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**Land at Nup End
Knebworth
Geo-Environmental Investigation**

**For
Bly Developments Ltd**

**Geo-Environmental Investigations Ltd
78 Beckenham Road
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Prepared By	Checked By		Status	Date	Issue No
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This report discusses and assesses published information on local ground conditions, and presents the records of intrusive environmental site investigation works carried out by Geo-Environmental Investigations Ltd. The comments given in this report, and the opinions expressed therein, are based on the ground conditions at the time of the investigation, together with any conjectural interpretations of conditions in areas between excavations. There may, however, be other conditions not revealed by the work discussed here, which have not been taken into account in this report. The conclusions reached are those that can reasonably be determined from the sources of information referred to in the report and from our knowledge of current professional practice and standards. Any limitations resulting from the data are identified where possible but both these and our conclusions may require amendment should additional information become available. Geo-Environmental Investigations Ltd cannot accept any responsibility for any data derived from other reports used to produce this report.

The comments made on groundwater conditions are based on observations made at the time of the investigation. It should be noted that groundwater levels may vary due to seasonal and other causes.

This report is limited to the aspects of contamination and the analytes specifically discussed. No liability is accepted for any other aspects of contamination or pollution incidents that may be sudden or gradual in nature. No undertakings can be given as to the possibility of future changes in the conditions at the site. Geotechnical data has been acquired during the investigation and is presented as factual information only with no interpretation.

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1.0 INTRODUCTION AND SCOPE

Bly Developments Ltd (hereafter abbreviated to *DB*) instructed *Geo-Environmental Investigations Ltd* (hereafter abbreviated to *GEI*) to carry out a geo- environmental site investigation at a proposed residential development site on part of the rear garden of Nup End Farm. The brief for this report was to establish the environmental conditions and at the same time acquire factual geotechnical data to assist with foundation, foundation design however foundation design was not part of the brief.

It is proposed to redevelop this land for residential purposes.

2.0 SITE LOCATION AND DESCRIPTION

The site is at present is unused land with the industrial estate car park on one boundary, farm land and rear gardens on the other boundaries. The garden had an artificial pond this was a short lived ornamental pond with a liner. This pond was filled in with site won materials from the development of the adjacent industrial estate and comprised mainly topsoil and subsoil. The site is mainly grass with an ornamental block paving path with one area covered with granular material used for a short time for parking. The boundary with the industrial estate is lined with mature Leylandi trees, mature trees are also present on the site itself (now removed) the other boundaries are mainly lined with shrubs.

Access to the site is via a wooden gate leading to the Park Lane. The boundary with Park Lane is fronted a short length of wooden fence the remainder being hedge.

The site area is empty apart from a small caravan which appears to be semi-derelict.

3.0 SITE HISTORY

Anecdotal evidence indicates that the development plot has only been back garden or farm land. The back garden was cut off by the development of the old farm house and industrial estate, the land is therefore serving no useful purpose.

4.0 GEOLOGY

The site is not fully mapped geologically. The bedrock is the Lewes nodular chalk

Much of the local area is underlain by Glacial Till and some parts by Clay with flints which we consider underlies the site. The Glacial Till typically contains chalk clast which were not observed on the site.

A borehole drilled in 1909 situated in Knebworth for the Great Northern Railway recorded the following geology:

Fine gravel	1.0 metres
Flints loamy gravel	5.3 metres
Brown clay	9.4 metres
Gravel	1.5 metres
Chalk	was found 21 metres below surface

5.0 GEI SITE INVESTIGATION

The GEI site investigation was carried out on the 23 January 2023. The work was carried out by a window sample rigs, drilling six boreholes.

The site work was carried out in general accordance with the standard protocols set out in those sections of *BS 5930:1999, Code of Practice for Site Investigations* still in force, as well as *BS EN ISO 14688-1:2002 (Part 1: Identification and description)* and *BS EN ISO 14688-2: 2004 (Part 2: Identification for a classification)*, *Geotechnical investigation and testing – Identification and classification of soil*, and with *BS 10175:2011, "Investigation of potentially contaminated sites - Code of Practice"*.

All boreholes were logged by an experienced geo-environmental specialist. The soils encountered in the boreholes were sampled for chemical analysis at every strata change, using 1 - litre screw-top amber glass jars, and plastic potties were conveyed in cool boxes to the analytical laboratory. The laboratory used was ELAB who are UKAS and MCerts accredited.

Appendix A presents photographs taken during the site investigation. Figure 3 shows the approximate locations of GEI excavations. The logs of all boreholes are presented in Appendix B. A water and gas monitoring installation was installed in WS 1.

Insitu Standard Penetration Tests were carried out to estimate insitu shear strength, boreholes were drilled to a maximum depth of 5.5 metres. No water was struck in any of the holes except WS1 which was drilled in the low ground of the former pond. SPT Data is presented in Table 1.

6.0 INSITU TESTING

The SPT tests at a depth of 3 metres have an average N value of 27 using Stroud (1989) this would give a shear strength of approximately 120 kPa which correlates well with Pilcon hand penetrometer tests carried out on the cores retrieved from the boreholes.

Three window sample holes were drilled or utilised for soakaway testing.

TABLE 1 SPT DATA

Hole	Depth	Blows Seating	Blows Seating	BLOWS	BLOWS	BLOWS	BLOWS	N VALUE
	m							
WS1	1.00	3	3	4	5	5	5	19
	2.00	3	4	3	5	6	6	20
	3.00	3	4	3	5	6	6	20
	4.00	6	5	7	8	8	9	32
	5.00	5	6	9	10	11	10	40
	6.00	12	12	13	17	16	50/10mm	50
WS2	1.00	2	2	2	3	3	3	11
	2.00	3	4	4	7	7	8	26
	3.00	5	5	6	7	7	7	27
	4.00	5	5	6	7	7	8	28
	5.00	5	5	5	6	7	9	27
WS3	1.00	2	1	2	2	3	4	11
	2.00	2	2	3	2	3	4	12
	3.00	3	3	4	5	6	7	22
	4.00	2	2	2	4	3	4	13
	5.00	2	2	3	3	3	5	14
	6.00	4	4	4	6	6	8	24
WS4	1.00	2	1	2	3	3	4	12
	2.00	2	2	3	3	4	4	14
	3.00	2	2	4	6	6	9	25
	4.00	3	4	4	7	8	9	28
	5.00	3	4	4	6	6	8	24
	6.00	4	4	4	6	6	8	24
WS5	1.00	2	1	2	4	4	6	16
	2.00	5	5	5	7	8	9	29
	3.00	5	5	5	6	8	9	28
	4.00	4	4	5	9	9	11	34

7.0 CONCRETE QUALITY

The chemical analysis indicates a total potential sulphate of 0.09 % and low sulphate levels, no special precautions are required for concrete.

8.0 RISK ASSESSMENT

8.1 HUMAN HEALTH

RBCA (Risk Based Corrective Action) Version 2.5 Tier 1 and Tier 2 risk assessments have been carried out for the analyte lead. The *RBCA* gives a reasonable guide to groundwater risks, and Version 2.5 includes plant uptake. The *RBCA* software used includes American toxicological data and default parameters. Where *CLEA* data in the form of SGVs (Soil Guidance Values) or British toxicological data are available, these have been used in the *RBCA* assessment. *RBCA* Version 2.5 has been configured to accept the *CLEA* SGV approach.

Table 2 STATISTICAL ANALYSIS OF CHEMICAL DATA

ANALYTE	MAXIMUM	MINIMUM	MEAN	CRITERIA
Arsenic	29.8	15.6	20.6	37
Chromium	38.9	23	32.3	910
Copper	241	21.8	61.5	2400
Lead	261	18	90.7	300
Nickel	36.2	17.8	22.4	180
Vanadium	62.6	39.1	53.2	410
Zinc	361	49.3	130.7	3700

The distribution of the analytes in the subsoil is statistically normal.

In our opinion there is no evidence of significant anthropogenic contamination at this site and no significant risk to human health or the environment in general.

8.2 LAND GAS

We do not consider that there is a significant risk from land gases as there is no plausible source. The short-lived pond was artificial and lined it was also relatively shallow and lined and appears to have been a decorative garden feature and would not be considered a significant source.

Table 3: Chemical Acceptability Criteria

Contaminant of Concern	Acceptability Criterion (mg/kg)	Source
Arsenic	37	LQM/CIEH (2014)
Boron	290	LQM/CIEH (2014)
Cadmium	11	LQM/CIEH (2014)
Chromium (III)	910	LQM/CIEH (2014)
Chromium (VI)	4.2	LQM/CIEH
Copper	2400	LQM/CIEH (2014)
Lead	300	LQM/CIEH (2014)
Inorganic Mercury	40	LQM/CIEH (2014)
Nickel	180	LQM/CIEH (2014)
Selenium	250	LQM/CIEH (2014)
Vanadium	410	LQM/CIEH (2014)

Table 3: Chemical Acceptability Criteria (continued)

Contaminant of Concern	Acceptability Criterion (mg/kg)	Source
Zinc	3700	LQM/CIEH (2014)
Free Cyanide	25	GAC
Phenol	120	LQM/CIEH (2014)
PAHs		
Acenaphthene	100	Inert Landfill Criterion
Acenaphthylene	100	Inert Landfill Criterion
Anthracene	100	Inert Landfill Criterion
Benz(a)anthracene	7.2	LQM/CIEH (2014)
Benzo(a)pyrene	2.2	LQM/CIEH (2014)
Benzo(b)fluoranthene	2.6	LQM/CIEH (2014)
Benzo(ghi)perylene	320	LQM/CIEH (2014)
Benzo(k)fluoranthene	77	LQM/CIEH (2014)
Dibenz(a,h)anthracene	0.24	LQM/CIEH (2014)
Fluoranthene	280	LQM/CIEH (2014)
Chrysene	15	LQM/CIEH (2014)
Fluorene	170	LQM/CIEH (2014)

Indeno(1,2,3,cd)pyrene	27	LQM/CIEH (2014)
Naphthalene	2.3	LQM/CIEH (2014)
Phenanthrene	95	LQM/CIEH (2014)
Pyrene	100	Inert Landfill Criterion
Total PAHs	100	
Petroleum Hydrocarbons		
Aliphatic TPH (C5 – C6)	42	LQM/CIEH (2014)
Aliphatic TPH (C6 – C8)	100	LQM/CIEH (2014)
Aliphatic TPH (C8 – C10)	27	LQM/CIEH (2014)
Aliphatic TPH (C10 – C12)	130	LQM/CIEH (2014)
Aliphatic TPH (C12 – C16)	1100	LQM/CIEH (2014)
Aliphatic TPH (C16 – C35)	65000	LQM/CIEH (2014)
Aliphatic TPH (C35 – C44)	65000	LQM/CIEH (2014)
Aromatic TPH (C5 – C7)	70	LQM/CIEH (2014)
Aromatic TPH (C7 – C8)	130	LQM/CIEH (2014)
Aromatic TPH (C8 – C10)	34	LQM/CIEH (2014)
Aromatic TPH (C10 – C12)	74	LQM/CIEH (2014)
Aromatic TPH (C12 – C16)	140	LQM/CIEH (2014)
Aromatic TPH (C16 – C21)	260	LQM/CIEH (2014)
Aromatic TPH (C21 – C44)	1000	LQM/CIEH (2014)

Table 3: Chemical Acceptability Criteria (Continued)

Contaminant of Concern	Acceptability Criterion (mg/kg)	Source
Total TPH	1000	
Benzene	0.87	LQM/CIEH (2014)
Ethylbenzene	6	Inert Landfill Criterion
Toluene	6	Inert Landfill Criterion
Xylene	6	Inert Landfill Criterion
Total BTEX	6	Inert Landfill Criterion
Total PCBs	0.008	Inert Landfill Criterion
Asbestos	<0.001	IOM Detection limit

9.0 Controlled Waters

In view of the low levels of total analytes together with the relatively impermeable soils it was not consider necessary to evaluate the potential risk to groundwater using the Environment Agency's "*Hydrogeological risk assessment for land contamination*", *Remedial Targets Worksheet Release 3.1*, Workbook Issue October 2006.

In our opinion, the site does not pose a significant risk to surface or ground waters.

10.0 Combined Risk Assessment

The analyte values are consistent with the normal background levels expected in this area. The site in our opinion is suitable for domestic dwelling and does not pose a significant risk to human health or the environment.

11.00 SOAKWAY TESTING

Infiltration testing was carried out in window sample holes S1, S2 and S3 the values obtained are summarised below.

Infiltration Testing Results

Borehole	Depth mbgl	Infiltration (m/s)
S1	2.0 – 3.0	1.75 ¹⁰⁻³
S2	2.0 – 3.0	1.6 ¹⁰⁻³
S3	2.0 – 3.0	1.45 ¹⁰⁻³

The granular stratum at approximately 3 metres below current ground level would appear to be the most suitable stratum for a soakaway location, this does however locally contain some clayey soil. A full size pit test would may well produce improved results.

12.0 COMMENTS AND RECOMMENDATIONS

In our opinion, this investigation has demonstrated that the site does not pose a significant risk of significant harm to either human health or controlled waters, and is suitable for residential development.

Ground bearing is good and strip footings are suitable below 1 metre, however the Clay with Flints is generally low shrinkage soil but given the number of trees around and on the site a medium shrinkage level is advised and foundations should be designed that comply with NHBC guidance on building near trees.

Dust controls should be used in periods of dry weather.

Any topsoil imported for private gardens or amenity areas should conform to the requirements of *BS 3882: 2015, Specification for Topsoil*. Topsoil selected for use on this site should be sampled at source and tested for compliance using a NAMAS- and UKAS- accredited laboratory. The test results should be submitted

to the local authority for approval before emplacement on site. We caution against the purchase of any topsoil on the strength of suppliers' certificates only, which may be out of date or unrepresentative of the material purchased.

FIGURES

APPENDICES

APPENDIX A



Photo No.1 WS1 Located in the old pond area.

Photo No.2 WS 1





Photo No.3 Old infilled pond area.

Photo No.4 Main site area





Photo No.5 Looking toward existing site entrance

Photo No.6 Large tree (now removed) on the site.





Photo No. 7 Leylandi trees (now pollarded) along east site boundary.

Photo No 8 WS1 Cores





Photo No. 9 WS2

Photo No. 10 WS3 Cores





Photo No.11 WS4

Photo No. 12. WS5 Cores



APPENDIX B



Borehole Log

Borehole No.

WS 1

Sheet 1 of 1

Project Name: LAND AT NUP END

Project No.
2023/195

Co-ords: -

Hole Type
CP

Location: NUP END KNEBWORTH

Level:

Scale
1:50

Client: A D BLY CONSTRUCTION

Dates: 23/01/2023 -

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		1.00		N=19 (3,3/4,5,5,5)	1.00			TOPSOIL. Dark brown slightly clayey sandy SILT with some fine to coarse flint gravel (reworked TOPSOIL).	1
		2.00		N=19 (3,4/4,5,5,5)				MADE GROUND. Wet brown silty sandy CLAY with some fine to coarse flint gravel.	2
		3.00		N=25 (3,4/4,6,7,8)	3.00			Red brown slightly clayey silty SAND with fine to coarse flint gravel.	3
		4.00		N=32 (6,6/7,8,8,9)					4
		5.00		N=40 (5,6/9,10,11,10)					5
		6.00		N=96 (12,12/96 for 235mm)	6.50				6
								End of borehole at 6.50 m	7
									8
									9
									10

Remarks

WATER AT 1 mbgl





Borehole Log

Borehole No.

WS 2

Sheet 1 of 1

Project Name: LAND AT NUP END

Project No.
2023/195

Co-ords: -

Hole Type
CP

Location: NUP END KNEBWORTH

Level:

Scale
1:50

Client: A D BLY CONSTRUCTION

Dates: 23/01/2023 -

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.60			MADE GROUND. Reworked topsoil with some brick and brick.	
		1.00		N=11 (2,2/2,3,3,3)				Stiff orange and reddish brown silty slightly sandy CLAY with some fine flint gravel. CLAY WITH FLINTS	1
		2.00		N=26 (3,4/4,7,7,8)					2
					2.70			Orange brown slightly sandy SILT with much fine to medium flint gravel locally clayey. CLAY WITH FLINTS.	3
		3.00		N=27 (5,5/6,7,7,7)					
		4.00		N=27 (5,5/6,7,7,7)					4
		5.00		N=27 (5,5/5,6,7,9)					5
					5.50				6
								End of borehole at 5.50 m	7
									8
									9
									10

Remarks
HOLE DRY



Borehole Log

Borehole No.

WS 3

Sheet 1 of 1

Project Name: LAND AT NUP END

Project No.
2023/195

Co-ords: -

Hole Type
CP

Location: NUP END KNEBWORTH

Level:

Scale
1:50

Client: A D BLY CONSTRUCTION

Dates: 23/01/2023 -

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.40			TOPSOIL. Dark brown clayey slightly sandy SILT with some fine to medium flint gravel and fine roots.	
		1.00		8 (2,1/3,2,3,)				Stiff brown to orange brown silty CLAY with some fine to coarse flint gravel some pockets of silty sand.	1
		2.00		N=12 (2,2/3,2,3,4)					2
		3.00		N=22 (3,3/4,5,6,7)					3
		4.00		N=13 (2,2/2,4,3,4)	3.80			Brown silty SAND locally clayey with some flint gravel.	4
		5.00		N=14 (2,2/3,3,3,5)					5
		6.00		N=8 (2,2/2,2,1,3)					6
					7.50				7
								End of borehole at 7.00 m	7
									8
									9
									10

Remarks
HOLE DRY



Borehole Log

Borehole No.

WS 4

Sheet 1 of 1

Project Name: LAND AT NUP END

Project No.
2023/195

Co-ords: -

Hole Type
CP

Location: NUP END KNEBWORTH

Level:

Scale
1:50

Client: A D BLY CONSTRUCTION

Dates: 23/01/2023 -

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.50			Dark brown slightly clayey SILT with some fine to medium flint gravel and fine roots.	
		1.00		N=16 (2,1/2,4,4,6)				Brown slightly clayey SILT locally with silty clay pockets and rare flint gravel.	1
		2.00		N=14 (2,2/3,3,4,4)					2
					2.50			Grey silty SAND locally with clay pockets and pockets of flint gravel.	
		3.00		N=25 (2,2/4,6,6,9)					3
		4.00		N=28 (3,4/4,7,8,9)					4
		5.00		N=28 (3,4/4,7,8,9)					5
		6.00		N=24 (4,4/4,6,6,8)					6
					6.50				
								End of borehole at 6.50 m	7
									8
									9
									10

Remarks
HOLE DRY



Borehole Log

Borehole No.

WS 5

Sheet 1 of 1

Project Name: LAND AT NUP END

Project No.
2023/195

Co-ords: -

Hole Type
CP

Location: NUP END KNEBWORTH

Level:

Scale
1:50

Client: A D BLY CONSTRUCTION

Dates: 23/01/2023 -

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10			MADE GROUND. Reworked brown sandy slightly clayey SILT with some brick mainly reworked topsoil.	
		1.00		N=16 (2, 1/2, 4, 4, 6)				Stiff brown silty CLAY with pockets of flint gravel locally sandy.	1
		2.00		N=29 (5, 5/5, 7, 8, 9)					2
		3.00		N=28 (5, 5/5, 6, 8, 9)					3
					3.50			Orange brown silty slightly clayey SILT. Rare fling gravel.	4
		4.00		N=35 (5, 5/7, 8, 9, 11)					
					4.50			End of borehole at 4.50 m	5
									6
									7
									8
									9
									10

Remarks
HOLE DRY

APPENDIX C



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THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number: 23-46278

Issue: 1

Date of Issue: 10/02/2023

Contact: Albert Prince

Customer Details: A D Bly
Nup End Farm
HertfordshireSG3 6QJ

Quotation No: Q22-03495

Order No: Not Supplied

Customer Reference: Not Supplied

Date Received: 26/01/2023

Date Approved: 10/02/2023

Details: Nup End

Approved by: 

Mike Varley, General Manager

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Sample Summary

Report No.: 23-46278, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
309787	WS1 N1 0.00 - 1.00	23/01/2023	30/01/2023	Silty loam	
309788	WS1 N2 1.00 - 1.50	23/01/2023	30/01/2023	Silty clayey loam	
309789	WS2 N3 0.60 - 1.80	23/01/2023	30/01/2023	Clayey loam	
309790	WS3 N5 0.00 - 0.40	23/01/2023	30/01/2023	Sandy silty loam	
309791	WS3 N6 0.40 - 3.80	23/01/2023	30/01/2023	Clayey loam	
309792	WS4 N9 0.00 - 0.50	23/01/2023	30/01/2023	Sandy silty loam	
309793	WS4 N10 0.50 - 1.00	23/01/2023	30/01/2023	Clayey loam	
309794	WS4 N11 1.00 - 1.50	23/01/2023	30/01/2023	Clayey loam	

Results Summary

Report No.: 23-46278, issue number 1

	ELAB Reference	309787	309788	309789	309790		
	Customer Reference	N1	N2	N3	N5		
	Sample ID						
	Sample Type	SOIL	SOIL	SOIL	SOIL		
	Sample Location	WS1	WS1	WS2	WS3		
	Sample Depth (m)	0.00 - 1.00	1.00 - 1.50	0.60 - 1.80	0.00 - 0.40		
	Sampling Date	23/01/2023	23/01/2023	23/01/2023	23/01/2023		
Determinand	Codes	Units	LOD				
Soil sample preparation parameters							
Moisture Content	N	%	0.1	18.9	14.4	20.0	19.8
Material removed	N	%	0.1	9.9	10.9	8.4	2.9
Description of Inert material removed	N		0	Stones	Stones	Stones	Stones
Metals							
Antimony	N	mg/kg	2.5	n/t	< 2.5	n/t	n/t
Arsenic	M	mg/kg	1	19.1	19.8	20.3	19.0
Barium	U	mg/kg	10	121	73.5	88.8	92.7
Beryllium	U	mg/kg	1	1.2	1.7	1.3	1.2
Cadmium	M	mg/kg	0.5	0.6	< 0.5	< 0.5	< 0.5
Chromium	M	mg/kg	5	27.1	38.9	37.0	24.0
Copper	M	mg/kg	5	54.9	25.1	21.8	37.2
Iron	N	mg/kg	35	24400	34600	43400	26400
Lead	M	mg/kg	5	134	38.3	18.0	136
Manganese	U	mg/kg	30	869	354	455	661
Mercury	M	mg/kg	0.5	< 0.5	< 0.5	< 0.5	< 0.5
Nickel	M	mg/kg	5	20.6	24.4	19.0	17.8
Selenium	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium	M	mg/kg	5	39.7	61.9	58.9	39.1
Zinc	M	mg/kg	5	180	77.2	49.3	127
Anions							
Water Soluble Fluoride	N	mg/kg	40	n/t	< 40	n/t	n/t
Water Soluble Sulphate	M	g/l	0.02	n/t	n/t	n/t	n/t
Water Soluble Sulphate	M	mg/kg	40	n/t	n/t	n/t	n/t
Inorganics							
Ammonia as NH4	N	mg/kg	0.1	n/t	< 0.1	n/t	n/t
Total Sulphide	N	mg/kg	2	n/t	< 2	n/t	n/t
Total Cyanide	M	mg/kg	1	n/t	< 1.0	n/t	n/t
Total Sulphur	N	%	0.01	n/t	n/t	n/t	n/t
Total Potential Sulphate	N	%	0.01	n/t	n/t	n/t	n/t
Oxidisable sulphide (SO4)	N	% SO4	0.01	n/t	n/t	n/t	n/t
Acid Soluble Sulphate (SO4)	U	%	0.02	n/t	0.03	n/t	n/t
Water Soluble Boron	N	mg/kg	0.5	1.2	0.6	< 0.5	0.8
Miscellaneous							
pH	M	pH units	0.1	8.0	7.8	7.2	6.9
Soil Organic Matter	U	%	0.1	n/t	0.8	n/t	n/t
Total Organic Carbon	N	%	0.01	n/t	0.46	n/t	n/t
Phenols							
Total Monohydric Phenols	N	mg/kg	5	n/t	< 5	n/t	n/t



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Results Summary

Report No.: 23-46278, issue number 1

				ELAB Reference	309787	309788	309789	309790
				Customer Reference	N1	N2	N3	N5
				Sample ID				
				Sample Type	SOIL	SOIL	SOIL	SOIL
				Sample Location	WS1	WS1	WS2	WS3
				Sample Depth (m)	0.00 - 1.00	1.00 - 1.50	0.60 - 1.80	0.00 - 0.40
				Sampling Date	23/01/2023	23/01/2023	23/01/2023	23/01/2023
Determinand	Codes	Units	LOD					
Polyaromatic hydrocarbons								
Naphthalene	MS	mg/kg	0.02	n/t	< 0.02	n/t	n/t	n/t
Acenaphthylene	MS	mg/kg	0.02	n/t	< 0.02	n/t	n/t	n/t
Acenaphthene	MS	mg/kg	0.02	n/t	< 0.02	n/t	n/t	n/t
Fluorene	US	mg/kg	0.02	n/t	< 0.02	n/t	n/t	n/t
Phenanthrene	MS	mg/kg	0.02	n/t	< 0.02	n/t	n/t	n/t
Anthracene	US	mg/kg	0.02	n/t	< 0.02	n/t	n/t	n/t
Fluoranthene	MS	mg/kg	0.02	n/t	0.06	n/t	n/t	n/t
Pyrene	MS	mg/kg	0.02	n/t	0.05	n/t	n/t	n/t
Benzo(a)anthracene	US	mg/kg	0.02	n/t	0.03	n/t	n/t	n/t
Chrysene	MS	mg/kg	0.02	n/t	< 0.03	n/t	n/t	n/t
Benzo(b)fluoranthene	MS	mg/kg	0.02	n/t	0.03	n/t	n/t	n/t
Benzo(k)fluoranthene	MS	mg/kg	0.03	n/t	< 0.03	n/t	n/t	n/t
Benzo(a)pyrene	US	mg/kg	0.02	n/t	0.03	n/t	n/t	n/t
Indeno(1,2,3-cd)pyrene	MS	mg/kg	0.02	n/t	0.03	n/t	n/t	n/t
Dibenzo(a,h)anthracene	MS	mg/kg	0.02	n/t	< 0.02	n/t	n/t	n/t
Benzo[g,h,i]perylene	MS	mg/kg	0.02	n/t	< 0.02	n/t	n/t	n/t
Total PAH(16)	NS	mg/kg	0.34	n/t	< 0.34	n/t	n/t	n/t
BTEX								
Benzene	M	ug/kg	10	n/t	< 10.0	n/t	n/t	n/t
Toluene	M	ug/kg	10	n/t	< 10.0	n/t	n/t	n/t
Ethylbenzene	M	ug/kg	10	n/t	< 10.0	n/t	n/t	n/t
Xylenes	M	ug/kg	10	n/t	< 10.0	n/t	n/t	n/t
MTBE	U	ug/kg	10	n/t	< 10.0	n/t	n/t	n/t
TPH CWG								
>C5-C6 Aliphatic (HS_1D_AL)	NS	mg/kg	0.1	n/t	< 0.01	n/t	n/t	n/t
>C6-C8 Aliphatic (HS_1D_AL)	NS	mg/kg	0.1	n/t	< 0.01	n/t	n/t	n/t
>C8-C10 Aliphatic (HS_1D_AL)	NS	mg/kg	0.1	n/t	< 0.01	n/t	n/t	n/t
>C10-C12 Aliphatic (EH_2D_AL)	NS	mg/kg	6	n/t	< 6	n/t	n/t	n/t
>C12-C16 Aliphatic (EH_2D_AL)	NS	mg/kg	6	n/t	< 6	n/t	n/t	n/t
>C16-C35 Aliphatic (EH_2D_AL)	NS	mg/kg	15	n/t	< 15	n/t	n/t	n/t
>C35-C44 Aliphatic (EH_2D_AL)	NS	mg/kg	10	n/t	< 10	n/t	n/t	n/t
>C5-C7 Aromatic (HS_1D_AR)	NS	mg/kg	0.01	n/t	< 0.01	n/t	n/t	n/t
>C7-C8 Aromatic (HS_1D_AR)	NS	mg/kg	0.01	n/t	< 0.01	n/t	n/t	n/t
>C8-C10 Aromatic (HS_1D_AR)	NS	mg/kg	0.01	n/t	< 0.01	n/t	n/t	n/t
>C10-C12 Aromatic (EH_2D_AR)	NS	mg/kg	10	n/t	< 10	n/t	n/t	n/t
>C12-C16 Aromatic (EH_2D_AR)	NS	mg/kg	10	n/t	< 10	n/t	n/t	n/t
>C16-C21 Aromatic (EH_2D_AR)	NS	mg/kg	1	n/t	< 1	n/t	n/t	n/t
>C21-C35 Aromatic (EH_2D_AR)	NS	mg/kg	1	n/t	< 1	n/t	n/t	n/t
>C35-C44 Aromatic (EH_2D_AR)	NS	mg/kg	1	n/t	< 1	n/t	n/t	n/t

Results Summary

Report No.: 23-46278, issue number 1

				ELAB Reference	309791	309792	309793	309794
				Customer Reference	N6	N9	N10	N11
				Sample ID				
				Sample Type	SOIL	SOIL	SOIL	SOIL
				Sample Location	WS3	WS4	WS4	WS4
				Sample Depth (m)	0.40 - 3.80	0.00 - 0.50	0.50 - 1.00	1.00 - 1.50
				Sampling Date	23/01/2023	23/01/2023	23/01/2023	23/01/2023
Determinand	Codes	Units	LOD					
Soil sample preparation parameters								
Moisture Content	N	%	0.1	16.8	16.0	16.2	13.8	
Material removed	N	%	0.1	5.6	12.4	8.6	12.4	
Description of Inert material removed	N		0	Stones	Stones/Clinker	Stones	Stones	
Metals								
Antimony	N	mg/kg	2.5	n/t	3.7	n/t	n/t	
Arsenic	M	mg/kg	1	20.6	29.8	15.6	n/t	
Barium	U	mg/kg	10	68.8	243	95.7	n/t	
Beryllium	U	mg/kg	1	1.9	2.8	1.1	n/t	
Cadmium	M	mg/kg	0.5	< 0.5	0.8	< 0.5	n/t	
Chromium	M	mg/kg	5	39.1	28.7	31.4	n/t	
Copper	M	mg/kg	5	23.0	241	27.6	n/t	
Iron	N	mg/kg	35	45600	30500	32700	n/t	
Lead	M	mg/kg	5	21.7	261	25.6	n/t	
Manganese	U	mg/kg	30	204	936	272	n/t	
Mercury	M	mg/kg	0.5	< 0.5	< 0.5	< 0.5	n/t	
Nickel	M	mg/kg	5	20.8	36.2	17.9	n/t	
Selenium	M	mg/kg	1	< 1.0	< 1.0	< 1.0	n/t	
Vanadium	M	mg/kg	5	62.8	61.6	48.5	n/t	
Zinc	M	mg/kg	5	54.0	361	66.6	n/t	
Anions								
Water Soluble Fluoride	N	mg/kg	40	n/t	< 40	n/t	n/t	
Water Soluble Sulphate	M	g/l	0.02	< 0.02	n/t	n/t	0.14	
Water Soluble Sulphate	M	mg/kg	40	< 40	n/t	n/t	278	
Inorganics								
Ammonia as NH4	N	mg/kg	0.1	n/t	< 0.1	n/t	n/t	
Total Sulphide	N	mg/kg	2	n/t	< 2	n/t	n/t	
Total Cyanide	M	mg/kg	1	n/t	< 1.0	n/t	n/t	
Total Sulphur	N	%	0.01	0.03	n/t	n/t	0.03	
Total Potential Sulphate	N	%	0.01	0.08	n/t	n/t	0.09	
Oxidisable sulphide (SO4)	N	% SO4	0.01	0.06	n/t	n/t	0.05	
Acid Soluble Sulphate (SO4)	U	%	0.02	0.02	0.05	n/t	0.04	
Water Soluble Boron	N	mg/kg	0.5	0.7	1.2	0.6	n/t	
Miscellaneous								
pH	M	pH units	0.1	8.1	7.7	7.6	n/t	
Soil Organic Matter	U	%	0.1	n/t	5.1	n/t	n/t	
Total Organic Carbon	N	%	0.01	n/t	4.8	n/t	n/t	
Phenols								
Total Monohydric Phenols	N	mg/kg	5	n/t	< 5	n/t	n/t	



Results Summary

Report No.: 23-46278, issue number 1

				ELAB Reference	309791	309792	309793	309794
				Customer Reference	N6	N9	N10	N11
				Sample ID				
				Sample Type	SOIL	SOIL	SOIL	SOIL
				Sample Location	WS3	WS4	WS4	WS4
				Sample Depth (m)	0.40 - 3.80	0.00 - 0.50	0.50 - 1.00	1.00 - 1.50
				Sampling Date	23/01/2023	23/01/2023	23/01/2023	23/01/2023
Determinand	Codes	Units	LOD					
Polyaromatic hydrocarbons								
Naphthalene	MS	mg/kg	0.02	n/t	0.03	n/t	n/t	n/t
Acenaphthylene	MS	mg/kg	0.02	n/t	0.05	n/t	n/t	n/t
Acenaphthene	MS	mg/kg	0.02	n/t	0.04	n/t	n/t	n/t
Fluorene	US	mg/kg	0.02	n/t	0.04	n/t	n/t	n/t
Phenanthrene	MS	mg/kg	0.02	n/t	0.54	n/t	n/t	n/t
Anthracene	US	mg/kg	0.02	n/t	0.18	n/t	n/t	n/t
Fluoranthene	MS	mg/kg	0.02	n/t	1.53	n/t	n/t	n/t
Pyrene	MS	mg/kg	0.02	n/t	1.44	n/t	n/t	n/t
Benzo(a)anthracene	US	mg/kg	0.02	n/t	0.93	n/t	n/t	n/t
Chrysene	MS	mg/kg	0.02	n/t	1.06	n/t	n/t	n/t
Benzo(b)fluoranthene	MS	mg/kg	0.02	n/t	1.71	n/t	n/t	n/t
Benzo(k)fluoranthene	MS	mg/kg	0.03	n/t	0.81	n/t	n/t	n/t
Benzo(a)pyrene	US	mg/kg	0.02	n/t	1.39	n/t	n/t	n/t
Indeno(1,2,3-cd)pyrene	MS	mg/kg	0.02	n/t	1.22	n/t	n/t	n/t
Dibenzo(a,h)anthracene	MS	mg/kg	0.02	n/t	0.22	n/t	n/t	n/t
Benzo(g,h,i)perylene	MS	mg/kg	0.02	n/t	1.11	n/t	n/t	n/t
Total PAH(16)	NS	mg/kg	0.34	n/t	12.1	n/t	n/t	n/t
BTEX								
Benzene	M	ug/kg	10	n/t	< 10.0	n/t	n/t	n/t
Toluene	M	ug/kg	10	n/t	< 10.0	n/t	n/t	n/t
Ethylbenzene	M	ug/kg	10	n/t	< 10.0	n/t	n/t	n/t
Xylenes	M	ug/kg	10	n/t	< 10.0	n/t	n/t	n/t
MTBE	U	ug/kg	10	n/t	< 10.0	n/t	n/t	n/t
TPH CWG								
>C5-C6 Aliphatic (HS_1D_AL)	NS	mg/kg	0.1	n/t	< 0.01	n/t	n/t	n/t
>C6-C8 Aliphatic (HS_1D_AL)	NS	mg/kg	0.1	n/t	< 0.01	n/t	n/t	n/t
>C8-C10 Aliphatic (HS_1D_AL)	NS	mg/kg	0.1	n/t	< 0.01	n/t	n/t	n/t
>C10-C12 Aliphatic (EH_2D_AL)	NS	mg/kg	6	n/t	< 6	n/t	n/t	n/t
>C12-C16 Aliphatic (EH_2D_AL)	NS	mg/kg	6	n/t	< 6	n/t	n/t	n/t
>C16-C35 Aliphatic (EH_2D_AL)	NS	mg/kg	15	n/t	37	n/t	n/t	n/t
>C35-C44 Aliphatic (EH_2D_AL)	NS	mg/kg	10	n/t	25	n/t	n/t	n/t
>C5-C7 Aromatic (HS_1D_AR)	NS	mg/kg	0.01	n/t	< 0.01	n/t	n/t	n/t
>C7-C8 Aromatic (HS_1D_AR)	NS	mg/kg	0.01	n/t	< 0.01	n/t	n/t	n/t
>C8-C10 Aromatic (HS_1D_AR)	NS	mg/kg	0.01	n/t	< 0.01	n/t	n/t	n/t
>C10-C12 Aromatic (EH_2D_AR)	NS	mg/kg	10	n/t	< 10	n/t	n/t	n/t
>C12-C16 Aromatic (EH_2D_AR)	NS	mg/kg	10	n/t	14	n/t	n/t	n/t
>C16-C21 Aromatic (EH_2D_AR)	NS	mg/kg	1	n/t	11	n/t	n/t	n/t
>C21-C35 Aromatic (EH_2D_AR)	NS	mg/kg	1	n/t	146	n/t	n/t	n/t
>C35-C44 Aromatic (EH_2D_AR)	NS	mg/kg	1	n/t	125	n/t	n/t	n/t



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Results Summary

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Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
309788	1.00 - 1.50	WS1 N2	Brown Soil, Stones, Clinker	No asbestos detected	n/t	n/t	n/t	n/t
309792	0.00 - 0.50	WS4 N9	Brown Soil, Stones, Clinker	No asbestos detected	n/t	n/t	n/t	n/t



Method Summary

Report No.: 23-46278, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Sulphide	N	As submitted sample	02/02/2023	109	Colorimetry
pH	M	Air dried sample	01/02/2023	113	Electromeric
Acid Soluble Sulphate	U	Air dried sample	01/02/2023	115	Ion Chromatography
Aqua regia extractable metals	M	Air dried sample	31/01/2023	118	ICPMS
Phenols in solids	N	As submitted sample	31/01/2023	121	HPLC
Ammonia in soil	N	As submitted sample	01/02/2023	138	Colorimetry
Water soluble anions	M	Air dried sample	31/01/2023	172	Ion Chromatography
Low range Aliphatic hydrocarbons soil	N	As submitted sample	05/02/2023	181	GC-MS
Low range Aromatic hydrocarbons soil	N	As submitted sample	05/02/2023	181	GC-MS
BTEX in solids	M	As submitted sample	05/02/2023	181A	GC-MS
Water soluble boron	N	Air dried sample	31/01/2023	202	Colorimetry
Total cyanide	M	As submitted sample	31/01/2023	204	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	01/02/2023	210	IR
Asbestos identification	U	Air dried sample	03/02/2023	280	Microscopy
Soil organic matter	U	Air dried sample	01/02/2023	BS1377:P3	Titrimetry

Tests marked N are not UKAS accredited



Report Information

Report No.: 23-46278, issue number 1

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"
LOD	LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination. Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed. ELAB are unable to provide an interpretation or opinion on the content of this report. The results relate only to the sample received. PCB congener results may include any coeluting PCBs Uncertainty of measurement for the determinands tested are available upon request <i>Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.</i>

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
 All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

TPH Classification - HWOL Acronym System

HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
2D	GC-GC - Double coil gas chromatography
#1	EH_Total but with humics mathematically subtracted
#2	EH_Total but with fatty acids mathematically subtracted
-	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

APPENDIX D



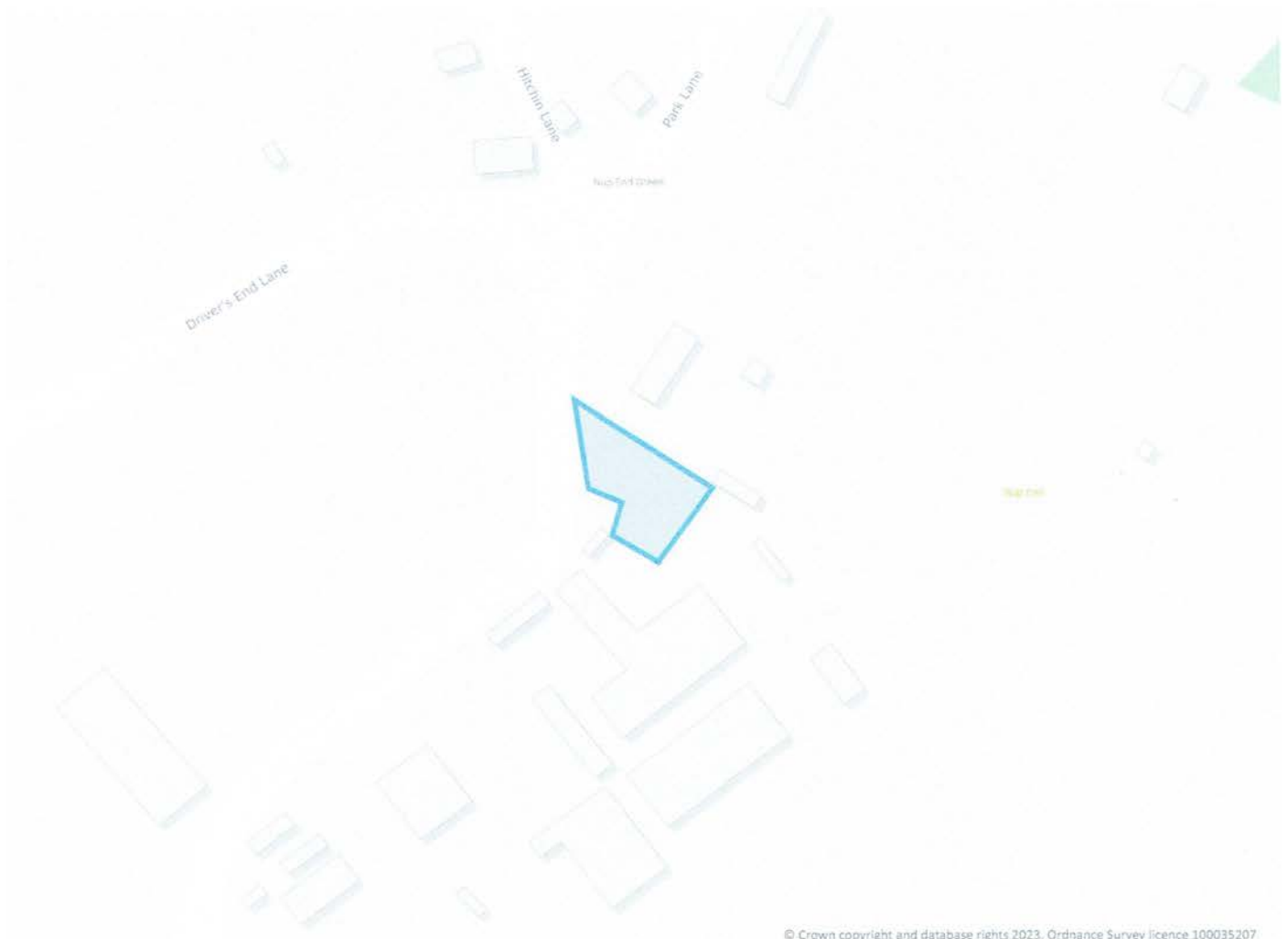
NUP END INDUSTRIAL ESTATE, NUP END, OLD KNEBWORTH, SG3 6QJ

Order Details

Date: 06/03/2023
Your ref: NUP
Our Ref: GS-9400256

Site Details

Location: 522554 219880
Area: 0.1 ha
Authority: [North Hertfordshire District Council](#)



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Summary of findings

p. 2

Aerial image

p. 5

OS MasterMap site plan

p.10

groundsure.com/insightuserguide

Summary of findings

Page	Section	Geology 1:10,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
11	1.1	10k Availability	Identified (within 500m)				
12	1.2	Artificial and made ground (10k)	0	0	0	0	—
13	1.3	Superficial geology (10k)	0	0	1	1	—
14	1.4	Landslip (10k)	0	0	0	0	—
15	1.5	Bedrock geology (10k)	0	0	1	0	—
16	1.6	Bedrock faults and other linear features (10k)	0	0	0	0	—
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	1	0	—
19	2.3	Artificial ground permeability (50k)	0	0	—	—	—
20	2.4	Superficial geology (50k)	1	0	2	4	—
21	2.5	Superficial permeability (50k)	Identified (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	0	0	0	—
23	2.9	Bedrock permeability (50k)	Identified (within 50m)				
23	2.10	Bedrock faults and other linear features (50k)	0	0	0	0	—
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	Low (within 50m)				
26	4.2	Running sands	Very low (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	Very low (within 50m)				



Page	Section	Mining, ground workings and natural cavities	On site	0-50m	50-250m	250-500m	500-2000m
32	5.1	Natural cavities	0	0	0	0	-
33	5.2	<u>BritPits</u>	0	0	0	1	-
33	5.3	<u>Surface ground workings</u>	1	0	0	-	-
33	5.4	Underground workings	0	0	0	0	0
34	5.5	Historical Mineral Planning Areas	0	0	0	0	-
34	5.6	<u>Non-coal mining</u>	1	0	1	0	0
34	5.7	Mining cavities	0	0	0	0	0
35	5.8	JPB mining areas	None (within 0m)				
35	5.9	Coal mining	None (within 0m)				
35	5.10	Brine areas	None (within 0m)				
35	5.11	Gypsum areas	None (within 0m)				
35	5.12	Tin mining	None (within 0m)				
36	5.13	Clay mining	None (within 0m)				

Page	Section	Radon					
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37	6.1	<u>Radon</u>	Less than 1% (within 0m)				
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Page	Section	Soil chemistry	On site	0-50m	50-250m	250-500m	500-2000m
39	7.1	<u>BGS Estimated Background Soil Chemistry</u>	1	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	-	-
40	8.3	Railway tunnels	0	0	0	-	-
40	8.4	Historical railway and tunnel features	0	0	0	-	-
40	8.5	Royal Mail tunnels	0	0	0	-	-
41	8.6	Historical railways	0	0	0	-	-
41	8.7	Railways	0	0	0	-	-
41	8.8	Crossrail 1	0	0	0	0	-



4.1	8.9	Crossrail 3	0	0	0
4.1	8.10	H57	0	0	0



Recent aerial photograph



Aerial photography supplied by Getmapping PLC. © Copyright Getmapping PLC 2023. All Rights Reserved.

Capture Date: 09/04/2020

Site Area: 0.1ha



Recent site history - 2019 aerial photograph



Capture Date: 14/09/2019

Site Area: 0.1ha



Recent site history - 2014 aerial photograph



Capture Date: 01/06/2014

Site Area: 0.1ha



Recent site history - 2010 aerial photograph



Capture Date: 27/04/2010

Site Area: 0.1ha



Recent site history - 1999 aerial photograph

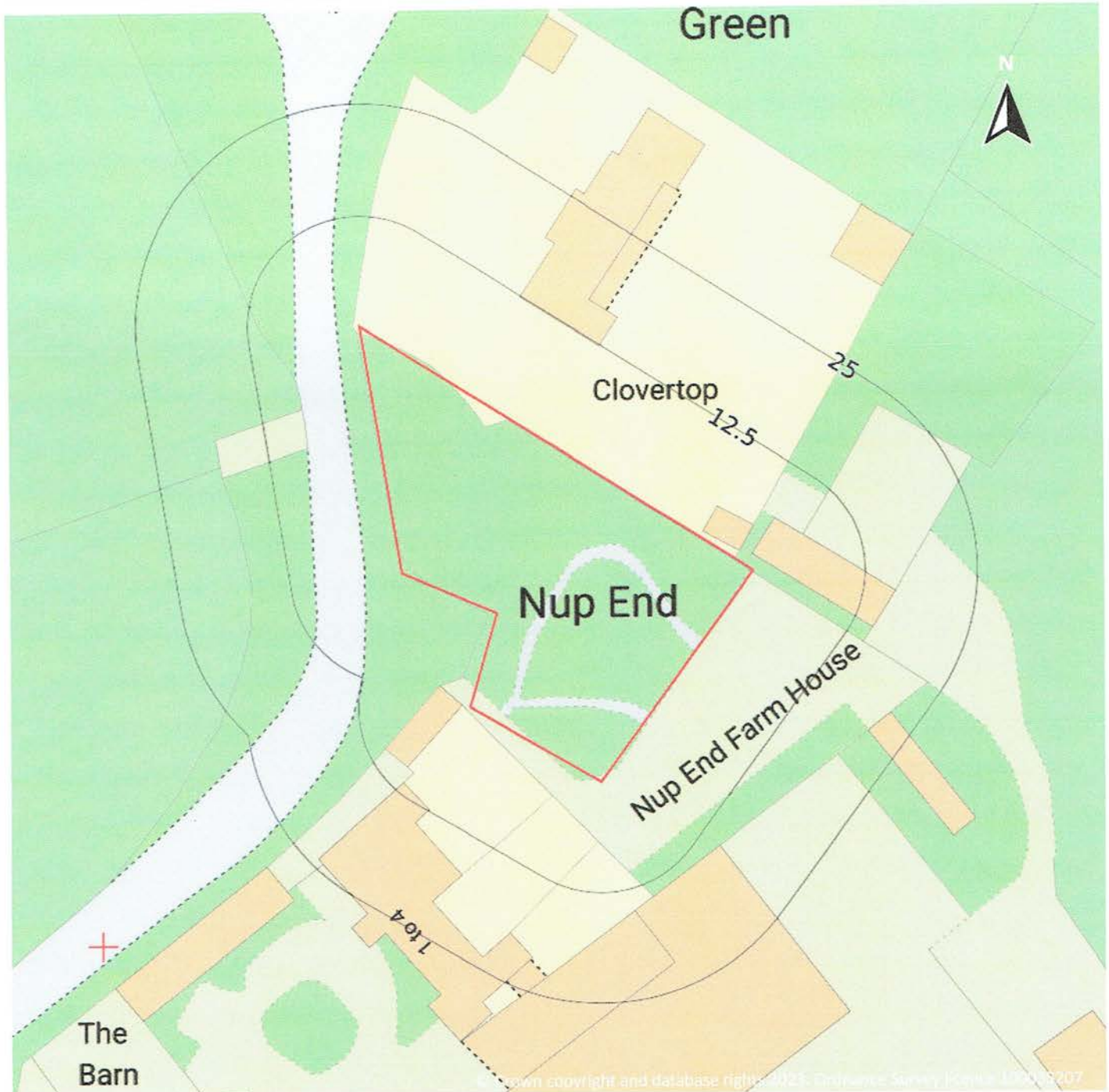


Capture Date: 18/07/1999

Site Area: 0.1ha



OS MasterMap site plan



Site Area: 0.1ha



1 Geology 1:10,000 scale - Availability



1.1 10k Availability

Records within 500m

2

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

Features are displayed on the Geology 1:10,000 scale - Availability map on **page 11**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	No coverage	No coverage	No coverage	No coverage	NoCov
2	103m N	Full	Full	Full	No coverage	TL22SW

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

1.2 Artificial and made ground (10k)

Records within 500m

0

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.

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

2

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	103m N	LOFT-DMTN	Lowestoft Formation - Diamicton	Diamicton
2	302m NE	GFDMP-XSV	Glaciofluvial Deposits, Mid Pleistocene - Sand And Gravel	Sand And Gravel

This data is sourced from the British Geological Survey.



1.4 Landslip (10k)

Records within 500m

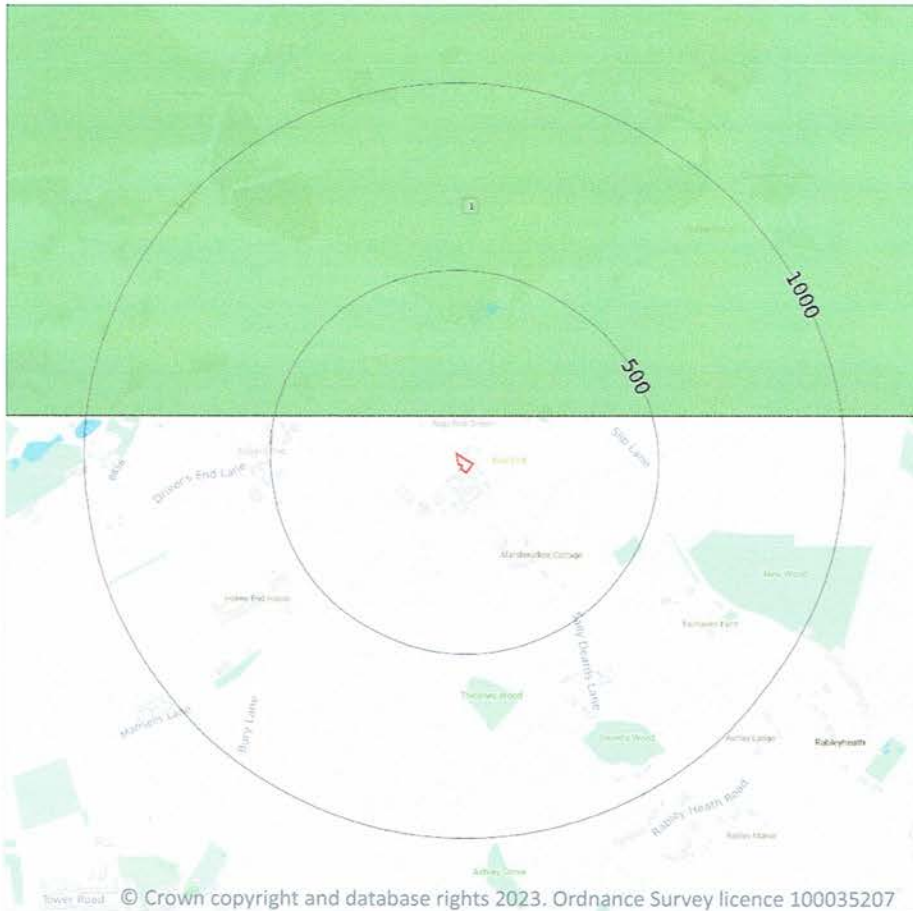
0

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

1

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

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

ID	Location	LEX Code	Description	Rock age
1	103m N	LESE-CHLK	Lewes Nodular Chalk Formation And Seaford Chalk Formation (undifferentiated) - Chalk	Santonian Age - Turonian Age

This data is sourced from the British Geological Survey.



1.6 Bedrock faults and other linear features (10k)

Records within 500m

0

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.

This data is sourced from the British Geological Survey



2 Geology 1:50,000 scale - Availability



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.

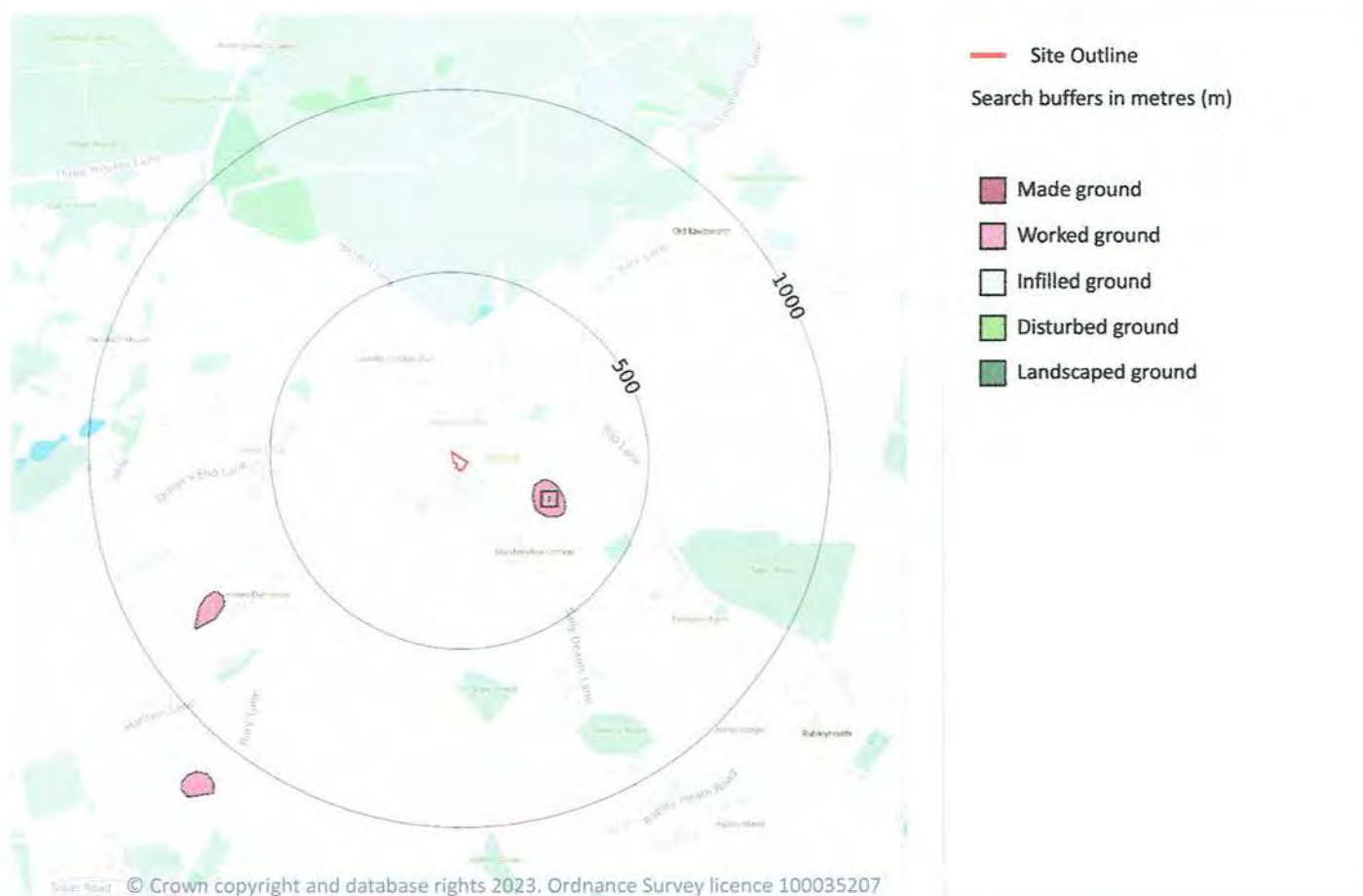
Features are displayed on the Geology 1:50,000 scale - Availability map on [page 17](#)

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	Full	Full	Full	Full	EW221_hitchin_v4

This data is sourced from the British Geological Survey.



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



2.2 Artificial and made ground (50k)

Records within 500m

1

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	195m E	WGR-VOID	WORKED GROUND (UNDIVIDED)	VOID

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

7

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	On site	LOFT-DMTN	LOWESTOFT FORMATION	DIAMICTON
2	173m E	GFDMP-XSV	GLACIOFLUVIAL DEPOSITS, MID PLEISTOCENE	SAND AND GRAVEL
3	232m SE	HEAD-XCZSV	HEAD	CLAY, SILT, SAND AND GRAVEL



ID	Location	LEX Code	Description	Rock description
4	260m E	HEAD-XCZSV	HEAD	CLAY, SILT, SAND AND GRAVEL
5	311m SE	CWF-XCZSV	CLAY-WITH-FLINTS FORMATION	CLAY, SILT, SAND AND GRAVEL
6	345m S	CWF-XCZSV	CLAY-WITH-FLINTS FORMATION	CLAY, SILT, SAND AND GRAVEL
7	386m S	HEAD-XCZSV	HEAD	CLAY, SILT, SAND AND GRAVEL

This data is sourced from the British Geological Survey.

2.5 Superficial permeability (50k)

Records within 50m

1

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

Location	Flow type	Maximum permeability	Minimum permeability
On site	Mixed	Moderate	Low

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

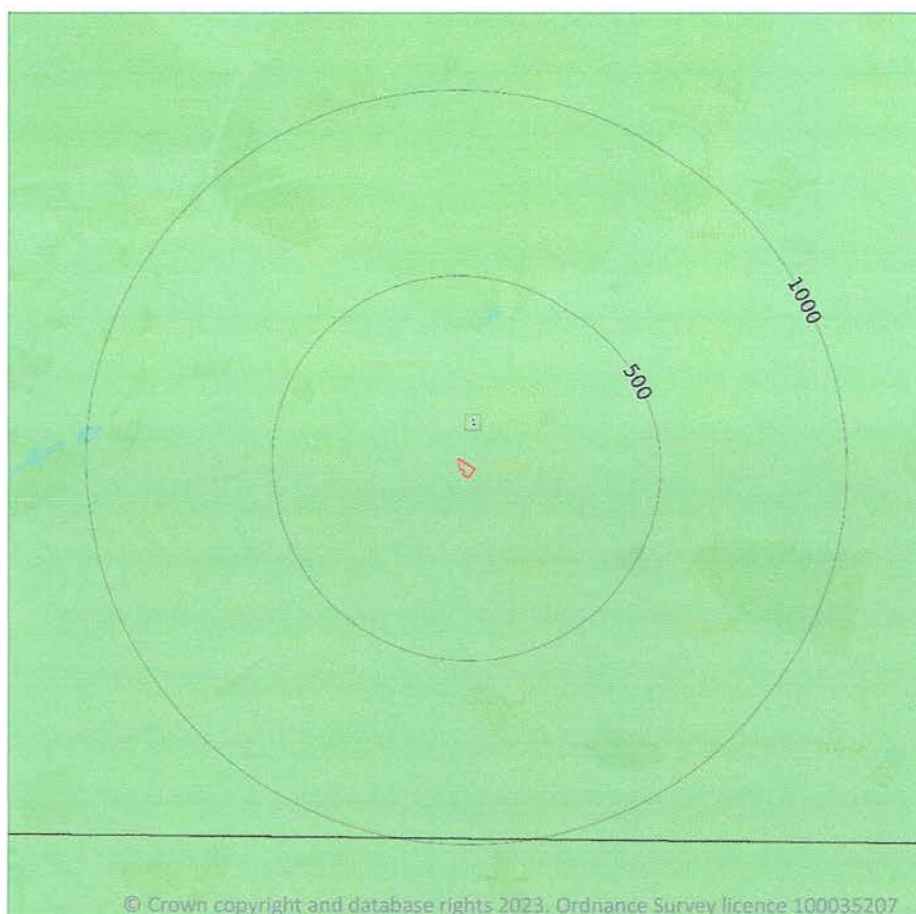
0

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

1

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

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

ID	Location	LEX Code	Description	Rock age
1	On site	LESE-CHLK	LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED) - CHALK	TURONIAN

This data is sourced from the British Geological Survey.



2.9 Bedrock permeability (50k)

Records within 50m

1

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

Location	Flow type	Maximum permeability	Minimum permeability
On site	Fracture	Very High	Very High

This data is sourced from the British Geological Survey.

2.10 Bedrock faults and other linear features (50k)

Records within 500m

0

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.

This data is sourced from the British Geological Survey.



3 Boreholes

3.1 BGS Boreholes

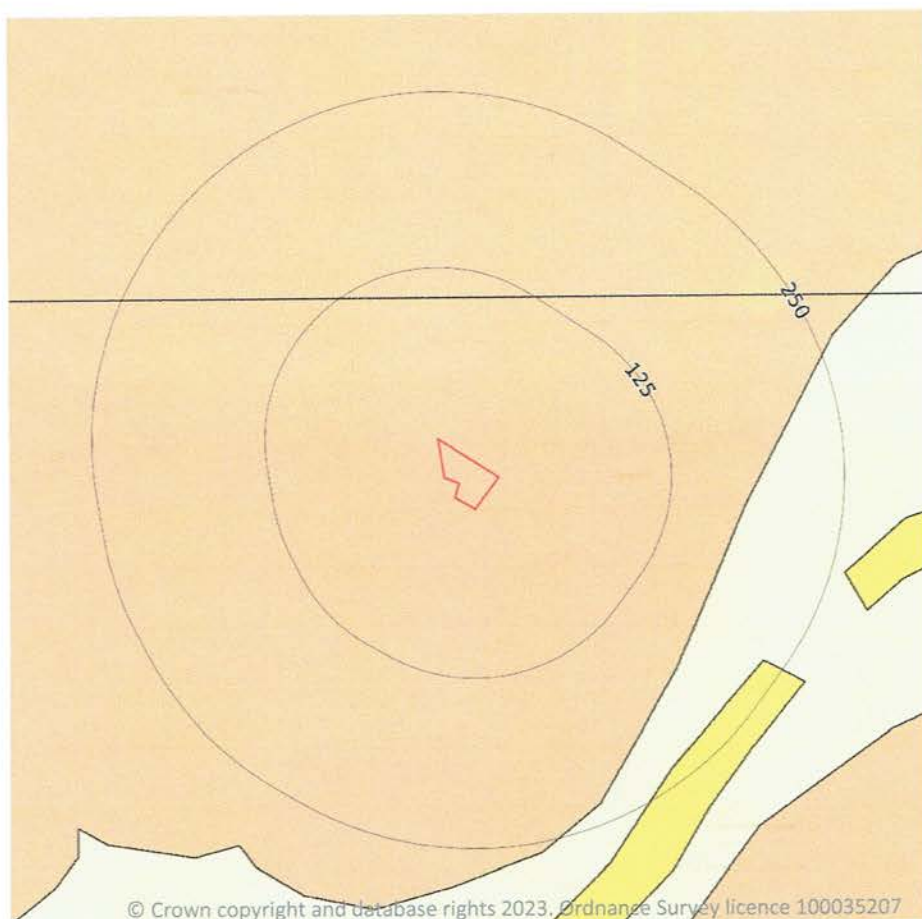
Records within 250m

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).

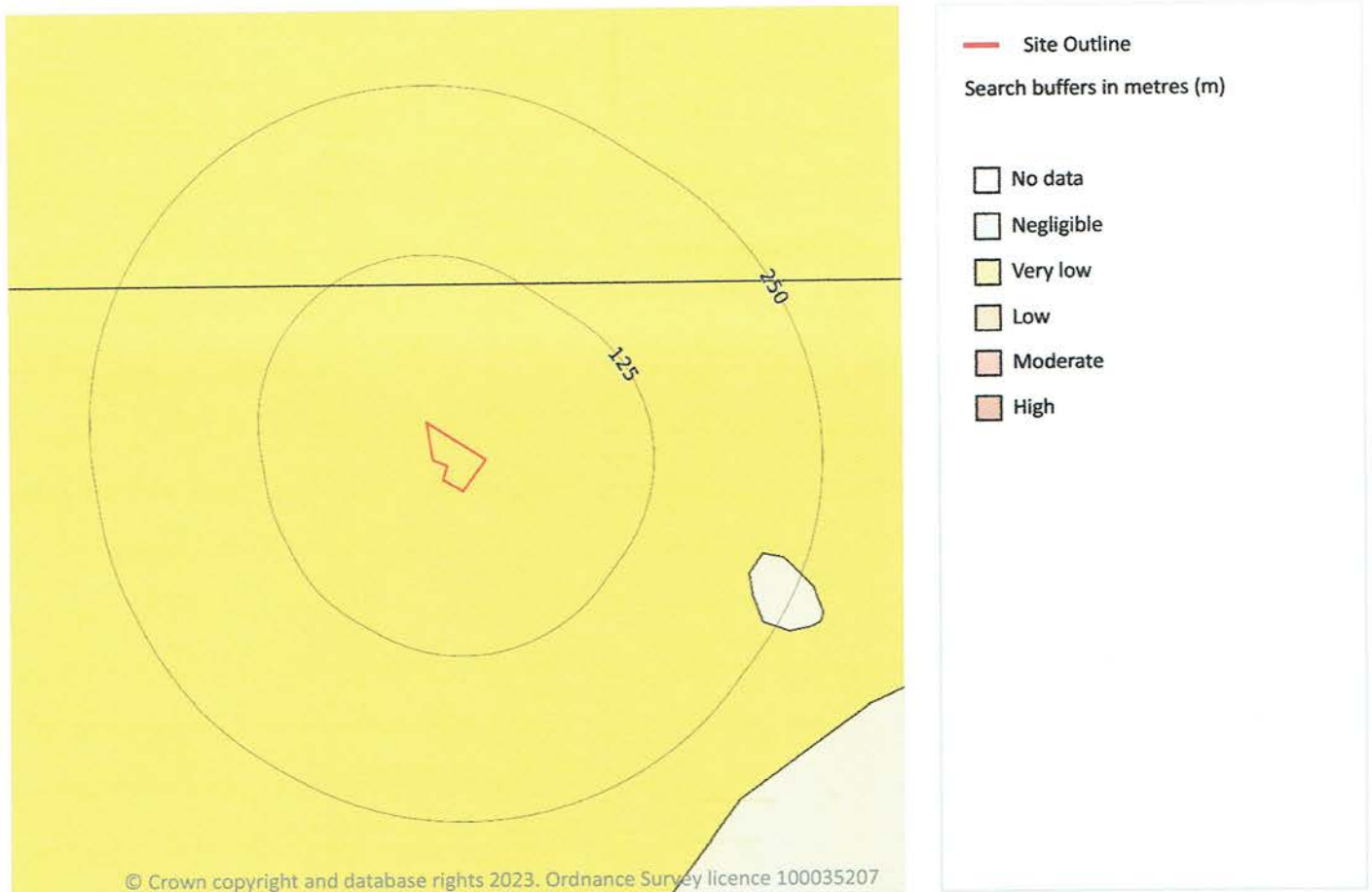
Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 25**

Location	Hazard rating	Details
On site	Low	Ground conditions predominantly medium plasticity.

This data is sourced from the British Geological Survey.



Natural ground subsidence - Running sands



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	Very low	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.

This data is sourced from the British Geological Survey.



Natural ground subsidence - Compressible deposits



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.

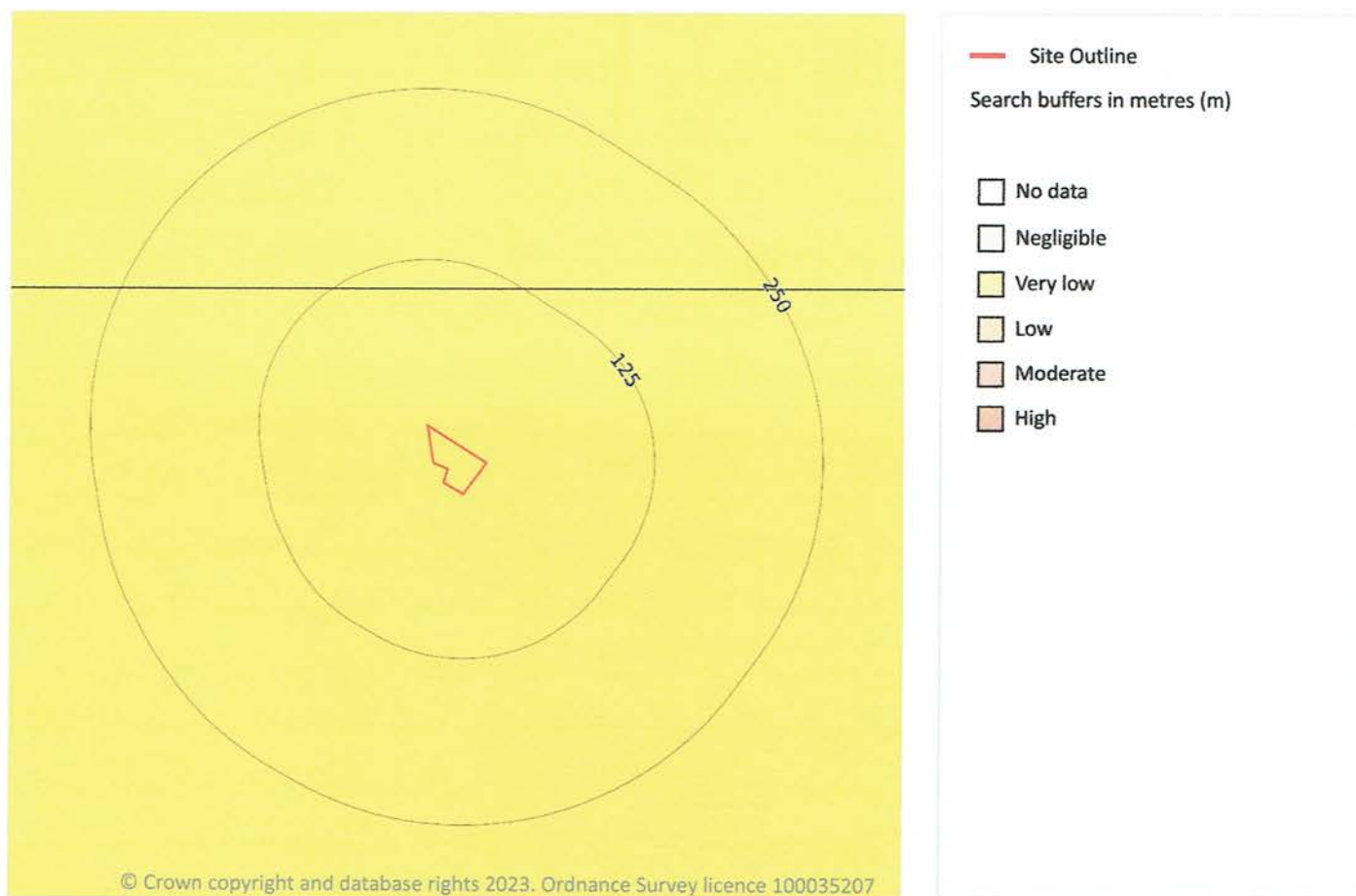
Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 27**

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



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



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.

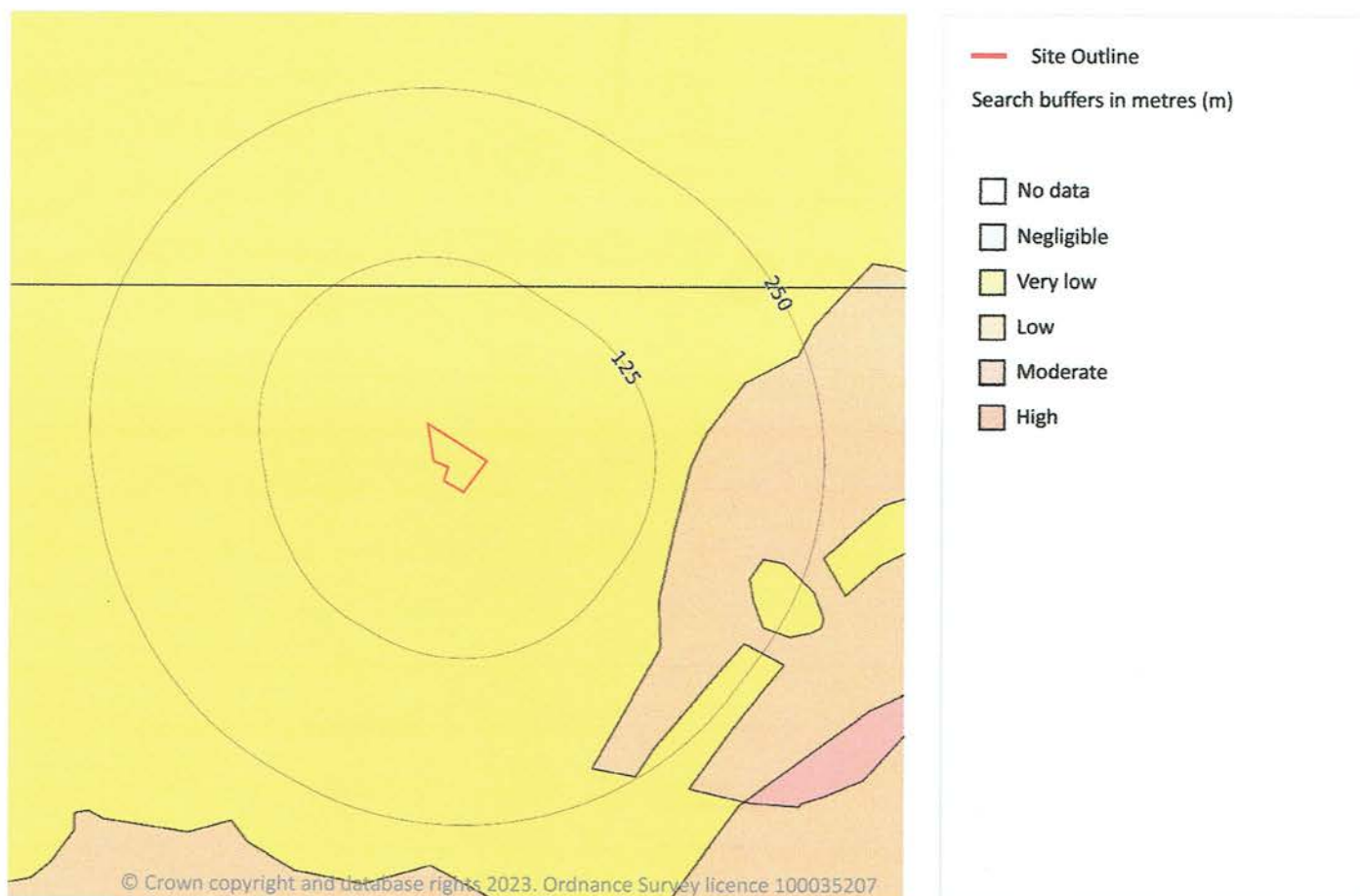
Features are displayed on the Natural ground subsidence - Landslides map on **page 29**

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



4.6 Ground dissolution of soluble rocks

Records within 50m

1

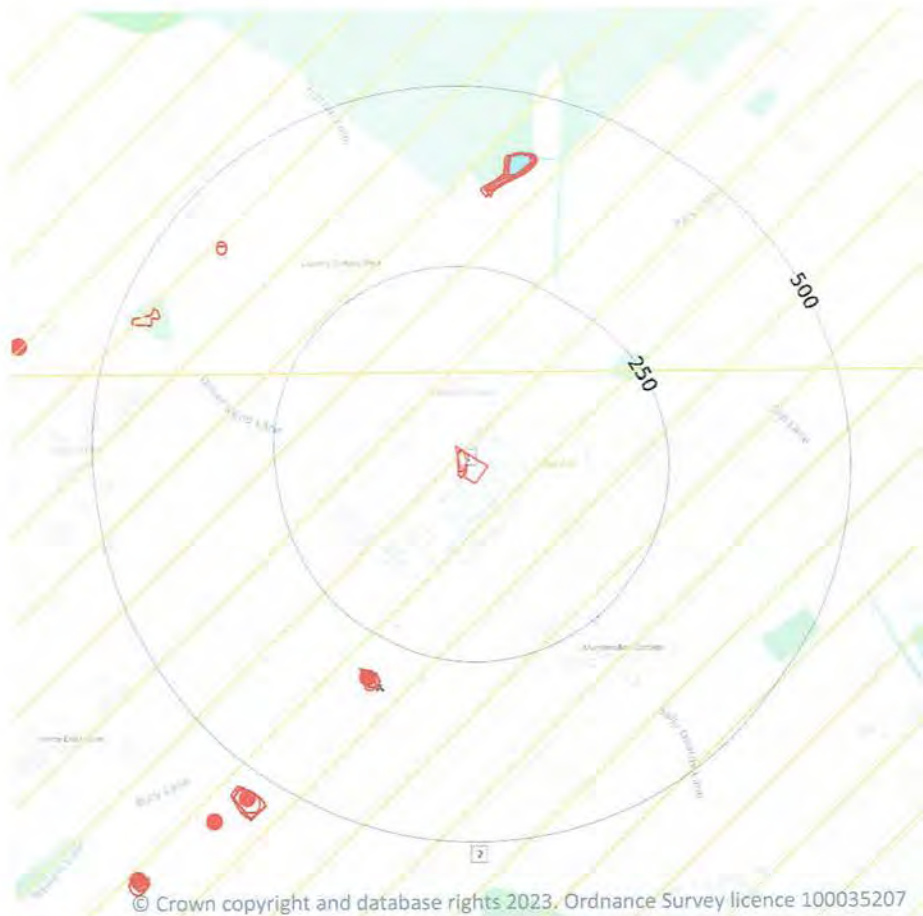
The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

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

Location	Hazard rating	Details
On site	Very low	Soluble rocks are present within the ground. Few dissolution features are likely to be present. Potential for difficult ground conditions or localised subsidence are at a level where they need not be considered.



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

1

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 32**

ID	Location	Details	Description
A.	308m SW	Name: Nap End Chalk Pit Address: Codicote, STEVENAGE, Hertfordshire Commodity: Chalk 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

1

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 32**

ID	Location	Land Use	Year of mapping	Mapping scale
1	On site	Pond	1881	1:10560

This data is sourced from Ordnance Survey/Groundsure.

5.4 Underground workings

Records within 1000m

0

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

This 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

2

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 32**

ID	Location	Name	Commodity	Class	Likelihood
2	On site	Not available	Chalk	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
3	103m N	Not available	Chalk	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

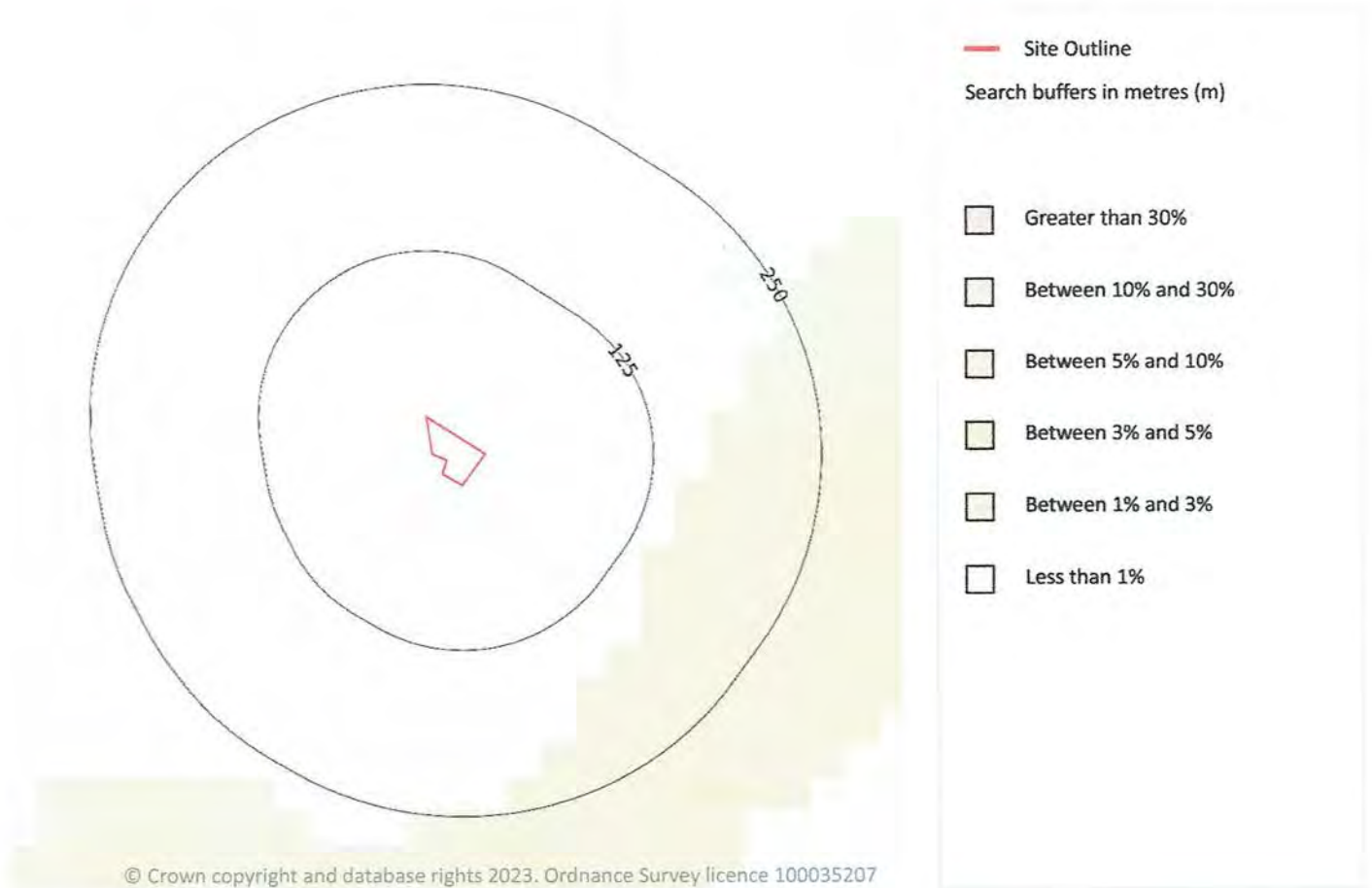
0

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



6.1 Radon

Records on site

1

The Radon Potential data classifies areas based on their likelihood of a property having a radon level at or above the Action Level in Great Britain. The dataset is intended for use at 1:50,000 scale and was derived from both geological assessments and indoor radon measurements (more than 560,000 records). A minimum 50m buffer should be considered when searching the maps, as the smallest detectable feature at this scale is 50m. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain (1:100,000 scale).

Features are displayed on the Radon map on **page 37**

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



This data is sourced from the British Geological Survey and UK Health Security Agency.



7 Soil chemistry

7.1 BGS Estimated Background Soil Chemistry

Records within 50m

2

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 km². 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 km²; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
40m NW	15 - 25 mg/kg	No data	100 mg/kg	60 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 km²).

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 km².

This data is sourced from the British Geological Survey.



8 Railway infrastructure and projects

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

0

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

This data is sourced from Ordnance Survey/Groundsure.

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/HSE Pastoral 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

0

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

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/>.

