



EmapSite
Masdar House, 1 Reading Road,
Hants, RG27 0RP

GroundSure Reference: EMS-54103_67520
Your Reference: EMS_54103_67520
Report Date: Feb 14, 2008
Report Delivery Method: Email - pdf

GroundSure Geology & Ground Stability Report

Address:

Dear Sir/Madam,

Thank you for placing your order with GroundSure. Please find enclosed the **GroundSure Geology & Ground Stability Report** as requested.

If you need any further assistance, please do not hesitate to contact our maps and data helpline on 01273 819700 or email maps&data@groundsure.com quoting the above GroundSure reference number.

Yours faithfully,

A handwritten signature in black ink, appearing to read "P. Alford".

Managing Director
Groundsure Limited

Enc.
GroundSure Geology & Ground Stability Report

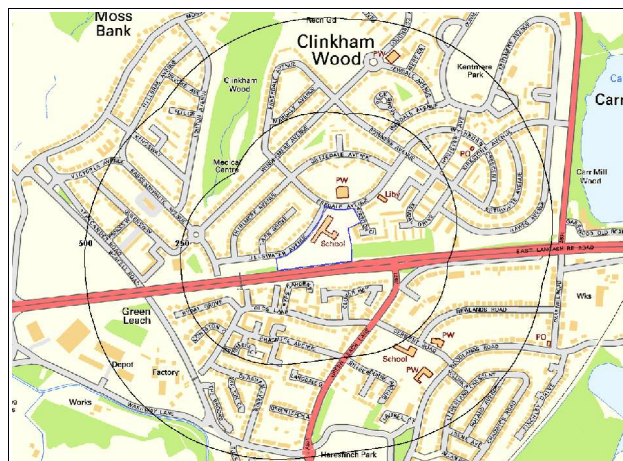
GroundSure Geology & Ground Stability Report

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Aerial Photograph of Study Site



Aerial photography supplied by Getmapping PLC.
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Site Name:

Grid Reference: 351732,397582

Overview of Findings

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

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

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

Report Section	Number of records found within (X) m of the study site boundary
1. Geology	
	Description
1.1 Artificial Ground,	
1.1.1 Is there any Artificial Ground /Made Ground present beneath the study site? *	No
1.1.2 Are there any records relating to permeability of artificial ground within the study site* boundary?	No
1.2 Superficial Geology & Landslips	
1.2.1 Is there any Superficial Ground /Drift Geology present beneath the study site? *	Yes
1.2.2 Are there any records relating to permeability of superficial geology within the study site* boundary?	Yes
1.2.3 Are there any records of landslip within 500m of the study site boundary?	No
1.2.4 Are there any records relating to permeability of landslips within the study site* boundary?	No
1.3 Bedrock, Solid Geology & Faults	
1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
1.3.2 Are there any records relating to permeability of bedrock within the study site* boundary?	Yes
1.3.3 Are there any records of faults within 500m of the study site boundary?	Yes
1.3.4 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is in a radon Affected Area, as between 1 and 3% of properties are above the Action Level
1.3.5 Is the property in an area where Radon Protection Measures are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary

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

Source:Scale 1:50,000 BGS Sheet No:084

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Geology & Ground Stability Report Reference: EMS-54103_67520

2. Ground Workings	on-site	0-50	51-250	251-500	501-1000
2.1 Historical Surface Ground Working Features from Small Scale Mapping	2	0	3	-	-
2.2 Historical Underground Workings Features from Small Scale Mapping	0	0	0	0	13
2.3 Current Ground Workings	0	0	0	0	1

3. Mining, Extraction & Natural Cavities	on-site	0-50	51-250	251-500	501-1000
3.1 Historical Mining	0	0	0	0	13
3.2 Coal Mining	1	0	0	0	0
3.3 Shallow Mining*	1	-	-	-	-
3.4 Non – Coal Mining Cavities	0	0	0	0	0
3.5 Natural Cavities	0	0	0	0	0
3.6 Brine Extraction	0	0	0	0	0
3.7 Gypsum Extraction	0	0	0	0	0
3.8 Tin Mining	0	0	0	0	0
3.9 Clay Mining	0	0	0	0	0

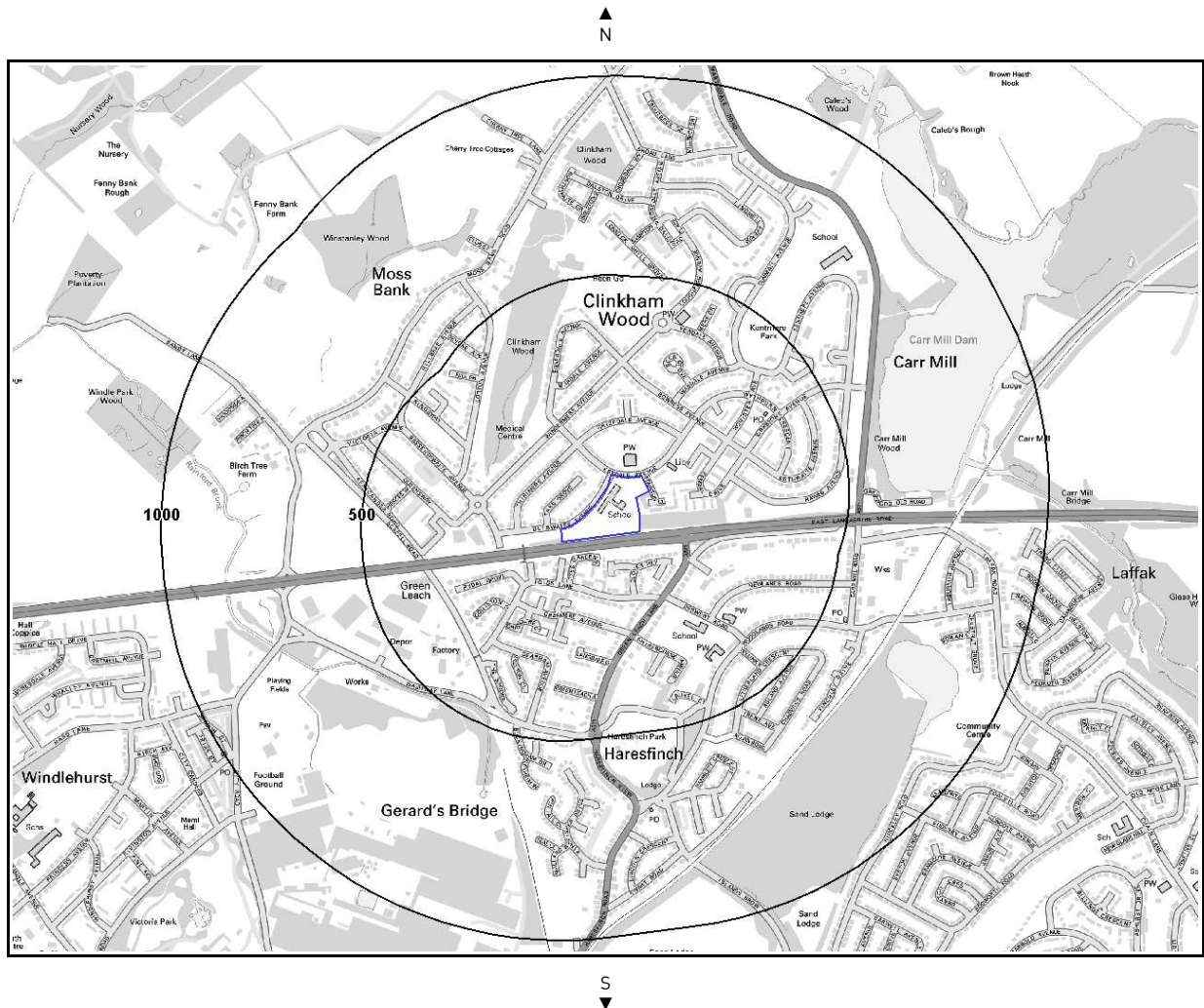
*This includes an automatically generated 150m buffer zone around the site

4. Natural Ground Subsidence	on-site*	0-50	51-250	251-500	501-1000
4.1 Shrink-Swell Clay	Very Low	-	-	-	-
4.2 Landslides	Very Low	-	-	-	-
4.3 Ground Dissolution of Soluble Rocks	Negligible	-	-	-	-
4.4 Compressible Deposits	Negligible	-	-	-	-
4.5 Collapsible Deposits	Negligible	-	-	-	-
4.6 Running Sand	Low	-	-	-	-

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

5. Borehole Records	on-site	0-50	51-250	251-500	501-1000
5.1 BGS Recorded Boreholes	0	0	0	-	-

1.1 Artificial Ground Map



Artificial Ground Legend



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-  Site Outline
-  50
-  250 Search Buffers

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

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1.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:084

1.1.1 Artificial/Made Ground

Are there any records of Artificial/Made Ground within 500m of the study site boundary: **No**

Database searched and no data found.

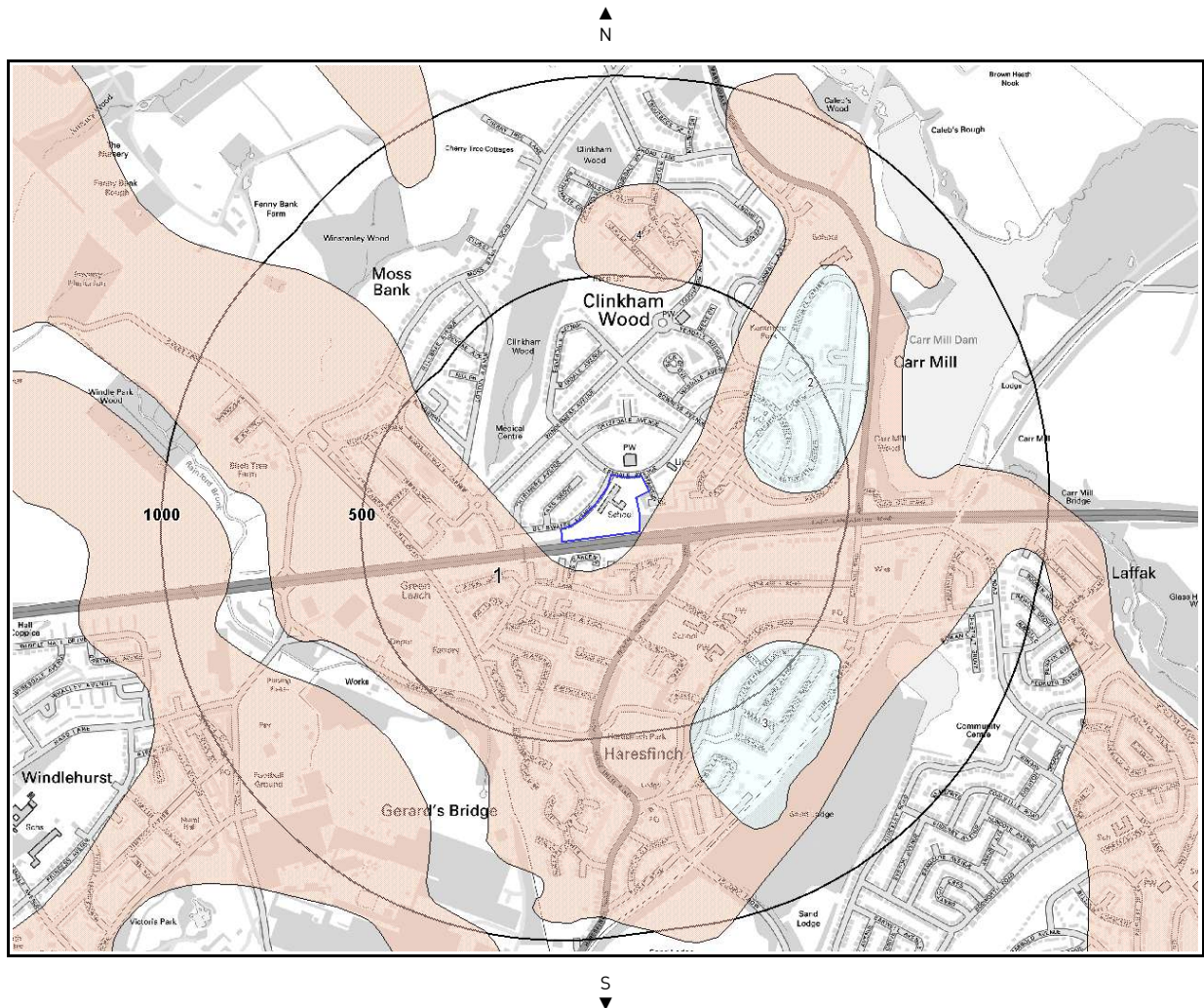
1.1.2 Permeability of Artificial Ground

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

Database searched and no data found.

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

1.2 Superficial Deposits and Landslips Map



Superficial and Landslips Legend



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-  Site Outline
-  50
-  250 Search Buffers

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

1.2 Superficial Deposits and Landslips

1.2.1 Superficial Deposits/Drift Geology

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

ID	Distance (m)	Direction	Lex Code	Description	Rock Description
1	3.0	SE	SSA-SAND	Shirdley Hill Sand Formation	Sand
2	256.0	E	TILLD-DMTN	Till, Devensian	Diamicton
3	403.0	SE	TILLD-DMTN	Till, Devensian	Diamicton
4	462.0	N	SSA-SAND	Shirdley Hill Sand Formation	Sand

1.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site* boundary: **Yes**

Distance (m)	Direction	Flow type	Maximum Permeability	Minimum Permeability
3.0	SE	Intergranular	High	High

1.2.3 Landslip

Database searched and no data found.

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

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

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

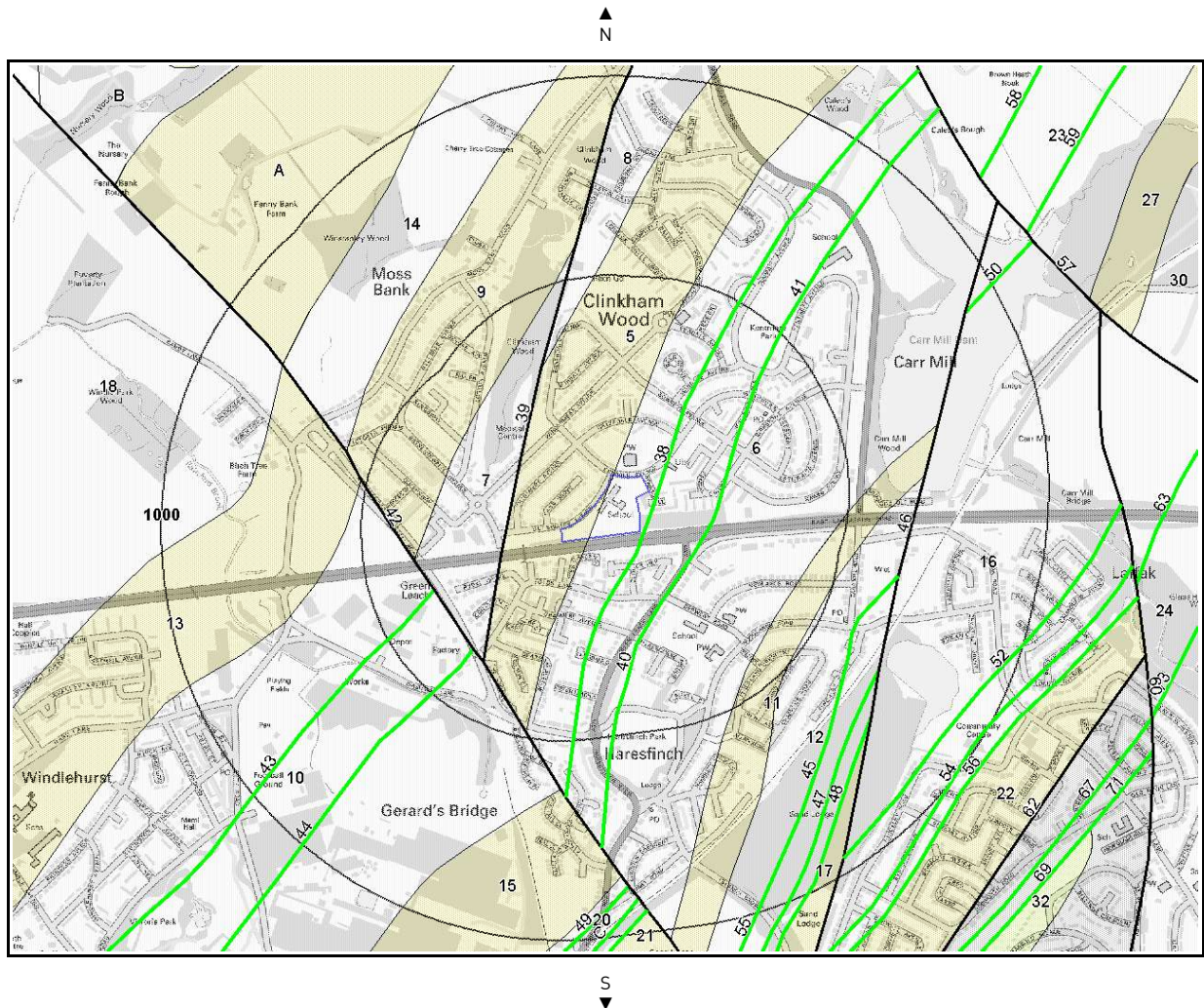
1.2.4 Landslip Permeability

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

Database searched and no data found.

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

1.3 Bedrock and Faults Map



Bedrock & Faults Deposits Legend

-  Site Outline
-  50
-  250 Search Buffers



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1.3 Bedrock, Solid Geology & Faults

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:084

1.3.1 Bedrock/Solid Geology

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

ID	Distance (m)	Direction	LEX Code	Rock Description	Rock Age
5	0.0	On Site	OL-SDST	Old Lawrence Rock - Sandstone	Langsettian (westphalian A)
6	0.0	On Site	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian (westphalian A)
7	134.0	W	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian (westphalian A)
8	317.0	NW	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian (westphalian A)
9	317.0	W	PLCM-SDST	Pennine Lower Coal Measures Formation - Sandstone	Langsettian (westphalian A)
10	334.0	SW	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian (westphalian A)
11	398.0	SE	PLCM-SDST	Pennine Lower Coal Measures Formation - Sandstone	Langsettian (westphalian A)
12	484.0	SE	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian (westphalian A)

1.3.2 Permeability of Bedrock Ground

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

Distance (m)	Direction	Flow type	Maximum Permeability	Minimum Permeability
0.0	On Site	Fracture	High	Low
0.0	On Site	Fracture	High	Moderate

1.3.3 Faults

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

ID	Distance (m)	Direction	Category Description	Feature Description
38	10.0	E	ROCK	Coal seam, inferred
39	134.0	W	FAULT	Normal fault, inferred
40	144.0	SE	ROCK	Coal seam, inferred
41	177.0	E	ROCK	Coal seam, inferred
42	334.0	SW	FAULT	Normal fault, inferred
43	343.0	W	ROCK	Coal seam, inferred
44	349.0	SW	ROCK	Coal seam, inferred

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

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

Geology & Ground Stability Report Reference: EMS-54103_67520

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

1.3.4 Radon Affected Areas

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

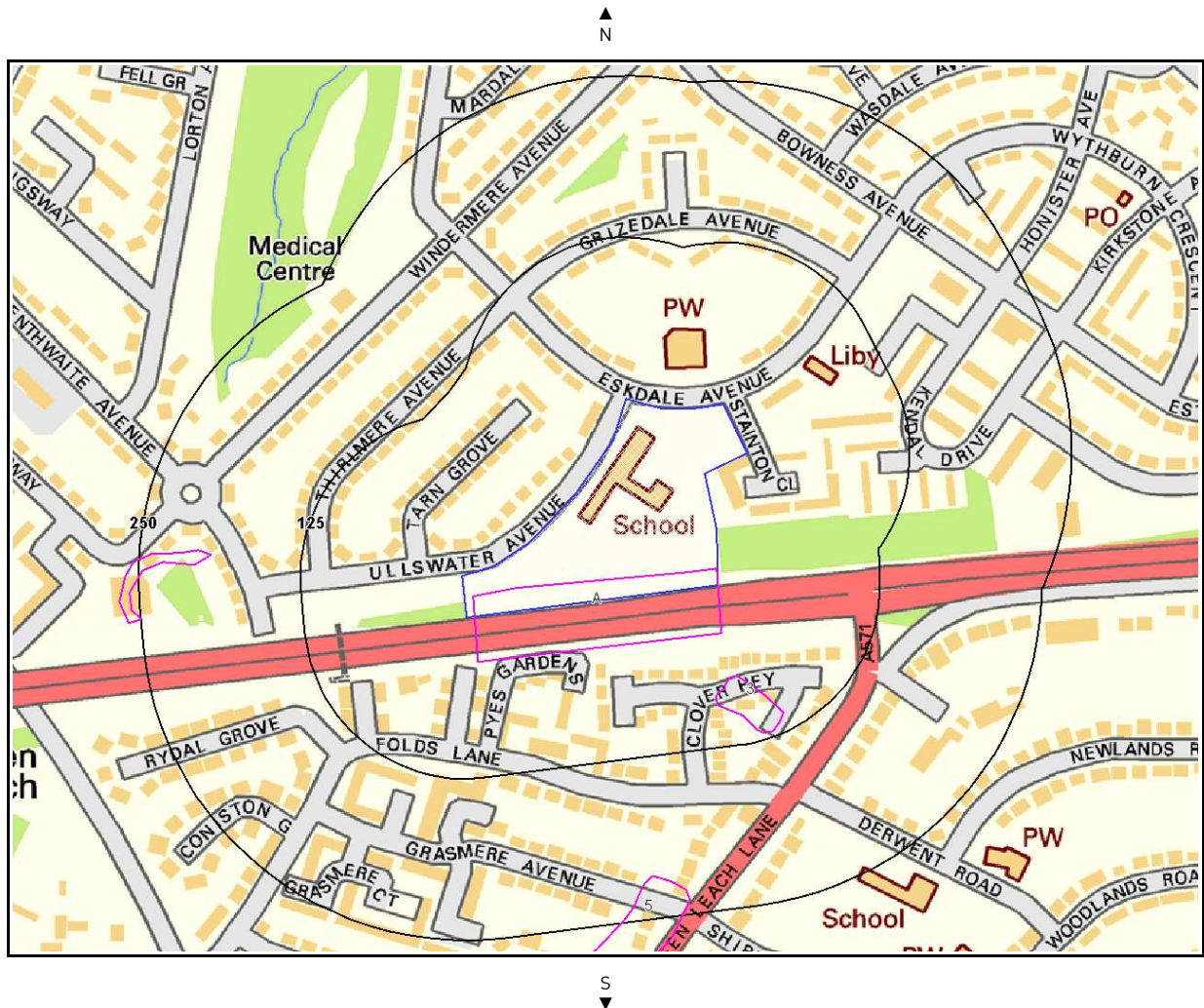
The property is in a radon Affected Area, as between 1 and 3% of properties are above the Action Level

1.3.5 Radon Protection



Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?




No radon protective measures are necessary

2 Ground Workings Map



Ground Workings Legend

-  Site Outline
-  Search Buffers (m)

-  Historic Surface Ground Workings
-  Historic Underground Workings
-  Current Ground Workings



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2 Ground Workings

2.1 Historical Surface Ground Working Features derived from the Historical Mapping

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

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

The following Historical Surface Ground Working Features are provided by GroundSure:

ID	Distance (m)	Direction	NGR	Use	Date
1A	0.0	On Site	351712,397509	Cuttings	1979
2A	0.0	On Site	351712,397509	Cuttings	1990
3	72.0	S	351829,397440	Sand Pit	1906
4	195.0	W	351350,397531	Unspecified Ground Workings	1926
5	217.0	S	351718,397250	Sand Pit	1926

2.2 Historical Underground Workings Features derived from the Historical Mapping

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

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

The following Historical Underground Working Features are provided by GroundSure:

ID	Distance (m)	Direction	NGR	Use	Date
Not shown	943.0	SE	352270,396708	Unspecified Old Shafts	1938
Not shown	943.0	SE	352270,396708	Unspecified Old Shafts	1926
Not shown	943.0	SE	352270,396708	Unspecified Old Shafts	1906
Not shown	968.0	E	352752,397321	Unspecified Old Shafts	1892
Not shown	974.0	E	352759,397323	Unspecified Old Shaft	1949
Not shown	974.0	E	352759,397320	Unspecified Old Shaft	1906
Not shown	974.0	E	352759,397320	Unspecified Old Shaft	1938
Not shown	974.0	E	352759,397320	Unspecified Old Shaft	1926
Not shown	977.0	E	352764,397323	Unspecified Disused Shaft	1965
Not shown	978.0	SE	352315,396693	Unspecified Old Shafts	1938
Not shown	978.0	SE	352315,396693	Unspecified Old Shafts	1926
Not shown	978.0	SE	352315,396693	Unspecified Old Shafts	1906
Not shown	978.0	SE	352315,396693	Unspecified Old Shafts	1892

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2.3 Current Ground Workings

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

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

Yes

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

ID	Distance (m)	Direction	NGR	Use	Date Updated
Not shown	825.0	N	351695.0,398500.0	Sandstone	16-Jul-2007



3 Mining, Extraction & Natural Cavities Map






Mining, Extraction & Natural Cavities Legend

Mapping sourced from 

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-  Site Outline
-  Search Buffers (m)

-  Historical Mining
-  Non-Coal Mining Cavities
-  Natural Cavities

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3 Mining, Extraction & Natural Cavities

3.1 Historical Mining

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

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

Yes

The following Historical Mining information is provided by Groundsure :

ID	Distance (m)	Direction	NGR	Details	Date
Not shown	943.0	SE	352270,396708	Unspecified Old Shafts	1938
Not shown	943.0	SE	352270,396708	Unspecified Old Shafts	1926
Not shown	943.0	SE	352270,396708	Unspecified Old Shafts	1906
Not shown	968.0	E	352752,397321	Unspecified Old Shafts	1892
Not shown	974.0	E	352759,397323	Unspecified Old Shaft	1949
Not shown	974.0	E	352759,397320	Unspecified Old Shaft	1906
Not shown	974.0	E	352759,397320	Unspecified Old Shaft	1938
Not shown	974.0	E	352759,397320	Unspecified Old Shaft	1926
Not shown	977.0	E	352764,397323	Unspecified Disused Shaft	1965
Not shown	978.0	SE	352315,396693	Unspecified Old Shafts	1938
Not shown	978.0	SE	352315,396693	Unspecified Old Shafts	1926
Not shown	978.0	SE	352315,396693	Unspecified Old Shafts	1906
Not shown	978.0	SE	352315,396693	Unspecified Old Shafts	1892

3.2 Coal Mining

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

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

Yes

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

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

3.3 Shallow Mining

This dataset refers to the (largely very old) extraction of mineral deposits by means of near surface underground workings.

What is the maximum hazard rating of subsidence relating to shallow mining within the study site* boundary?

Low - Moderate

*This includes an automatically generated 150m buffer zone around the study site boundary

The following Shallow Mining information provided by the British Geological Survey is not represented on Mapping:

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Geology & Ground Stability Report Reference: EMS-54103_67520

Distance (m)	Direction	Hazard Rating	Details
0.0	On Site	Low	Where low potential is indicated, this means that the rocks underlying the area are of a type known to have been mined at shallow depth in some parts of the UK, but that it is unlikely to be of significant concern in this area. However, it is recommended that you do obtain a Coal Authority mining search in this area, which will provide a comprehensive search of former mining activity, including coal mining at deeper levels.
35.0	S	Low - Moderate	Where low-moderate potential is indicated, this means that the rocks underlying the area are of a type known to have been mined at shallow depth in some parts of the UK, and that such working may be possible in your area. In these cases it is recommended that you seek further advice from a Royal Institute Chartered Surveyor (RICS), the local Building Control Officer, or by ordering a Geological Report from the BGS. It is also recommended that you obtain a Coal Authority mining search, which will provide a comprehensive search of former mining activity, including coal mining at deeper levels.

3.4 Non – Coal Mining Cavities

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

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

Database searched and no data found.

3.5 Natural Cavities

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

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

Database searched and no data found.

3.6 Brine Extraction

This dataset provides information from the Brine compensation board which has been discontinued and is now covered by the Coal Authority.

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

Database searched and no data found.

3.7 Gypsum Extraction

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

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

Database searched and no data found.

3.8 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records.

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

Database searched and no data found.

3.9 Clay Mining

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

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

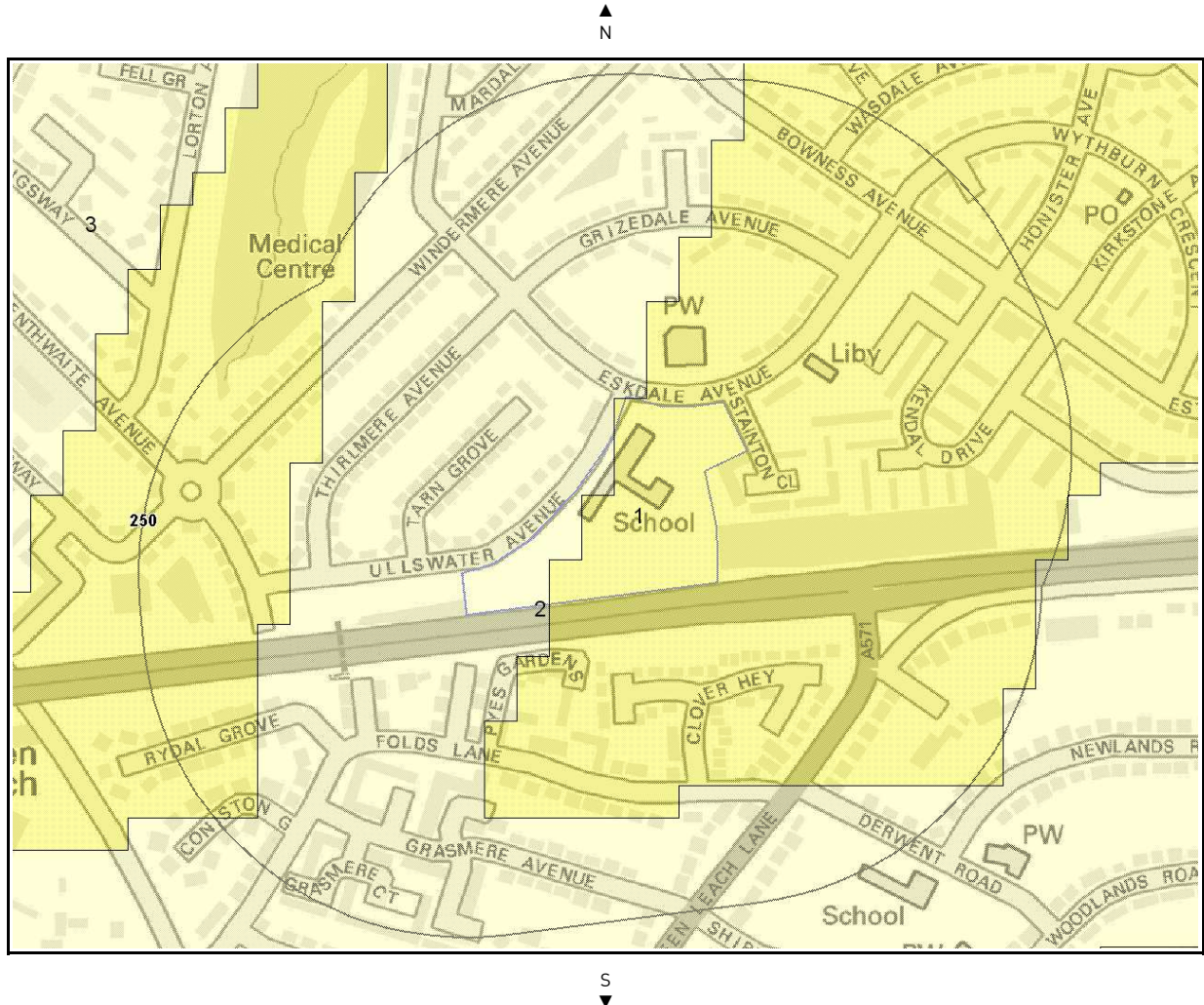
Database searched and no data found.

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4 Natural Ground Subsidence

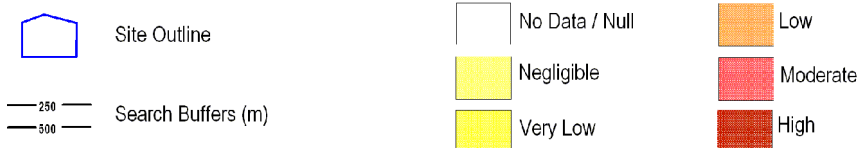
4.1 Shrink-Swell Clay Map



Shrink-Swell Clay Legend



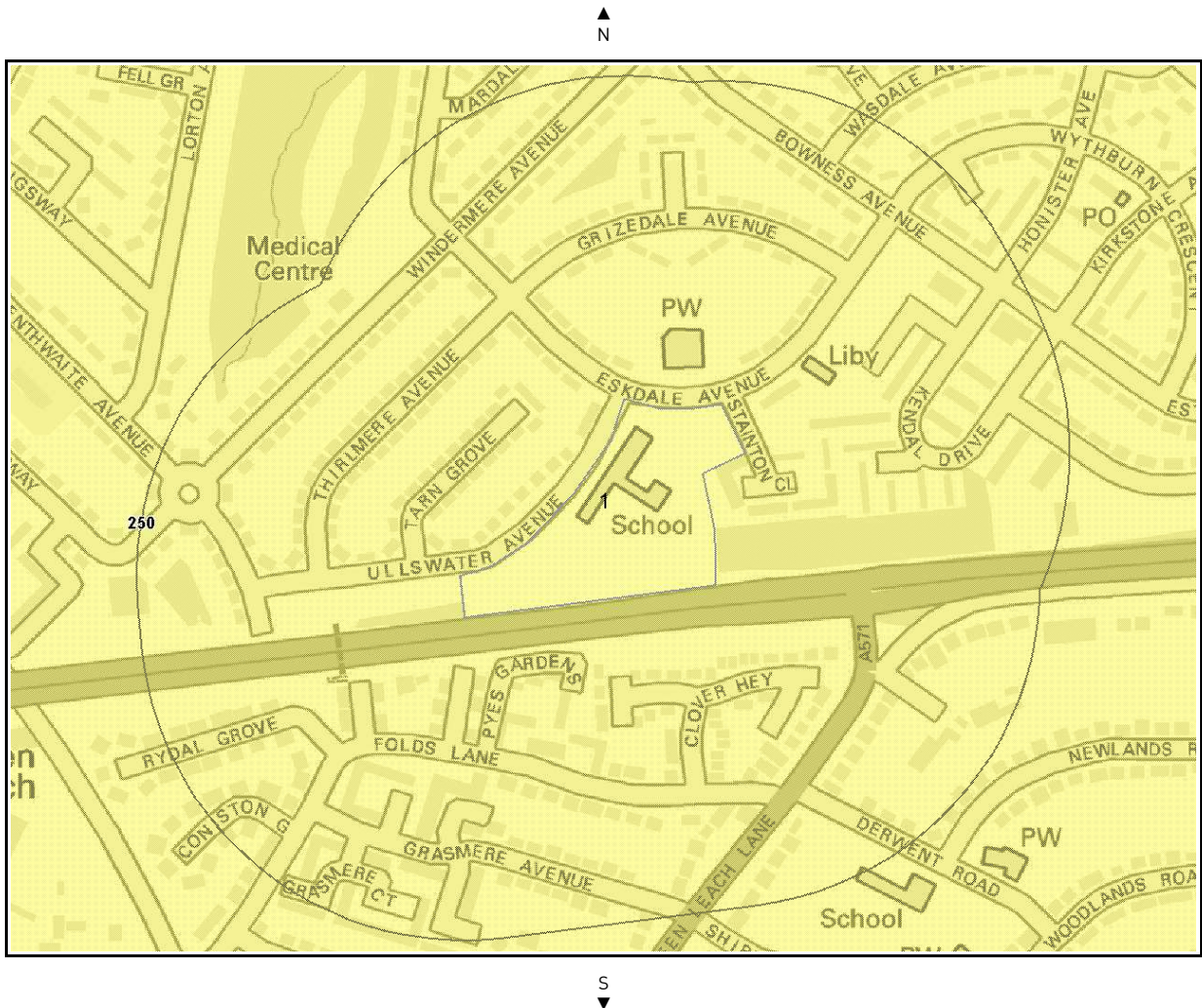
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4.2 Landslides Map



Landslides Legend

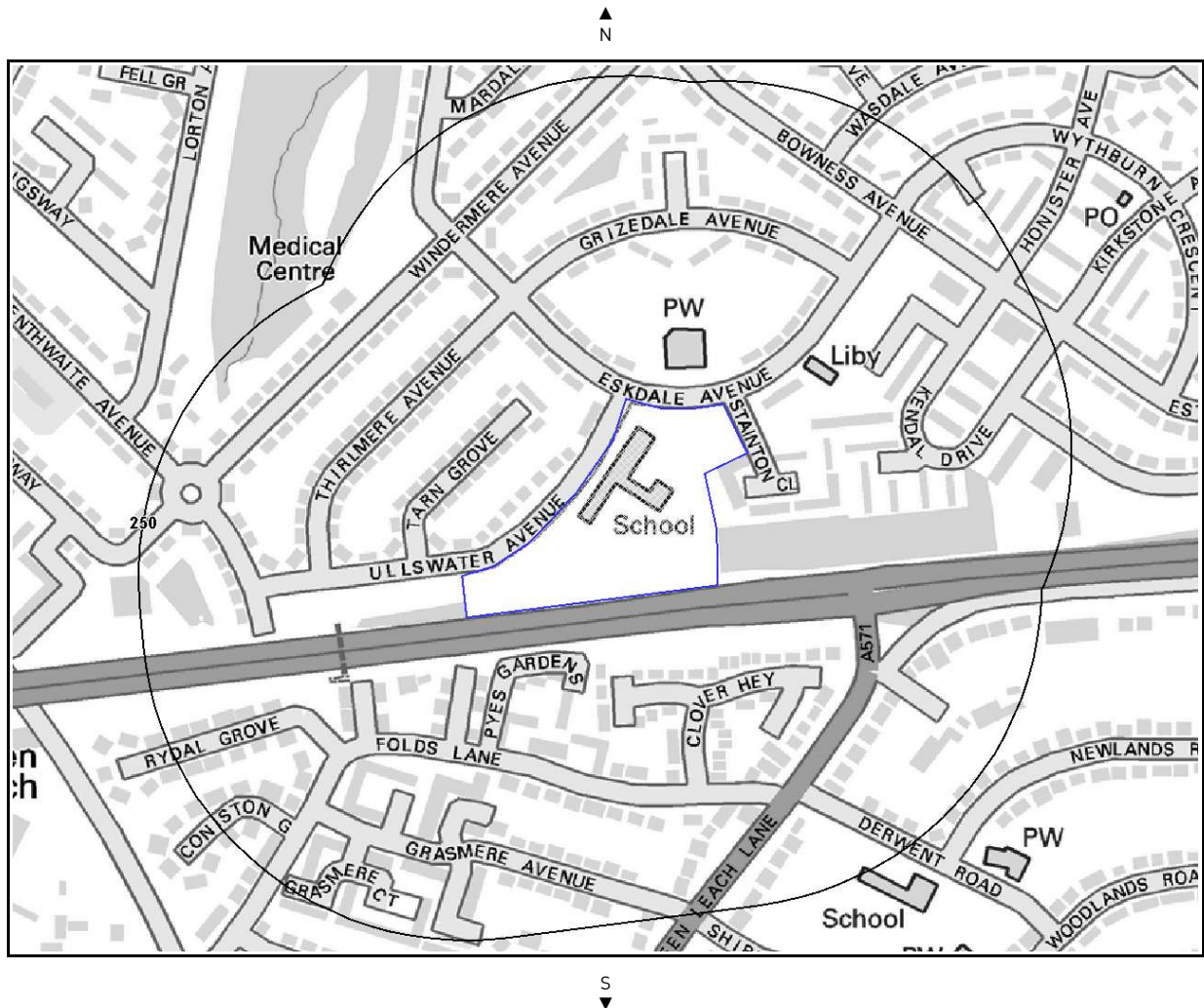


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-  Site Outline
-  No Data / Null
-  Low
-  Negligible
-  Moderate
-  Very Low
-  High

 250
 500
 Search Buffers (m)




4.3 Ground Dissolution Soluble Rocks Map



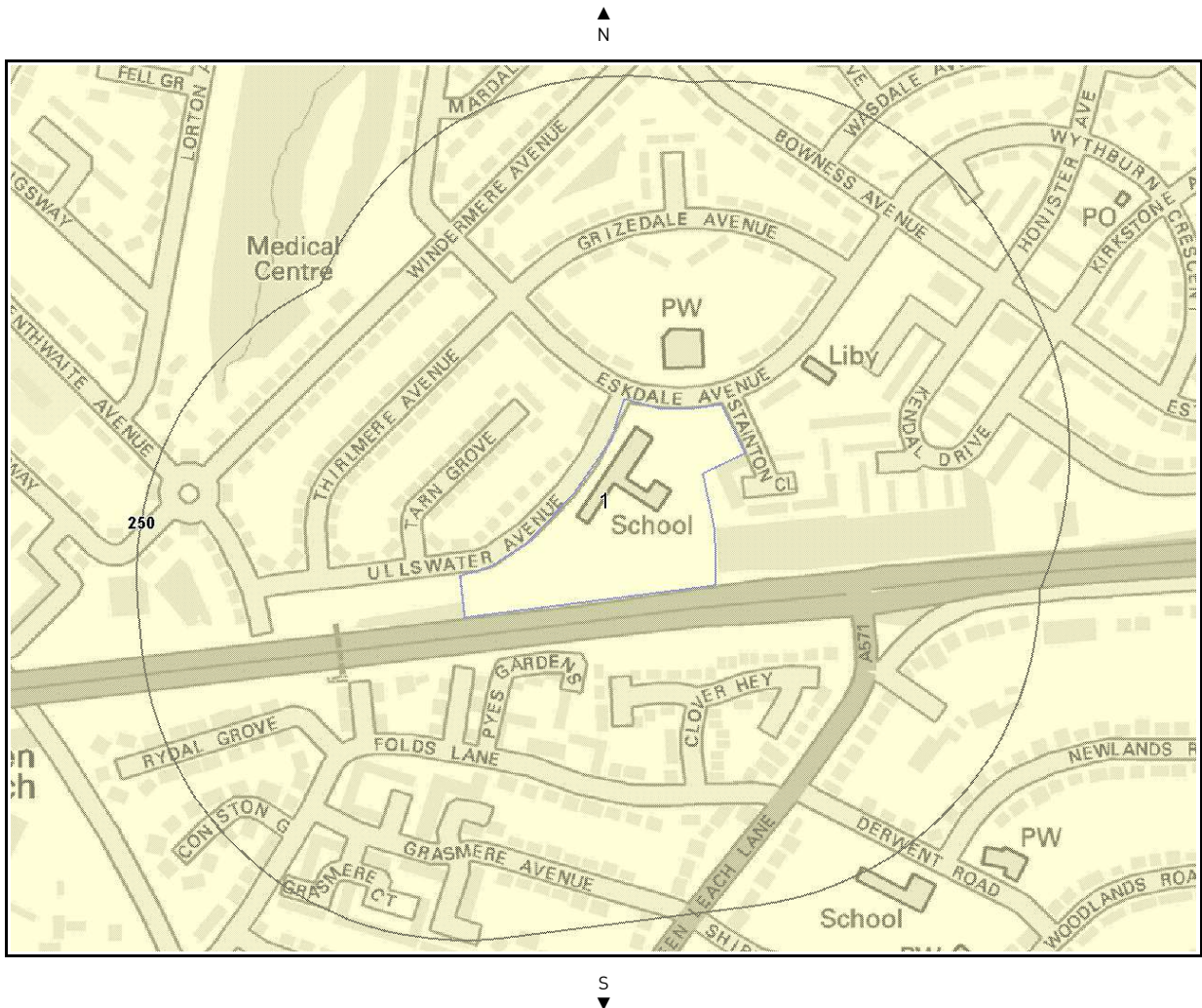
Ground Dissolution Soluble Rocks Legend



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-  Site Outline
-  No Data / Null
-  Low
-  Negligible
-  Moderate
-  Very Low
-  High






4.4 Compressible Deposits Map



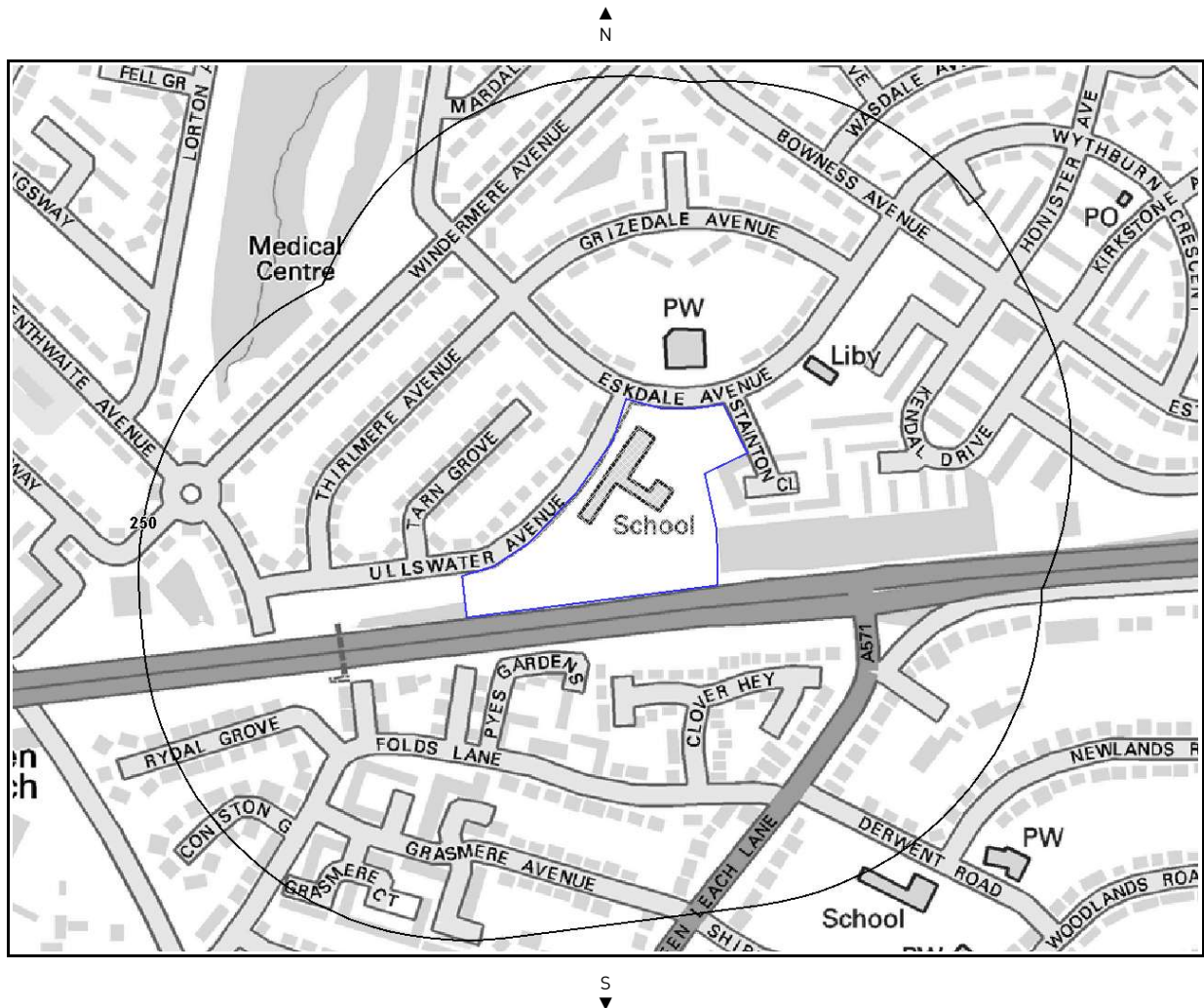
Compressible Deposits Legend






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- | | | | | | |
|---|--------------------|---|----------------|--|----------|
|  | Site Outline |  | No Data / Null |  | Low |
|  | Search Buffers (m) |  | Negligible |  | Moderate |
| | |  | Very Low |  | High |

4.5 Collapsible Deposits Map



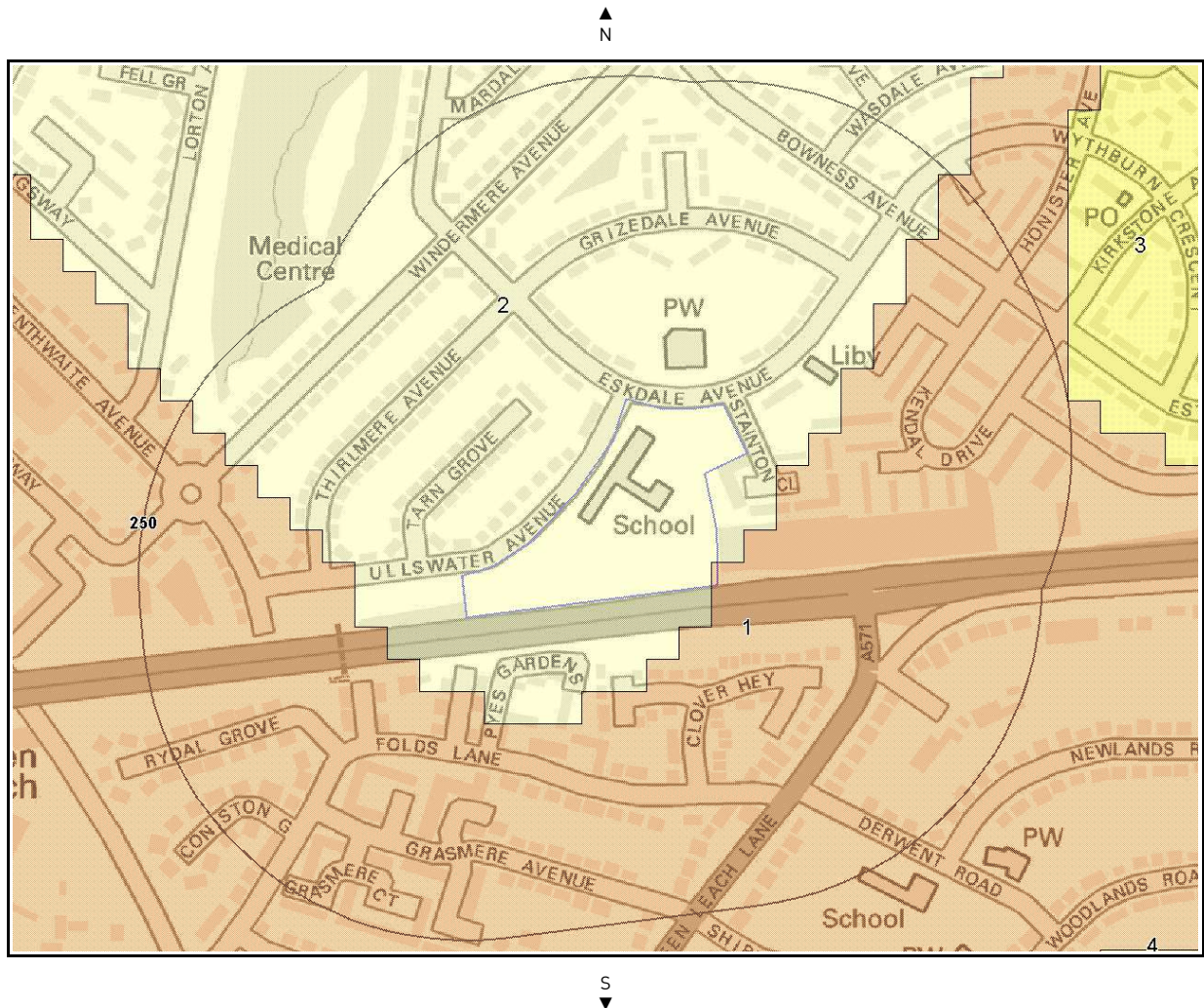
Collapsible Deposits Legend

-  Site Outline
-  Search Buffers (m)
-  Significant
- No Data / Null



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




4.6 Running Sand Map



Running Sand Legend



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- | | | | | | |
|---|--------------------|---|----------------|--|----------|
|  | Site Outline |  | No Data / Null |  | Low |
|  | Search Buffers (m) |  | Negligible |  | Moderate |
| | |  | Very Low |  | High |

4. Natural Ground Subsidence

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

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

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

Low

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

4.1 Shrink – Swell Clays

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

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

4.2 Landslides

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

4.3 Ground Dissolution of Soluble Rocks

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

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

4.4 Compressible Deposits

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

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

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If you would like any further assistance regarding this report then please contact GroundSure on (T) 01273 819700, (F) 01273 377902, email: maps&data@groundsure.com

4.5 Collapsible Deposits

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

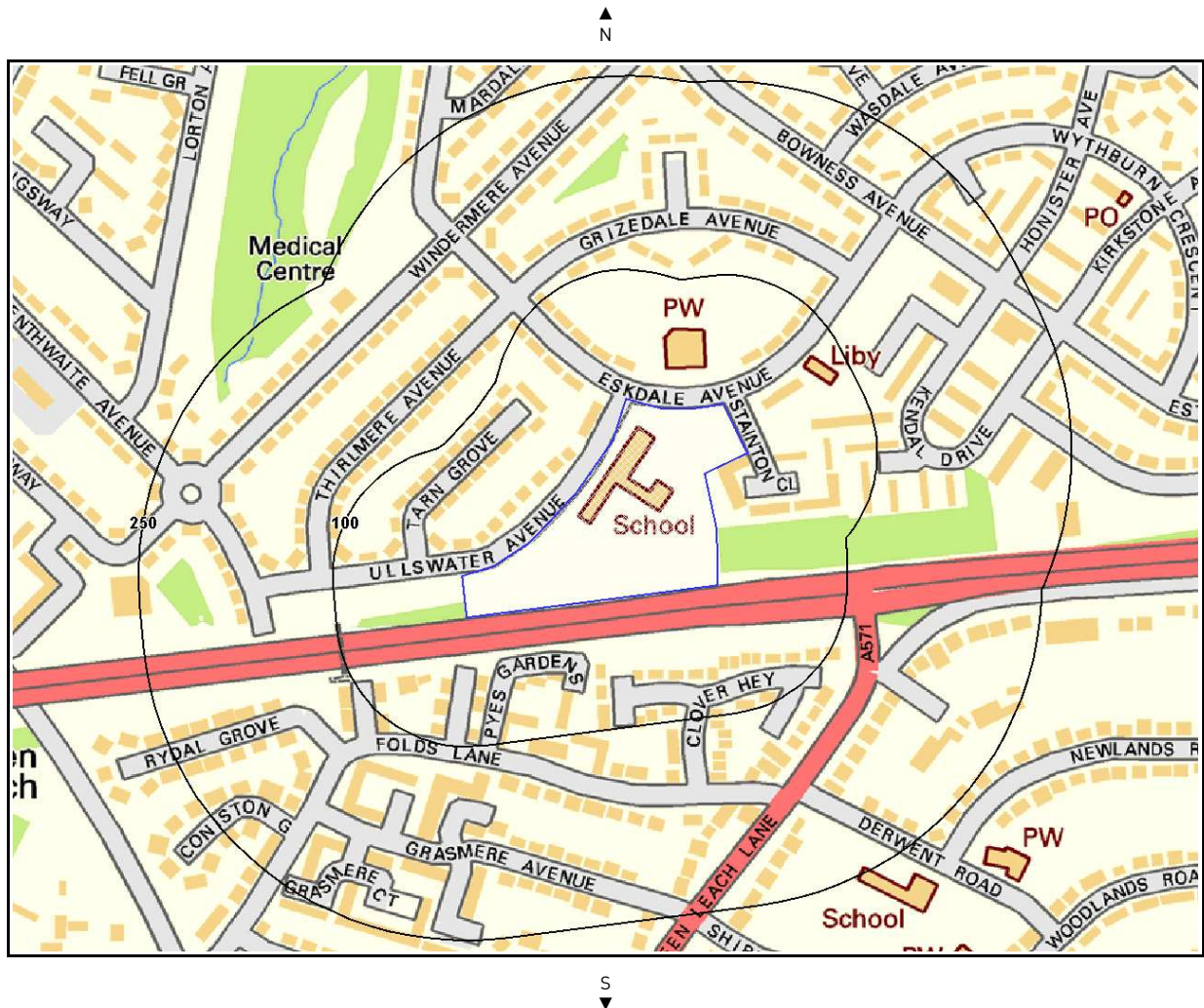
Distance (m)*	Direction	Hazard Rating	Details
0	On site	Null-Negligible	No Indicators for collapsible deposits identified. No Special actions required to avoid problems due to collapsible deposit.

4.6 Running Sands




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

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Low	Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build – consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property – no significant increase in insurance risk due to running sand problems is likely.
2	0.0	On Site	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

5. Borehole Records Map



Borehole Records Legend

-  Site Outline
-  100
-  250
- Search Buffers (m)



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-  Borehole Locations

5. Borehole Records

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

Records of boreholes within 250m of the study site boundary: 0

Database searched and no data found.

Contacts

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