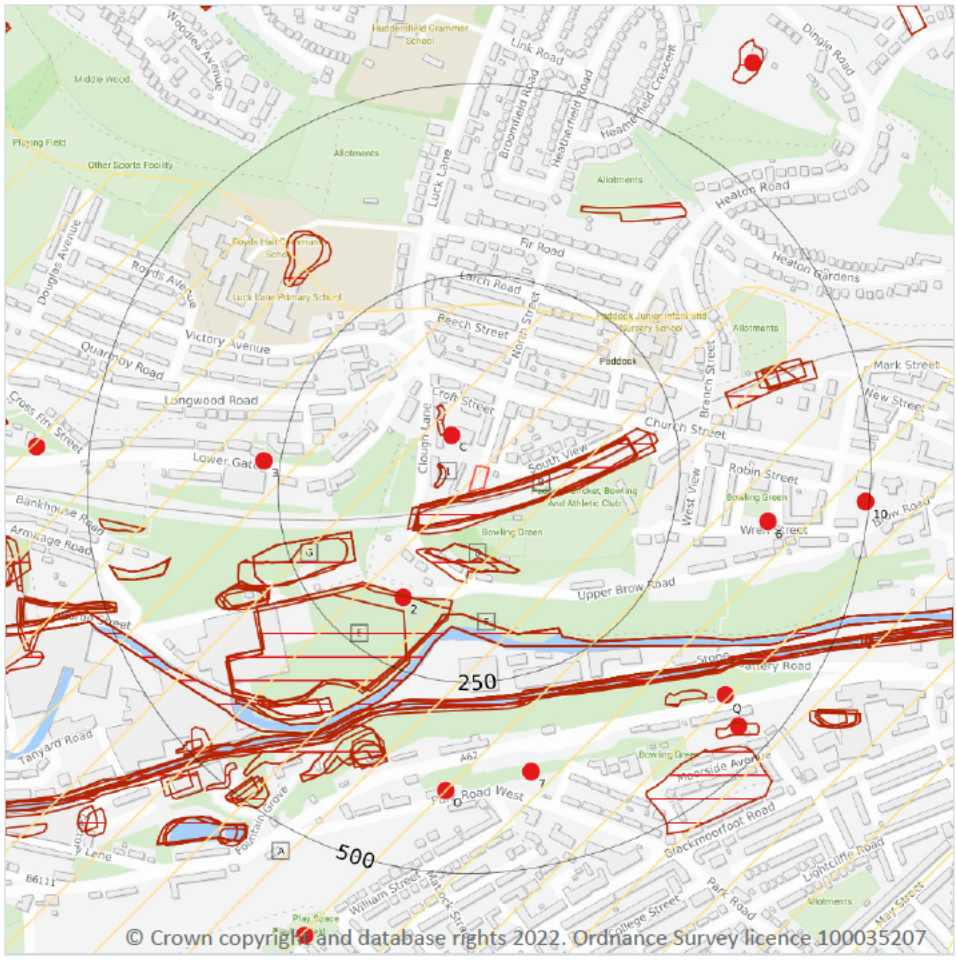
The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 30**

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

This data is sourced from the British Geological Survey.

5 Mining, ground workings and natural cavities



Site Outline

Search buffers in metres (m)

Natural cavities (Area)

Natural cavities (Point)

BritPits

Surface ground workings

Underground workings

Historical Mineral Planning Areas

Mining Cavities

Non Coal Mining

Sporadic underground mining of restricted extent possible

Localised small scale underground mining possible

Small scale mining possible

Underground mining known or likely within or in close proximity

Underground mining known within or in very close proximity

5.1 Natural cavities

Records within 500m	0

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

This data is sourced from Stantec UK Ltd.

5.2 BritPits

Records within 500m	10

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

Features are displayed on the Mining, ground workings and natural cavities map on **page 31**

ID	Location	Details	Description
C	51m NW	Name: Paddock Clough Address: Paddock, HUDDERSFIELD, West Yorkshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
2	163m SW	Name: Johnny Moore's Hill Address: Paddock, HUDDERSFIELD, West Yorkshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
3	271m W	Name: Royds Hall Address: Paddock, HUDDERSFIELD, West Yorkshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
6	372m E	Name: Paddock Address: Paddock, HUDDERSFIELD, West Yorkshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
7	375m S	Name: Paddock Brow Address: Paddock, HUDDERSFIELD, West Yorkshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority

ID	Location	Details	Description
O	392m S	Name: Paddock Brow Address: Paddock, HUDDERSFIELD, West Yorkshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
Q	416m SE	Name: Marsden Road Quarries Address: Crosland Moor Bottom, HUDDERSFIELD, West Yorkshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
O	417m S	Name: Paddock Brow Address: Paddock, HUDDERSFIELD, West Yorkshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
Q	456m SE	Name: Marsden Road Quarries Address: Crosland Moor Bottom, HUDDERSFIELD, West Yorkshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
10	495m E	Name: Paddock Road Address: Paddock, HUDDERSFIELD, West Yorkshire Commodity: Sandstone Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority

This data is sourced from the British Geological Survey.

5.3 Surface ground workings

Records within 250m	26

Historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

Features are displayed on the Mining, ground workings and natural cavities map on **page 31**

ID	Location	Land Use	Year of mapping	Mapping scale
B	3m S	Cuttings	1985	1:10000
B	3m S	Cuttings	1966	1:10560
B	3m S	Cuttings	1975	1:10000
B	3m S	Cuttings	1956	1:10560
B	5m S	Cuttings	1905	1:10560
B	5m S	Cuttings	1938	1:10560
B	7m S	Cuttings	1948	1:10560
B	13m S	Cuttings	1890	1:10560
1	35m W	Unspecified Ground Workings	1905	1:10560
C	60m NW	Unspecified Ground Workings	1905	1:10560
D	71m S	Unspecified Quarry	1985	1:10000
D	71m S	Unspecified Quarry	1966	1:10560
D	71m S	Unspecified Quarry	1975	1:10000
D	88m S	Unspecified Quarry	1905	1:10560
E	145m S	Sewage Works	1948	1:10560
E	155m S	Sewage Works	1938	1:10560
E	155m S	Sewage Works	1938	1:10560
F	161m S	Canal	1985	1:10000
F	161m S	Canal	1966	1:10560
F	161m S	Canal	1975	1:10000
F	161m S	Canal	1956	1:10560
G	163m W	Unspecified Heap	1985	1:10000
G	163m W	Unspecified Heap	1966	1:10560
G	163m W	Unspecified Heap	1975	1:10000
G	175m SW	Unspecified Ground Workings	1905	1:10560
E	179m SW	Disused Sewage Works	1956	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

5.4 Underground workings

Records within 1000m	18

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

Features are displayed on the Mining, ground workings and natural cavities map on **page 31**

ID	Location	Land Use	Year of mapping	Mapping scale
-	915m SE	Tunnel	1948	1:10560
-	915m SE	Tunnel	1905	1:10560
-	917m E	Tunnel	1948	1:10560
-	917m E	Tunnel	1905	1:10560
-	917m E	Tunnel	1948	1:10560
-	917m E	Tunnel	1905	1:10560
-	918m SE	Tunnel	1975	1:10000
-	918m SE	Tunnel	1951	1:10560
-	918m SE	Tunnel	1985	1:10000
-	918m SE	Tunnel	1966	1:10560
-	920m E	Tunnel	1975	1:10000
-	920m E	Tunnel	1951	1:10560
-	920m E	Tunnel	1985	1:10000
-	920m E	Tunnel	1966	1:10560
-	923m E	Tunnel	1975	1:10000
-	923m E	Tunnel	1951	1:10560
-	923m E	Tunnel	1985	1:10000
-	923m E	Tunnel	1966	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

5.5 Historical Mineral Planning Areas

Records within 500m	0

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

This data is sourced from the British Geological Survey.

5.6 Non-coal mining

Records within 1000m	1

The potential for historical non-coal mining to have affected an area. The assessment is drawn from expert knowledge and literature in addition to the digital geological map of Britain. Mineral commodities may be divided into seven general categories - vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities (including ball clay, jet, black marble, graphite and chert).

Features are displayed on the Mining, ground workings and natural cavities map on **page 31**

ID	Location	Name	Commodity	Class	Likelihood
A	**On site**	**Not available**	**Vein Mineral**	**A**	**Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered**

This data is sourced from the British Geological Survey.

5.7 Mining cavities

Records within 1000m	0

Industry recognised national database of mining cavities. Degraded mines may result in hazardous subsidence (crown holes). Climatic conditions and water escape can also trigger subsidence over mine entrances and workings.

This data is sourced from Stantec UK Ltd.

5.8 JPB mining areas

Records on site	0

Areas which could be affected by former coal and other mining. This data includes some mine plans unavailable to the Coal Authority.

This data is sourced from Johnson Poole and Bloomer.

5.9 Coal mining

Records on site	0

Areas which could be affected by past, current or future coal mining.

This data is sourced from the Coal Authority.

5.10 Brine areas

Records on site	0

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

This data is sourced from the Cheshire Brine Subsidence Compensation Board.

5.11 Gypsum areas

Records on site	0

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

5.12 Tin mining

Records on site	0

Generalised areas that may be affected by historical tin mining.

This data is sourced from Groundsure.

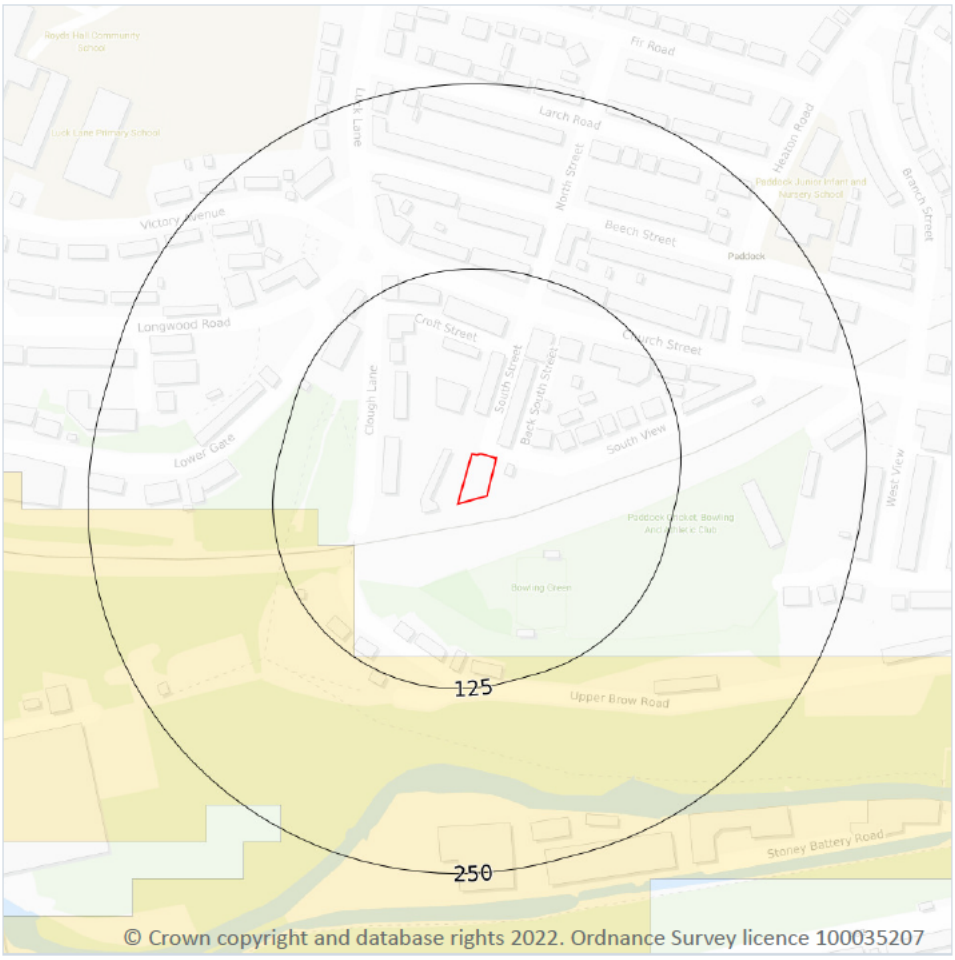
5.13 Clay mining

Records on site	0

Generalised areas that may be affected by kaolin and ball clay extraction.

This data is sourced from the Kaolin and Ball Clay Association (UK).

6 Radon



Site Outline

Search buffers in metres (m)

- Greater than 30%
- Between 10% and 30%
- Between 5% and 10%
- Between 3% and 5%
- Between 1% and 3%
- Less than 1%

6.1 Radon

Records on site	1

Estimated percentage of dwellings exceeding the Radon Action Level. This data is the highest resolution radon dataset available for the UK and is produced to a 75m level of accuracy to allow for geological data accuracy and a 'residential property' buffer. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain. The data was derived from both geological assessments and long term measurements of radon in more than 479,000 households.

Features are displayed on the Radon map on **page 38**

Location	Estimated properties affected	Radon Protection Measures required
On site	**Less than 1%**	**None****

This data is sourced from the British Geological Survey and Public Health England.

7 Soil chemistry

7.1 BGS Estimated Background Soil Chemistry

Records within 50m	3

The estimated values provide the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km^2. In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km^2; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	**25 - 35 mg/kg**	**No data**	**100 - 200 mg/kg**	**60 - 120 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**15 - 30 mg/kg**
On site	**25 - 35 mg/kg**	**No data**	**100 - 200 mg/kg**	**60 - 120 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**15 - 30 mg/kg**
43m W	25 - 35 mg/kg	No data	100 - 200 mg/kg	60 - 120 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg

This data is sourced from the British Geological Survey.

7.2 BGS Estimated Urban Soil Chemistry

Records within 50m	0

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km^2).

This data is sourced from the British Geological Survey.

7.3 BGS Measured Urban Soil Chemistry

Records within 50m	0

The locations and measured total concentrations (mg/kg) of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc in urban topsoil samples from 23 urban centres across Great Britain. These are collected at a sample density of 4 per km^2.

This data is sourced from the British Geological Survey.

8 Railway infrastructure and projects

Site Outline

Search buffers in metres (m)

- Crossrail 1 Stations
- Crossrail 1 Route
- Crossrail 1 Worksites
- Crossrail 2 Stations
- Crossrail 2 Route
- Crossrail 2 Worksites
- Crossrail 2 Safeguarding
- Crossrail 2 Headhouses
- Railway stations
- Active railways
- Active tunnels
- Abandoned railways
- Historic railways
- Historic tunnels
- Underground stations
- Underground Lines
- Royal Mail tunnels
- HS2 optimised route
- HS2 Stations
- HS2 Depots
- HS2 Surface Safeguarding
- HS2 Subsurface Safeguarding

8.1 Underground railways (London)

Records within 250m	0

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

This data is sourced from publicly available information by Groundsure.

8.2 Underground railways (Non-London)

Records within 250m	0

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.

This data is sourced from publicly available information by Groundsure.

8.3 Railway tunnels

Records within 250m	0

Railway tunnels taken from contemporary Ordnance Survey mapping.

This data is sourced from the Ordnance Survey.

8.4 Historical railway and tunnel features

Records within 250m	7

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

Features are displayed on the Railway infrastructure and projects map on **page 40**

Location	Land Use	Year of mapping	Mapping scale
22m S	Railway Sidings	1918	2500
23m S	Railway Sidings	1932	2500
25m S	Railway Sidings	1893	2500
170m E	Railway Sidings	1890	10560
236m E	Tunnel	1960	2500
236m E	Tunnel	1961	1250
236m E	Tunnel	1974	1250

This data is sourced from Ordnance Survey/Groundsure.

8.5 Royal Mail tunnels

Records within 250m	0

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.

This data is sourced from Groundsure/the Postal Museum.

8.6 Historical railways

Records within 250m	0

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

This data is sourced from OpenStreetMap.

8.7 Railways

Records within 250m	14

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

Features are displayed on the Railway infrastructure and projects map on **page 40**

Location	Name	Type
15m S	Not given	Multi Track
17m S	Huddersfield Line	rail
22m S	Huddersfield Line	rail
98m W	Not given	Multi Track
122m E	Huddersfield Line	rail
135m E	Not given	Multi Track
144m E	Not given	Multi Track
158m W	Huddersfield Line	rail
163m E	Not given	Multi Track
165m W	Not given	Multi Track
172m E	Not given	Multi Track
181m W	Not given	Multi Track
190m W	Not given	Multi Track
250m E	Not given	Multi Track

This data is sourced from Ordnance Survey and OpenStreetMap.

8.8 Crossrail 1

Records within 500m	0

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

This data is sourced from publicly available information by Groundsure.

8.9 Crossrail 2

Records within 500m	0

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

This data is sourced from publicly available information by Groundsure.

8.10 HS2

Records within 500m	0

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

This data is sourced from HS2 ltd.

Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information. To find out who they are and their areas of expertise see https://www.groundsure.com/sources-reference.

Terms and conditions

Groundsure's Terms and Conditions can be accessed at this link: https://www.groundsure.com/terms-and-conditions-jan-2020/.

Appendix 3

Windowless Sampling Borehole Records

Borehole Log

Borehole No. **WS1**

Sheet 1 of 1

Project Name: South View, Paddock	Project No. C2752/22/E/4199	Co-ords:	Hole Type WLS
Location: Huddersfield		Level:	Scale 1:50
Client: Mr Saleem		Dates: 17/06/2022	Logged By IMY

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
				87	55		0.20			TOPSOIL (Dark brown very sandy SILT with frequent rootlets and plant matter).
		1.20	D	77	95					MADE GROUND (Dark brown silty gravelly fine to medium SAND. Gravel is sub-angular to sub-rounded, fine to coarse of sandstone, occasional concrete and rare porcelain fragments).
							1.55			End of Borehole at 1.55m

1 2 3 4 5 6 7 8 9 10

Remarks

1. No Groundwater encountered.

Borehole Log

Borehole No. **WS2**

Sheet 1 of 1

Project Name: South View, Paddock	Project No. C2752/22/E/4199	Co-ords:	Hole Type WLS
Location: Huddersfield		Level:	Scale 1:50
Client: Mr Saleem		Dates: 17/06/2022	Logged By IMY

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.40	D	87	100		0.15			TOPSOIL (Dark brown very sandy gravelly SILT with frequent rootlets and plant matter. Gravel is sub-angular to sub-rounded, fine to medium, tabular of mudstone).
							0.60			MADE GROUND (Dark brown silty gravelly fine to medium SAND. Gravel is sub-angular to sub-rounded, fine to coarse of sandstone, ash, clinker and rare porcelain fragments).
							0.87			Extremely weak thickly laminated light brown coarse grained SANDSTONE.
										End of Borehole at 0.87m

Remarks

1. No Groundwater encountered.

Borehole Log

Borehole No. **WS3**

Sheet 1 of 1

Project Name: South View, Paddock	Project No. C2752/22/E/4199	Co-ords:	Hole Type WLS
Location: Huddersfield		Level:	Scale 1:50
Client: Mr Saleem		Dates: 17/06/2022	Logged By IMY

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.45	SPT	87	100	50 (50 for 115mm/50 for 0mm)	0.15			TOPSOIL (Dark brown very sandy gravelly SILT with frequent rootlets and plant matter. Gravel is sub-angular to sub-rounded, fine to medium, tabular of mudstone).
							0.40			MADE GROUND (Brown silty gravelly fine to medium SAND. Gravel is sub-angular to sub-rounded, fine to medium and occasional coarse of brick, mortar, clinker and sandstone fragments).
										End of Borehole at 0.40m

Remarks

1. No Groundwater encountered. 2. SPT sampler broken

Borehole Log

Borehole No. **WS4**

Sheet 1 of 1

Project Name: South View, Paddock	Project No. C2752/22/E/4199	Co-ords:	Hole Type WLS
Location: Huddersfield		Level:	Scale 1:50
Client: Mr Saleem		Dates: 17/06/2022	Logged By IMY

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
				87	100		0.10			TOPSOIL (Dark brown very sandy gravelly SILT with frequent rootlets and plant matter. Gravel is sub-angular to sub-rounded, fine to medium, tabular of mudstone).
		1.00	SPT			N=9 (1,1/2,2,2,3)				MADE GROUND (Brown silty gravelly fine to medium SAND. Gravel is sub-angular to sub-rounded, fine to medium and occasional coarse of brick, mortar, clinker, sandstone and rare glass fragments).
		1.20	D	77	100		1.40			MADE GROUND (Brown becoming light brown silty very gravelly SAND. Gravel is sub-angular to sub-rounded, fine to coarse of predominantly sandstone and rare brick).
		2.00	SPT			N=17 (3,4/4,6,3,4)				
				67	80		2.45			Extremely weak thickly laminated light brown coarse grained SANDSTONE.
				57	90					
							3.60			End of Borehole at 3.60m

Remarks

1. No Groundwater encountered.

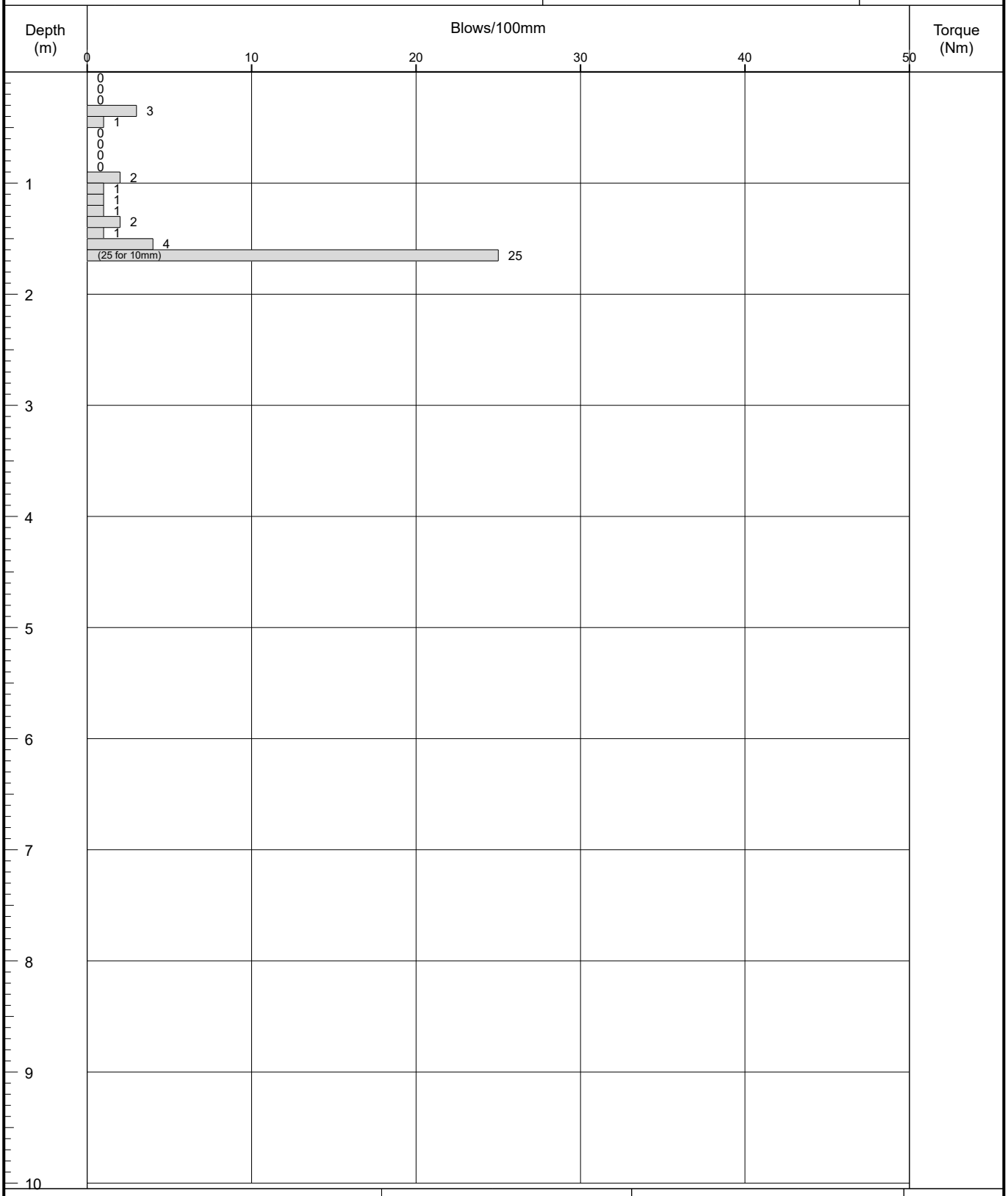
Appendix 4

Dynamic Probing Records

Probe Log

Probe No.
DP1
Sheet 1 of 1

Project Name: South View, Paddock	Project No. C2752/22/E/4199	Co-ords:	Hole Type DP
Location: Huddersfield		Level:	Scale 1:50
Client: Mr Saleem		Dates: 17/06/2022	Logged By AB & CG



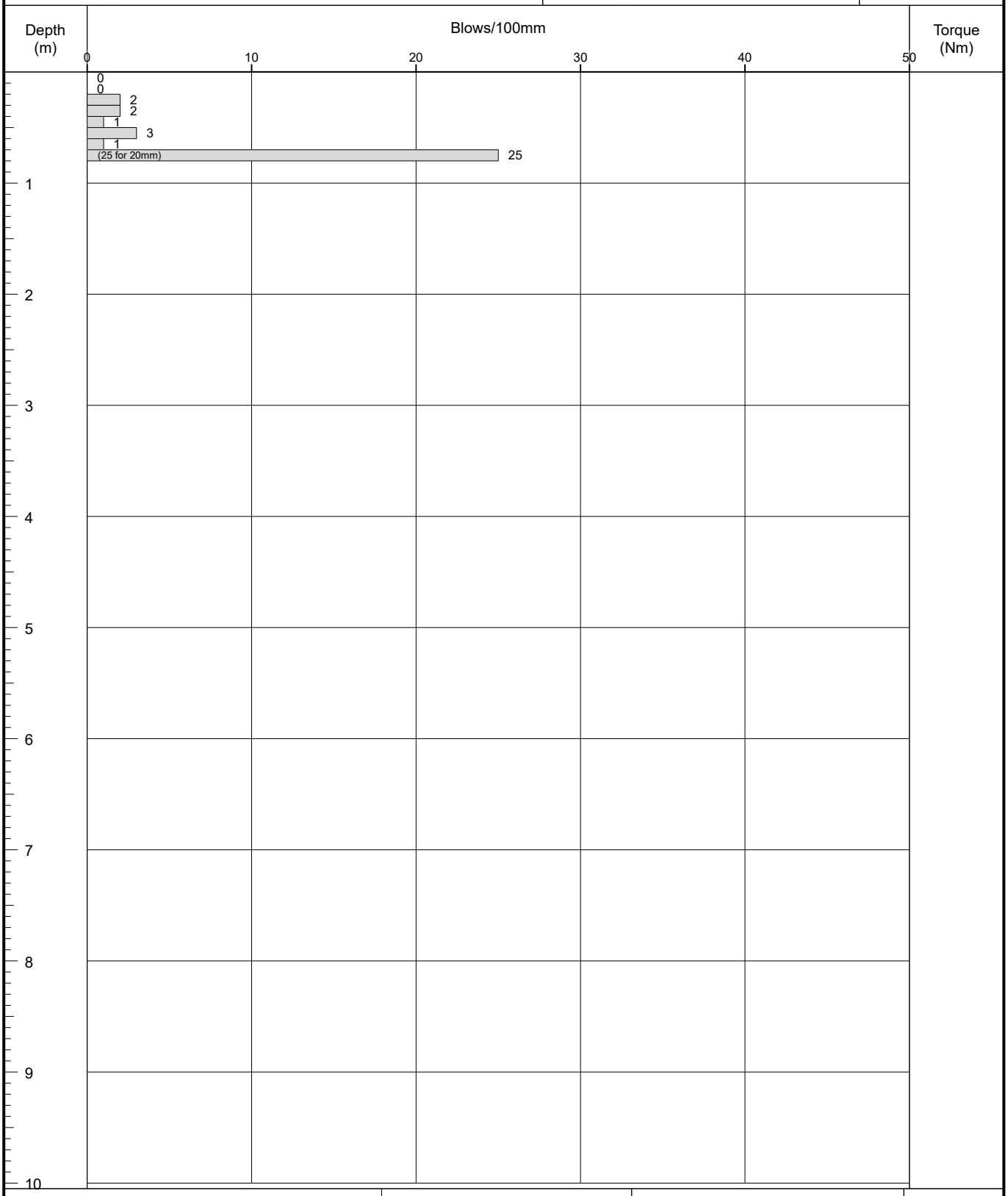
Remarks:

Fall Height	750mm	Cone Base Diameter	50.5mm
Hammer Wt	63.5kg	Final Depth	m
Probe Type	DPSH-B		

Probe Log

Probe No.
DP3
Sheet 1 of 1

Project Name: South View, Paddock	Project No. C2752/22/E/4199	Co-ords:	Hole Type DP
Location: Huddersfield		Level:	Scale 1:50
Client: Mr Saleem		Dates: 17/06/2022	Logged By AB & CG

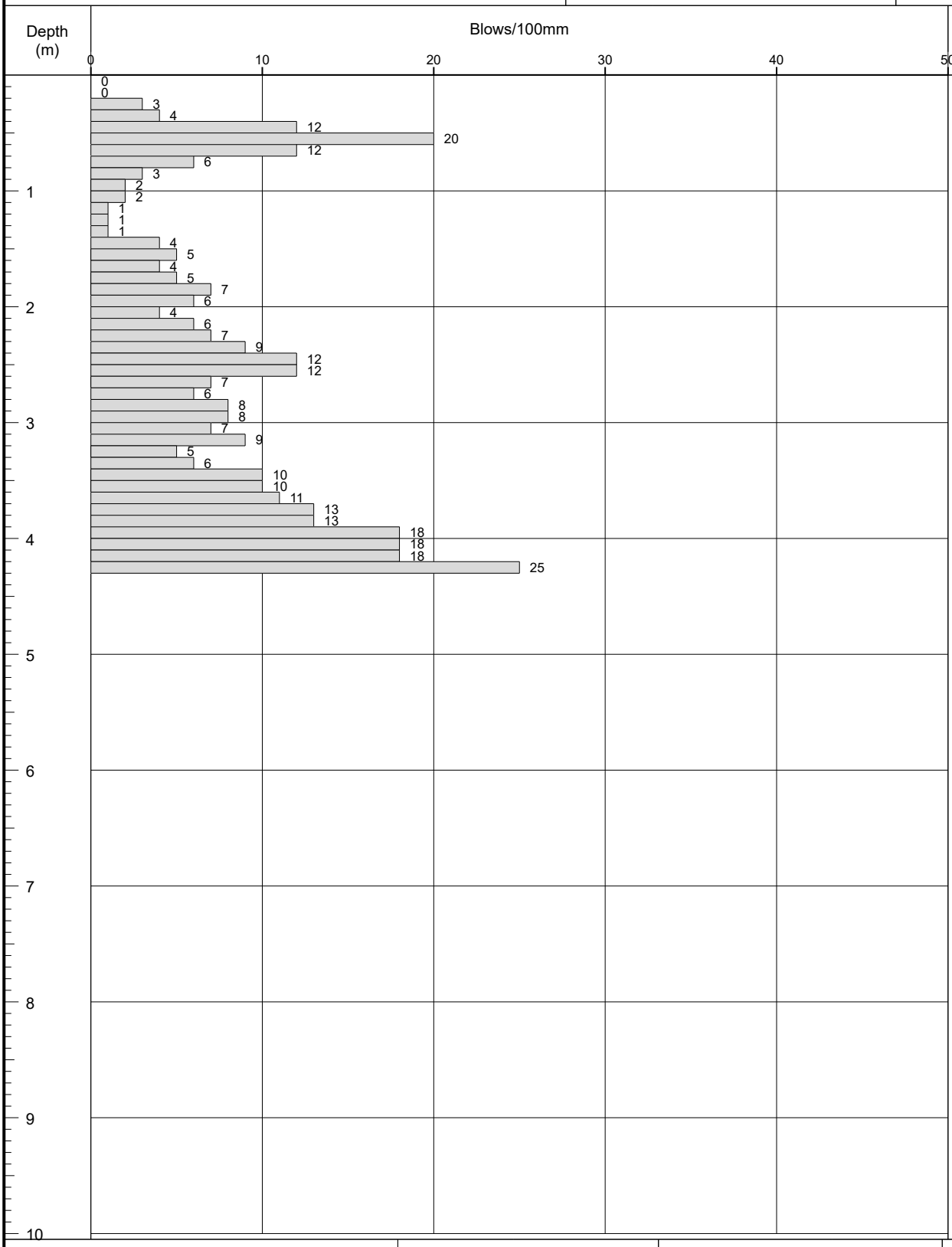


Remarks:	Fall Height	750mm	Cone Base Diameter	50.5mm	
	Hammer Wt	63.5kg	Final Depth	m	
	Probe Type	DPSH-B			

Probe Log

Probe No.
DP4
Sheet 1 of 1

Project Name: South View, Paddock	Project No. C2752/22/E/4199	Co-ords:	Hole Type DCP
Location: Huddersfield		Level:	Scale 1:50
Client: Mr Saleem		Dates: 17/06/2022	Logged By AB & CG



Remarks:

Fall Height	750mm	Cone Base Diameter	50.5mm
Hammer Wt	63.5kg	Final Depth	m
Probe Type	DPSH-B		

Appendix 5

Laboratory Testing – Geotechnical

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	22-24294-1
Initial Date of Issue:	01-Jul-2022
Client	Rogers Geotechnical Services Ltd
Client Address:	Offices 1&2, Barncliffe Business Park Near Bank Shelley Huddersfield West Yorkshire HD8 8LU
Contact(s):	Harry Letch
Project	C2752/22/E/4199 South View, Paddock

Quotation No.:		**Date Received:**	29-Jun-2022
Order No.:	PO-2214	**Date Instructed:**	29-Jun-2022
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	05-Jul-2022
Date Approved:	01-Jul-2022		
Approved By:			
Details:	Stuart Henderson, Technical Manager		

Results - Soil

Project: C2752/22/E/4199 South View, Paddock

Client: Rogers Geotechnical Services Ltd		**Chemtest Job No.:**			22-24294	22-24294	22-24294
Quotation No.:		**Chemtest Sample ID.:**			1457406	1457407	1457408
Order No.: PO-2214		Client Sample Ref.:			D1	D1	D1
		Sample Location:			WS1	WS2	WS4
		Sample Type:			SOIL	SOIL	SOIL
		Top Depth (m):			1.2	0.4	1.2
		Date Sampled:			23-Jun-2022	23-Jun-2022	23-Jun-2022
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
pH	M	2010		4.0	9.0	9.1	8.2
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.061	0.18	0.74
Moisture	N	2030	%	0.020	6.9	16	16
Soil Colour	N	2040		N/A	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones and Roots	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com