British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

GeoReports

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Borehole Prognosis:

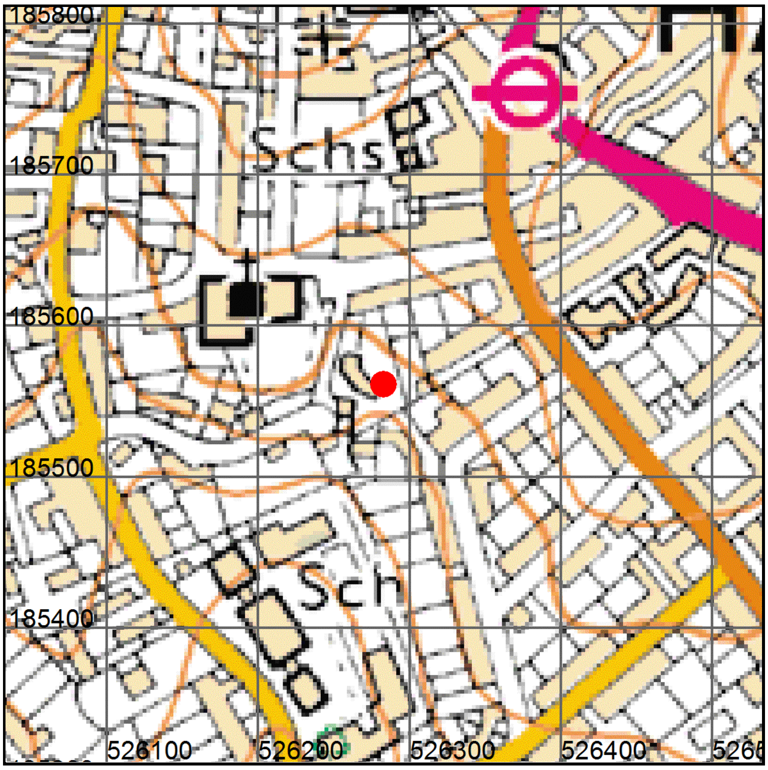
This report contains the geological succession derived from 1:10 000 data (where available) at a specific point. This includes geological map extracts for the surrounding area, taken from the 1:50 000 scale BGS digital geological map of Great Britain (DiGMapGB-50).

Modules:
Geological Map Extracts
Borehole prognosis (point)
Hydrogeology (non abstraction)
Temperature and Thermal properties detailed
Geoscience Data List

Report Id: ***GR_209837/1***

Client reference: J14302

Search location



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Scale: 1:5 000 (1cm = 50 m)

Point centred at:
526283,185561

Search location indicated in red

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OS Street View: Scale: 1:5 000 (1cm = 50 m)

Geological Map Extracts

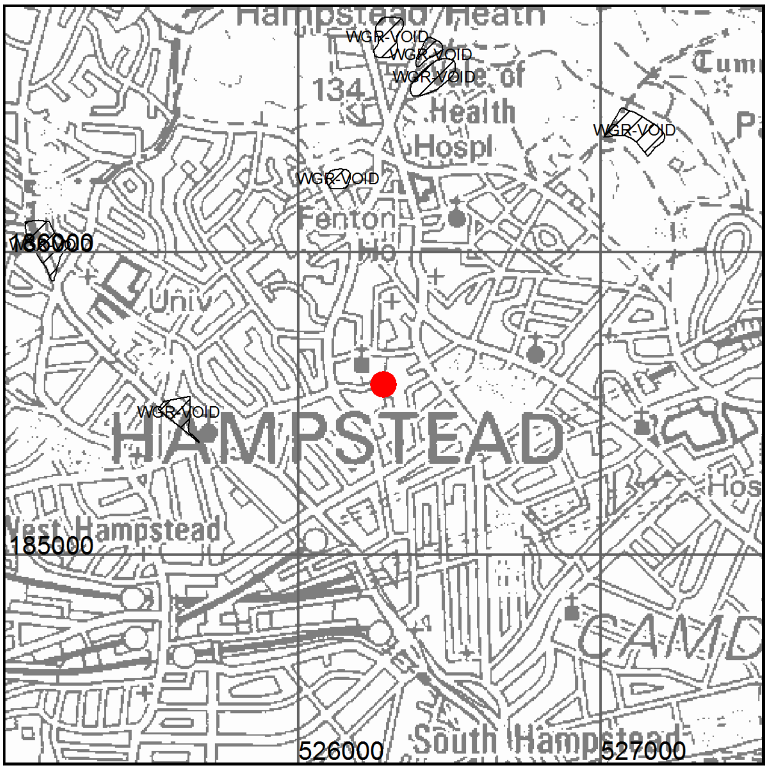
This part of the report contains extracts of geological maps taken from the 1:50 000 scale BGS Digital Geological Map of Great Britain (DiGMapGB-50). The geological information in DiGMapGB is separated into four themes: artificial ground, landslide deposits, superficial deposits and bedrock, shown here in separate maps. The fifth 'combined geology' map superimposes all four of these themes, to show the geological formations that occur at the surface, just beneath the soil.

More information about DiGMapGB-50 and how the various geological units are classified can be found on the BGS website (www.bgs.ac.uk). The maps are labelled with two-part computer codes that indicate the name of the geological unit and its composition. Descriptions of the units listed in the map keys may be available in the BGS Lexicon of Named Rock Units, which is also on the BGS website (http://www.bgs.ac.uk/lexicon/). If available, these descriptions can be found by searching against the first part of the computer code used on the maps. Please treat this labelling with caution in areas of complex geology, where some of the labels may overlap occurrences of several geological formations. If in doubt, please contact BGS Enquiries for clarification.

In the map keys the geological units are listed in order of their age, as defined in the BGS Lexicon, with the youngest first. However, where units are of the same defined age they are listed alphabetically and this may differ from the actual geological sequence.

Artificial ground

This is ground at or near the surface that has been modified by man. It includes ground that has been deposited (Made Ground) or excavated (Worked Ground), or some combination of these: Landscaped Ground or Disturbed Ground.



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Scale: 1:25 000 (1cm = 250 m)

Search area indicated in red

Key to Artificial ground:

Map colour	Computer Code	Name of geological unit	Composition
▨	WGR-VOID	WORKED GROUND (UNDIVIDED)	VOID

Landslide deposits
These are deposits formed by localised mass-movement of soils and rocks on slopes under the action of gravity. Landslides may occur within the bedrock, superficial deposits or artificial ground; and the landslide deposits may themselves be artificially modified.

Scale: 1:25 000 (1cm = 250 m)

Search area indicated in red

Key to Landslide deposits:
No deposits found in the search area

Superficial deposits

These are relatively young geological deposits, formerly known as 'Drift', which lie on the bedrock in many areas. They include deposits such as unconsolidated sands and gravels formed by rivers, and clayey tills formed by glacial action. They may be overlain by landslide deposits or by artificial deposits, or both.

Scale: 1:25 000 (1cm = 250 m)

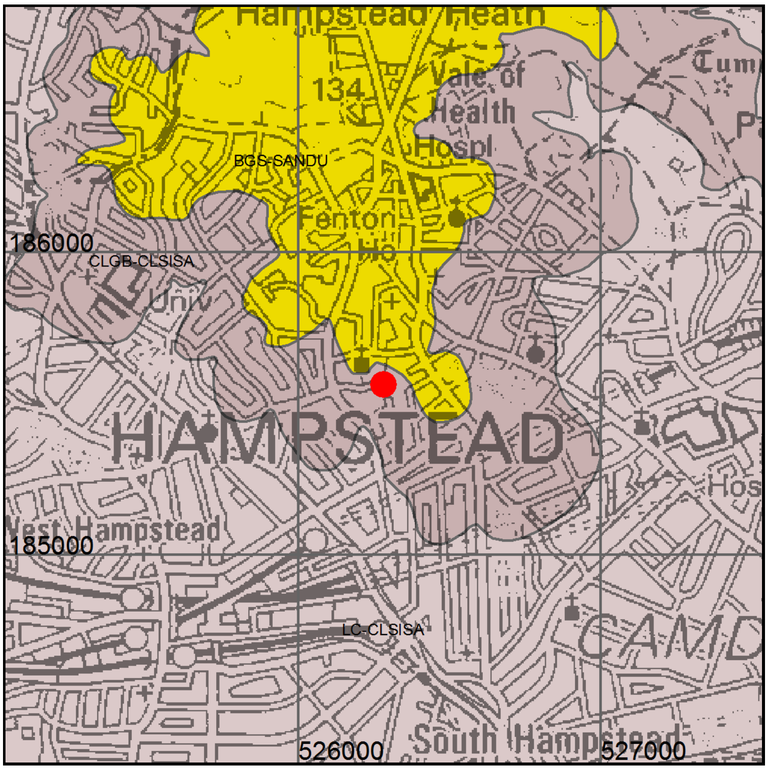
Search area indicated in red

Key to Superficial deposits:

Map colour	Computer Code	Name of geological unit	Composition
(pink)	STGR-XSV	STANMORE GRAVEL FORMATION	SAND AND GRAVEL [UNLITHIFIED DEPOSITS CODING SCHEME]

Bedrock

Bedrock forms the ground underlying the whole of an area, commonly overlain by superficial deposits, landslide deposits or artificial deposits, in any combination. The bedrock formations were formerly known as the 'Solid Geology'.



Search area indicated in red

Fault

Coal, ironstone or mineral vein

Note: Faults are shown for illustration and to aid interpretation of the map. Because these maps are generalised from more detailed versions not all such features are shown and their absence on the map face does not necessarily mean that none are present. Coals, ironstone beds and mineral veins occur only in certain rock types and regions of the UK; if present here, they will be described under 'bedrock' below.

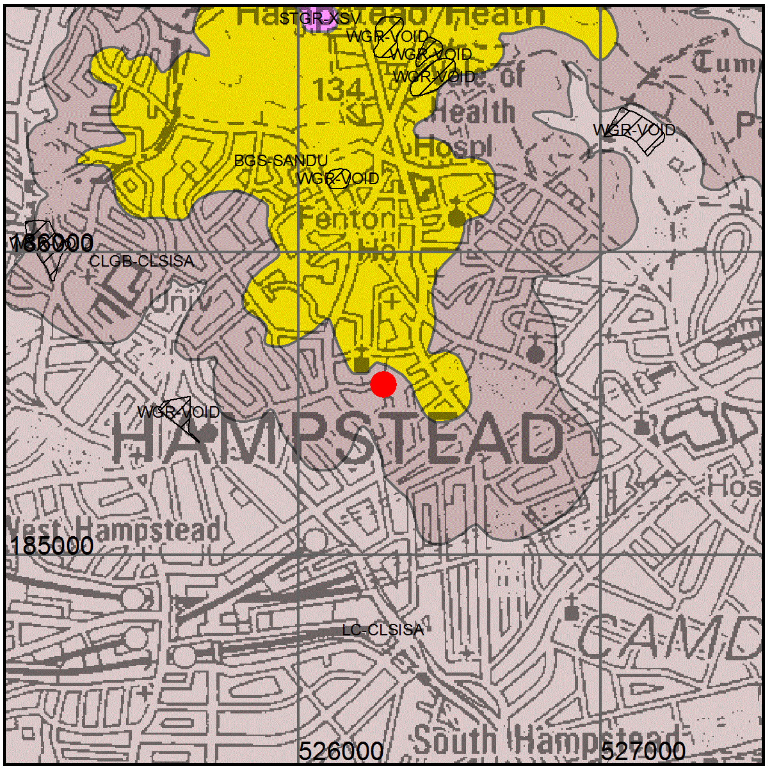
Scale: 1:25 000 (1cm = 250 m)

Key to Bedrock geology:

Map colour	Computer Code	Name of geological unit	Rock type
(yellow)	BGS-SANDU	BAGSHOT FORMATION	SAND
(mauve)	CLGB-CLSISA	CLAYGATE MEMBER	CLAY, SILT AND SAND
(pale pink)	LC-CLSISA	LONDON CLAY FORMATION	CLAY, SILT AND SAND

Combined 'Surface Geology' Map

This map shows all the geological themes from the previous four maps overlaid in order of age.



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Scale: 1:25 000 (1cm = 250 m)

Search area indicated in red

Please see the Keys to the Artificial, Landslide, Superficial and Bedrock geology maps.

Borehole Prognosis

This module provides an evaluation of the expected geological sequence beneath a site to a depth appropriate for the specified use. This interpretation is based on the information available in the surrounding area. Due to natural geological variation the conditions encountered on drilling may differ. This module does not cover the possibility of artesian conditions or gas being encountered. (Information on artesian conditions is included in the 'Groundwater abstraction' and 'Hydrogeology – non abstraction' modules).

Setting:

This urban site stands at an elevation of about 97 metres above Ordnance Datum (OD). It is located on land that locally slopes down relatively steeply towards the south-south-west, the site being on the south-western side of a small, south-easterly trending spur of Hampstead Heath in North London. The closest natural watercourses are the few small streams that issue from springs close to the top, and to either side, of the north-south trending ridge of Hampstead Heath and flow generally eastwards and westwards. These are about 1 km to the north-east and north-west of the site.

Geology

It is anticipated that the following succession of strata will be encountered in a borehole below the site:

Unit	Typical composition	Potential for difficult ground	Thickness	Depth to the base of the unit
Artificial ground No artificial ground has been recorded on the geological maps of the area, although up to 2.7 m have been recorded in boreholes on the site.				
Superficial deposits No superficial deposits have been recorded				
Bedrock (below rockhead)				
Claygate Member	Finely laminated, silt and fine-grained sand	Potential running sand conditions hazard	About 3-4 m*	About 3-6 m
London Clay Formation	Blue or grey clay, silty in part		About 105 m	About 110 m
Lambeth Group	Blue, grey, yellow and red mottled clay with sand and pebble beds	Potential running sand conditions hazard	About 16 m	About 126 m
Thanet Formation	Fine-grained, greyish-green sand	Potential running sand conditions hazard	About 9 m	About 135 m
White Chalk Subgroup	Chalk; soft, white to yellowish-white, becoming harder and greyer towards base. Thin marl bands and flints becoming less common towards base		Over 140 m	Over 275 m

The blue line in this table indicates ‘rockhead’, which is the base of superficial deposits. This is the ‘geological rockhead’, as distinct from the ‘engineering rockhead’, which is the base of ‘engineering soil’ (in the sense of BS5930:1999).

For further definitions of stratigraphic terms that appear in the table above, on our maps and in our publications please see ‘The BGS Lexicon’ www.bgs.ac.uk/lexicon

Information on the distribution of contaminated ground is not held by BGS but by the relevant Local Authority.

*The thickness of the Claygate Member has been taken from the logs of boreholes drilled (and provided by the client) at the site which appear to indicate the boundary between the Claygate Member and the underlying London Clay Formation. The geological map of the area indicates that the Claygate Member may be as much as 10 m thick beneath this site.

Potential drilling hazards considered at your site

This section of the report only describes geological hazards that might be directly encountered by drilling at this site.

Running sand conditions hazard

Running sand conditions occur when loosely-packed sand moves as a result of water flowing through the spaces between the sand grains. The pressure of the flowing water reduces the contact between the grains and they are carried along by the flow. Excavations or boreholes in water-saturated sand are likely to encounter running conditions: the sand will tend to flow into the void. This can lead to subsidence of the surrounding ground.

Hydrogeology (Non Abstraction)

This module is intended for clients assessing a site for development, including the installation of a closed loop ground heat pump system, and contains hydrogeological information such as aquifer descriptions, groundwater levels, direction of groundwater flow, groundwater quality and groundwater vulnerability. It does not contain detailed information on yields or borehole design and is therefore not suitable for customers proposing to drill a water borehole, or establish an open-loop ground heat pump system.

Hydrogeology (not site specific)
In lowland areas of the UK with little topographic variation, groundwater is likely to be found at shallow depths of only a few metres. Water table fluctuations will be small as they will be constrained by the ground surface and the base level of the local perennial streams and rivers.

In upland areas, precipitation is usually high and the dominantly metamorphic and igneous rocks often have relatively shallow groundwater levels. This is due to preferential groundwater storage in near-surface weathered and fractured zones with limited drainage into the underlying unweathered lower permeability rock. Exceptions can occur where higher permeability rocks, such as sandstone or limestone, allow faster throughflow of groundwater towards the nearest stream or other discharge point.

Perched water tables occur where a less permeable horizon (e.g. a clay layer) in an otherwise permeable sequence retains a body of groundwater above the level of the regional water table. They usually occur at shallow depths in alluvial and glacial sediments and can be difficult to identify or to delimit.

An aquifer becomes confined when it is overlain by a less permeable horizon that restricts the upward movement of groundwater. When this less permeable horizon is penetrated (e.g. by drilling), the groundwater level rises above where struck to a level controlled by the hydrostatic pressure. If this is above ground level, overflowing artesian conditions will be encountered. Confined conditions should be anticipated, where possible, in order to plan for the problems they can generate.

Hydrogeology of the site

Geological unit	Groundwater potential	Water level and strikes	Quality	*Environment Agency Groundwater vulnerability classification
Claygate Member	Relatively low permeability, intergranular-flow, possibly multi-layered, aquifer. Some issues and springs appear to issue from within the Claygate Member on Hampstead Heath.	Boreholes on site record slow inflows of groundwater, generally between 1 and 3.5 m below ground surface, with one at 6.0 m down that rose slightly to 5.8 m.	No local information but groundwater would be vulnerable to surface pollution.	Minor Aquifer with high (urban) soil leaching potential
London Clay Formation	Generally low permeability but possibly with some small seepages from thin, more permeable silt and sand lenses.	BH1 (on site) recorded various water seepages between 6.3 and 20.0 m (base of borehole). Water may rise above where first struck.	May be poor with high calcium and sulphate concentrations due to the presence of selenite in the rocks.	Non Aquifer, however some groundwater flow may still occur and this should be taken into consideration when assessing persistent pollutants
Lambeth Group	Generally low permeability clay, but may contain some sands, those near the base (Upnor Formation) will be in hydraulic continuity with underlying Thanet Formation.	Water level in Upnor Formation, will be similar to that in Thanet Formation and Chalk (see below)	Isolated small volumes of water in clays may be of poor quality. Upnor Formation (see below).	Minor Aquifer
Thanet Formation	Intergranular-flow aquifer; probably in hydraulic continuity with Upnor Formation, above and Chalk, below.	About 120 m below surface, possibly rising slightly above where struck to lie about 6 m above base of Lambeth Group.	Likely to be of sodium-bicarbonate type with about 700 mg/l total dissolved solids content (see below).	Minor Aquifer
White Chalk Subgroup	Fracture-flow aquifer			Major Aquifer

*Individual sites will always require more detailed assessments to determine the specific impact on groundwater resources. The maps represent conditions only at the ground surface. Where the soil and/or underlying formations have been disturbed or removed the vulnerability class may have been changed and site specific data will be required. Sites in urban areas and restored or current mineral workings are classified as having high (urban) soil leaching potential until proved otherwise. The site lies on the Environment Agency Groundwater Vulnerability Map, Sheet 39, West London.

According to the latest Environment Agency data (January 2014), the Chalk rest water level beneath this site is expected to lie at about 22 m below OD, i.e. about 120 m below ground level. Water levels under the London conurbation fell until the 1960s due to historic over-abstraction. Since then, they have generally been recovering due to a decline in abstraction. The rest water levels in this area have risen by about 3-4 m over the last 14 years. The natural hydraulic gradient in the Chalk aquifer beneath this site is about 1 in 200 towards the south-east, towards Central London.

From regional data the Chalk groundwater beneath this site is likely to have a temporary hardness of about 100 mg/l (as $CaCO_3$), a permanent hardness of less than 25 mg/l (as $CaCO_3$), a chloride ion concentration of about 100 mg/l and a sulphate content of about 200 mg/l. Fluoride concentrations may exceed 2.5 mg/l. Water from the Upnor and Thanet formations, could be similar to that from the Chalk but with higher iron concentrations.

Open loop system

The saturated thickness of Claygate Member, proved by the boreholes drilled on the site varies between 0.5 and 3.5 m. The fine-grained nature of this formation and small saturated thickness mean that a yield sufficient for an open loop ground source heat pump system would probably not be obtained. Therefore, if this type of system was being considered, a borehole to penetrate a significant thickness of Chalk (over 170 m deep) would be required, and at these depths the yield from the Chalk is also likely to be low.

If several boreholes were constructed to obtain a larger yield, it is possible that interference effects (between the zones of drawdown) could be significant as high rates of abstraction, accompanied by large water level drawdowns in the borehole, will be likely to induce drawdown of the water table over a broad zone, possibly extending for hundreds of metres in the Chalk. This interference will increase the total amount of drawdown in the boreholes and may consequently restrict the yield that can be obtained from each borehole. Interference effects can be minimised by the careful siting of additional boreholes but this requires a detailed knowledge of aquifer properties beneath the site. Such information can only be obtained from data collected during a carefully conducted aquifer test that includes the monitoring of water levels in observation boreholes. There could also be thermal interference effects between the boreholes.

If it is planned to re-inject the cooling water into the aquifer, the injection borehole(s) should be sited as far away as possible from the abstraction one(s), again to minimise interference effects, both hydraulic and thermal. However, if the system is used solely for heating, thermal interference is likely to become a problem and in aquifer thermal energy storage schemes it is important that the thermal load is balanced. It is possible that the injection borehole(s) would not accept water at the same rate that it was abstracted, due to air entrapment and/or borehole clogging by particulate matter or growth of biofilms. It is recommended that the borehole headworks be installed above ground level to ensure adequate ventilation. Altering the temperature of the water may alter the solubility of different minerals and hence the water chemistry.

The hydraulic gradient induced by abstraction (drawdown) and reinjection (hydraulic mound) from two relatively closely spaced boreholes is likely to greatly exceed the natural hydraulic gradient. However, not all the coolth added to the water will be dissipated via natural or induced groundwater flow and thermal conduction. A large proportion will be absorbed and stored in the rocks themselves and may provide a useable source. The converse would apply if the system was intended to be used for ccoling purposes.

Temperature and Thermal Properties (Detailed)

This module provides temperature and interpreted thermal properties data for the geological units at depth.

Surface temperature

The temperature of the ground determines the temperature gradient within the collector loops of the ground source heat pump. The UK Meteorological Office collects and archives climate temperature data. Monthly and annual long-term average datasets have been generated for the periods 1961-1990 and 1971-2000. Mean annual air temperatures at sea level in mainland UK varies from north to south from about 8 – 12 °C and the January - July mean air temperature swing for much of the UK is less than 15 °C. Mean annual air temperatures show a general decrease eastwards and northwards from highest values in the south-west of England. Mean annual air temperatures are mainly affected by position and elevation. Since the contribution to surface temperature from the heat conducted upwards from the sub-surface is very small, the mean annual ground surface temperature should be close to the mean annual air temperature although often shows a variation of ± 1 °C. Mean site temperature has been estimated using a model based on the 30-year station averages published by the UK Meteorological Office (UKMO) web site www.metoffice.gov.uk.

Sub-surface temperatures

Soil temperatures vary both diurnally and seasonally, the former variation fading out within a few 10s of cm and the latter at greater depths. At depths of about 15 m the temperature is approximately constant and equal to the mean annual air temperature. The temperature is transmitted down through the earth at a rate dependent on thermal diffusivity. Consequently the temperature in the near sub-surface has a progressive phase shift, i.e. at times of minimum air temperature ground temperatures are generally slightly higher and at times of maximum air temperatures ground temperatures are lower. Hence, at a depth of 3.5 m the minimum soil temperature is likely to be in the first two weeks of April and the maximum temperature about the end of October. The range of temperatures at 3.5 m depth is also likely to be about one quarter that at the surface. Soil temperatures at depth have been estimated using a soil diffusivity of 0.05 m^2 day^{-1}. Annual temperature swing is based on a model of the difference in mean January and July air temperatures derived from published UKMO long-term records.

At depths below about 15 m temperatures are affected by the small amount of heat conducted upwards from the sub-surface. In the UK this creates an increase of temperature with depth that has an average value of 2.6 °C per 100 m. This geothermal gradient will vary depending upon the nature of the rocks and their thermal properties. In addition moving groundwater can create warmer regions by transporting heat from depth, or cooler regions when cold water flows down from near the ground surface. Observed equilibrium temperature data for the UK indicate that some areas have stable ground temperatures of 15 °C at depths of 100 m. Conversely other regions show stable temperatures at 100 m depth of only 7 °C.

The mean observed equilibrium temperature for the UK at a depth of 100 m is close to 12 ±1.6 °C with a range of about 7-15 °C. Estimates of the temperatures at 100 and 200 m depths have been made from an estimate of the local heat flow and the thermal conductivity of the bedrock geology from the 1:250 000 scale geological map. It should be noted that anomalies caused by flowing groundwater are not included here.

Estimated temperature parameters of the site

Mean annual air temperature	9.8 °C
Mean annual temperature swing	8.4 °C
Estimated mean soil temperature	10.8 °C
Minimum annual soil temperature at 1 m	5.3 °C
Maximum annual soil temperature at 1 m	16.4 °C
Estimated temperature at 50 m depth	12 °C
Estimated temperature at 100 m depth	13.2 °C
Estimated temperature at 150 m depth	14.3 °C
Estimated temperature at 200 m depth	15.5 °C

Soil temperatures at 1 m estimated using a soil diffusivity of 0.05 m^2 day^{-1}.
Annual temperature swing based on mean January and July air temperatures.

Thermal properties

The rate at which heat is exchanged between the collector loop of the ground source heat pump and the ground is determined mainly by the thermal properties of the earth. Thermal conductivity is the capacity of a material to conduct or transmit heat, whilst thermal diffusivity describes the rate at which heat is conducted through a medium. For a horizontal loop system in a shallow (1-2 m) trench then the properties of the superficial deposits are important, whilst for a vertical loop system it is the properties of the bedrock geology that are important.

Thermal conductivity

Thermal conductivity varies by a factor of more than two (1.5 - 3.5 W m^{-1} K^{-1}) for the range of common rocks encountered at the surface. Superficial deposits and soils are complex aggregates of mineral and organic particles and so exhibit a wide range of thermal characteristics. The thermal conductivity of superficial deposits and soils will depend on the nature of the deposit, the bulk porosity of the soil and the degree of saturation. An approximate guide to the thermal conductivity of a superficial deposit can be made using a simple classification based on soil particle size and composition. Deposits containing silt or clay portions will have higher thermal conductivities than those of unsaturated clean granular sand. Clean sands have a low thermal conductivity when dry but a higher value when saturated. For sedimentary rocks the primary control on thermal conductivity is the lithology of the sedimentary rock, porosity, and the extent of saturation. Mudstones have thermal conductivities in the range 1.2-2.3 W m^{-1} K^{-1}.

For chemical sediments and low porosity (<30%) shale, sandstone and siltstone the mean thermal conductivity is in the range 2.2-2.6 W m^{-1} K^{-1}. Water has a thermal conductivity of 0.6 W m^{-1} K^{-1} and air a thermal conductivity of 0.0252 W m^{-1} K^{-1}. A saturated quartz sandstone with 5% porosity might have a thermal conductivity of about 6.5 W m^{-1} K^{-1} but this would decrease to about 2.5 W m^{-1} K^{-1} if the rock had a porosity of 30%. Porosity is also the main influence on thermal conductivity of volcanic rocks. Low porosity tuffs, lavas and basalts may have values above 2 W m^{-1} K^{-1}, but at 10% porosity with water saturation this might reduce to about 1.5 W m^{-1} K^{-1}. For intrusive igneous rocks, which generally have a much lower porosity, the thermal conductivity variation is less. Intrusive rocks with low feldspar content (<60%), including granite, granodiorite, diorite, gabbro and many dykes, have a mean thermal conductivity of about 3.0 W m^{-1} K^{-1}. For metamorphic rocks, porosity is often very low and thermal conductivity can be related to quartz content. The thermal conductivity of quartzites is high, typically above 5.5 W m^{-1} K^{-1}. For schists, hornfels, quartz mica schists, serpentinites and marbles the mean thermal conductivity is about 2.9 W m^{-1} K^{-1}.

Thermal diffusivity

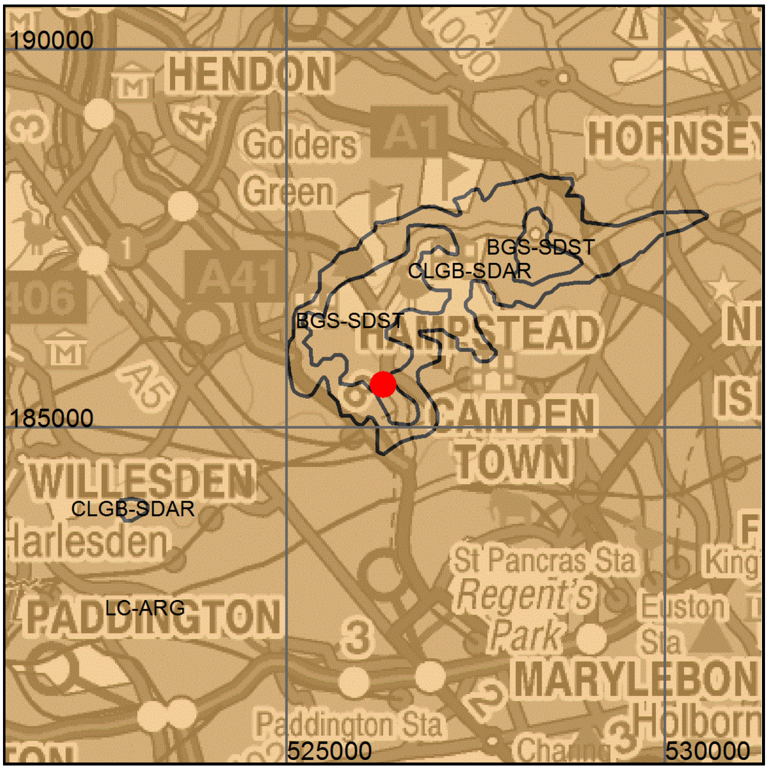
Typical rock thermal diffusivities range from about 0.065 m^2 day^{-1} for clays to about 0.17 m^2 day^{-1} for high conductivity rocks such quartzites. Many rocks have thermal diffusivities in the range 0.077–0.103 m^2 day^{-1}. Generally, thermal conductivity and specific heat are increased for saturated rocks and diffusivity is also enhanced.

Typical values of thermal conductivity and diffusivity for superficial deposits

Class	Thermal Conductivity W m^{-1} K^{-1}	Thermal diffusivity m^2 day^{-1}
Sand (gravel)	0.77	0.039
Silt	1.67	0.050
Clay	1.11	0.046
Loam	0.91	0.042
Saturated sand	2.50	0.079
Saturated silt or clay	1.67	0.056

W m^{-1} K^{-1} = Watts per Metre per Kelvin

Thermal conductivity-diffusivity (based on 1:250 000 Bedrock Geology map)



Scale: 1:100 000 (1cm = 1000 m)

Search area indicated in red

Key to Thermal conductivity-diffusivity:

Map colour	Computer Code	Geological unit	Composition	Thermal conductivity W m^{-1} K^{-1}	Thermal diffusivity m^2 day^{-1}
	BGS-SDST	BAGSHOT FORMATION	SANDSTONE	2.35	0.1074
	CLGB-SDAR	CLAYGATE MEMBER	SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED	2.2	0.1078
	LC-ARG	LONDON CLAY FORMATION	ARGILLACEOUS ROCKS, UNDIFFERENTIATED	1.79	0.0849

This mapping is based on the BGS Digital Map of Great Britain at the 1:250 000 scale (DiGMapGB-250), so the linework and formation names displayed may differ to a certain extent from those shown in other modules that are based on 1:50 000 scale mapping.

Site specific thermal conductivity-diffusivity values based on the Borehole Prognosis

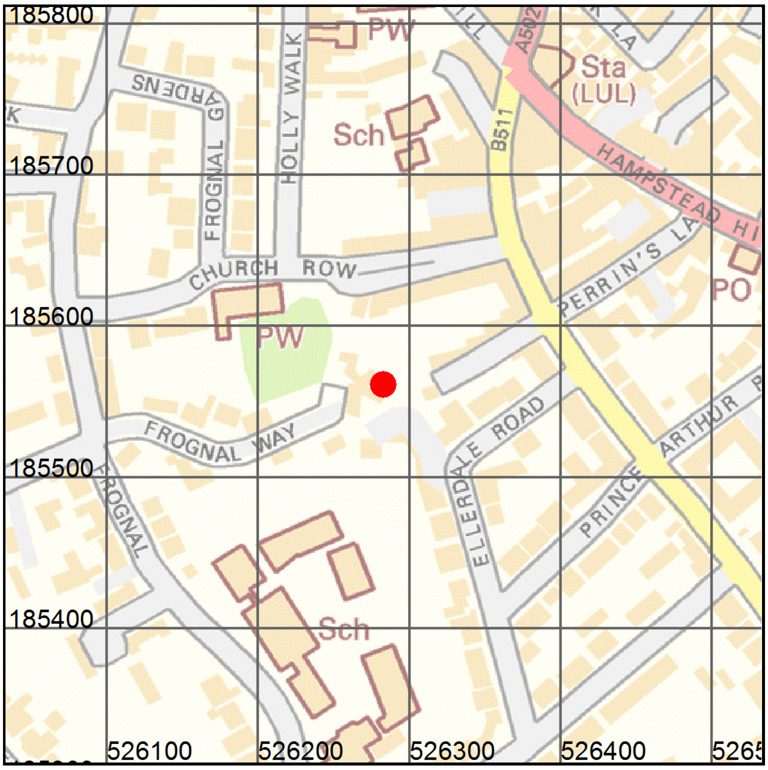
Unit	**Thermal conductivity $W\ m^{-1}\ K^{-1}$**	**Thermal diffusivity $m^2\ day^{-1}$**	**Thickness**
Claygate Member	2.2	0.1078	About 3-4 m
London Clay Formation	1.79	0.0849	About 105 m
Lambeth Group	2.2	0.1078	About 16 m
Thanet Formation	2.35	0.1074	About 9 m
White Chalk Subgroup	1.67	0.0745	Over 140 m

A typical 100 m deep borehole could therefore penetrate below any Made Ground, about 3.5 m of Claygate Member and about 96.5 m of London Clay Formation. This borehole would have an average thermal conductivity of 1.80 W m^{-1} K^{-1} and a mean thermal diffusivity of 0.0857 m^2 day^{-1}. The thermal values above relate to saturated conditions and as the Claygate Member is only partially saturated, the actual average values are likely to be slightly lower.

Most ground source heat pump design techniques are based on the assumption that the heat will be dissipated by conduction. If heat advection due to groundwater flow is significant at a site it is likely that this will have a beneficial effect. The significance of advection is controlled by the hydraulic gradient, the hydraulic conductivity and the thermal conductivity of the saturated rock. In most aquifers advection will be significant except where the groundwater gradient is low; e.g. in coastal plains or confined conditions. Advection will be unlikely to occur beneath this location, unless the boreholes continue to penetrate a significant thickness of the Chalk aquifer.

Superficial thickness

The following map is derived from a mathematical model of the thickness of Superficial Deposits produced by analysing information from approximately 600 000 borehole logs held in the BGS archives. It also uses the digital data on the extent of Superficial Deposits. As a model, the map is a guide only and may differ from the value for superficial deposits thickness given in the borehole prognosis above, but it indicates where thin superficial deposits are likely. In general, depending on the hardness of the bedrock, horizontal collector loops will be easier to install within superficial deposits.



Scale: 1:5 000 (1cm = 50 m)

Search area indicated in red

Key to Superficial thickness

Map colour	Expected Minimum Thickness (m)
(red)	100
(orange)	70
(light orange)	50
(yellow)	40
(yellow-green)	30
(green)	20
(turquoise)	10
(blue)	5
(grey)	Thickness unknown, but > 1m

Geoscience Data List

List of available geological data

This section lists the principal data sets held in the National Geoscience Records Centre that are relevant to your enquiry and explains how to obtain copies of the records. Users with access to computing facilities can make their own index searches using the BGS Internet (go to 'Online shops' at www.bgs.ac.uk). This will give access to the BGS Bookshop, Publications catalogue, GeoRecords (borehole browser) and GeoReports.

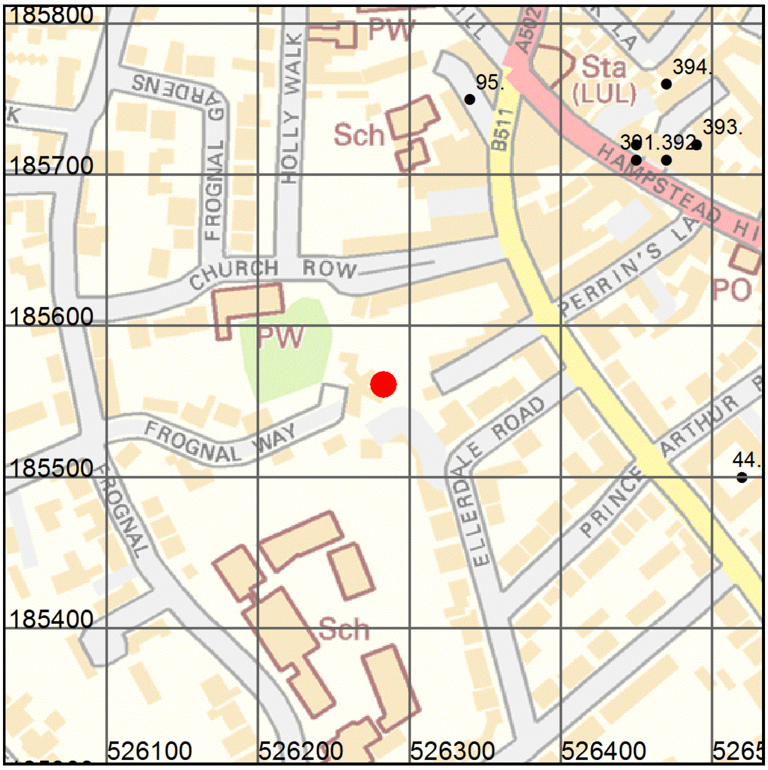
For current pricing see these internet pages or contact us using the list found at the back of this report.

Note that this report contains selective datasets and is not a definitive listing of all data held in BGS.

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

GeoReports

Borehole location map



Contains Ordnance Survey data © Crown Copyright and database right 2014

Scale: 1:5 000 (1cm = 50 m)

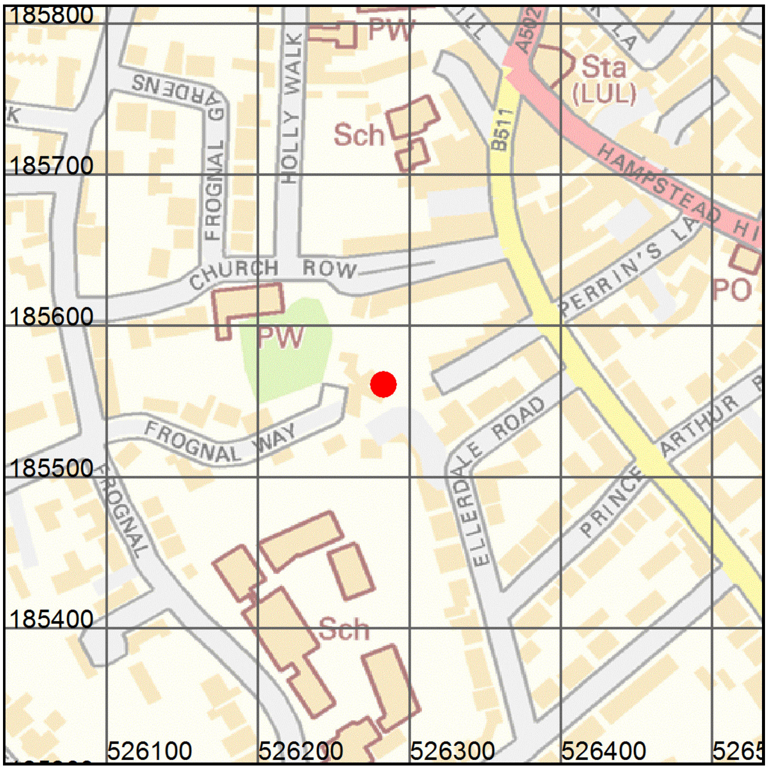
Borehole records

Number of records in map area: 7

In the following table a blank Length field indicates that the borehole is confidential or that no depth has been recorded digitally.
Enquiry staff may be able to provide you with contact details for the originator if you wish to seek release of confidential information.

Borehole registered no	Grid reference	Borehole name	Length (m)
TQ28NE390	TQ 26450 85720	BLUE STAR GARAGE HAMPSTEAD 4	-1
TQ28NE391	TQ 26450 85710	BLUE STAR GARAGE HAMPSTEAD 5	-1
TQ28NE392	TQ 26470 85710	BLUE STAR GARAGE HAMPSTEAD 6	-1
TQ28NE393	TQ 26490 85720	BLUE STAR GARAGE HAMPSTEAD 7	-1
TQ28NE394	TQ 26470 85760	BLUE STAR GARAGE HAMPSTEAD 8	-1
TQ28NE44	TQ 26520 85500	BOROUGH OF HAMPSTEAD FITZJOHNS AVE NW 3	12.19
TQ28NE95	TQ 26340 85750	HAMPSTEAD HEATH 8	12.67

Water Well location map



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Scale: 1:5 000 (1cm = 50 m)

Water Well records

Number of records in map area: 0

All of these records are registered in the main Borehole Records collections (see Borehole Records Table and map above), but please note that some may be duplicate or part duplicate copies. This map shows records of water wells and boreholes in the National Well Record Archive held at Wallingford (WL) or Murchison House (MH). Each record has a Well Registration number which should be quoted when applying for copies.

Additional index information may be held for the Water Well Records as shown below, indicating the information that can be found on the well record itself. If fields are blank, then the well record has not been examined and its contents are unknown. A ‘Yes’ or a ‘No’ indicates that the well record has been examined and the information indicated is, or is not, present. This information should help you when requesting copies of records.

Water Well records
BGS holds no water well records for the selected area

KEY:
Aquifer = The principal aquifer recorded in the borehole
G = Geological Information present on the log
C = Borehole construction information present on the log
W = Water level or yield information present on the log
Ch = Water chemistry information present on the log

Boreholes with water level readings
Number of records in map area: 0
BGS holds no boreholes with water level readings for the selected area

Locations with aquifer properties
Number of records in map area: 0
BGS holds no locations with aquifer properties for the selected area

Site investigation reports
Number of records in search area: 72

Additional laboratory and test data may be available in these reports, subject to any copyright and confidentiality conditions. The grid references used are based on an un-refined rectangle and therefore may not be applicable to a specific site. Borehole records in these reports will be individually referenced within the borehole records collection, described above.

Number	Site investigation title
3850	PROPOSED VICTORIA LINE UNDERGROUND RAILWAY
5751	A406 NORTH CIRCULAR ROAD EAST OF FALLODEN WAY TO EAST OF HIGH ROAD FINCHLEY IMPROVEMENT
8587	A406 EAST END ROAD JUNCTION IMPROVEMENTS FINCHLEY LONDON
8914	HIGHGATE BOWL HOLMESDALE ROAD LONDON
8953	H D A 92 HILLDROP ROAD HILLDROP CRESCENT NO. 7
8999	TRAINMANS ACCOMODATION GOLDERS GREEN
9046	PROPOSED SWIMMING POOL MACDONALD ROAD ARCHWAY LONDON
9634	FORTIS GREEN LONDON
12482	COSPEL OAK DEVELOPMENT LAMBLE STREET EXTENSION 2
12608	GOSPEL OAK NURSERY SCHOOL CAMDEN
12636	7-13 CRESCENT ROAD LONDON N8
12637	PEMBERTON GARDENS ISLINGTON
12683	HARGRAVE PARK ISLINGTON
12721	OAKBANK COURTENAY AVENUE HAMPSTEAD LONDON
14668	WILDWOOD GROVE FLOOD RELIEF SCHEME
15221	MUSWELL HILL, LONDON N10
17059	ALEXANDRA PALACE
17365	WOODSIDE AVENUE, MUSWELL HILL ROAD, LONDON N10
17385	CHANNING SCHOOL, HIGHGATE
17393	BRANCH HILL LODGE, HAMPSTEAD
17452	TAMWORTH LANE, MITCHAM
17503	113-115 HORNSEY LANE, LONDON, N6
17569	NORTHERN POLYTECHNIC EXTENSION, HOLLOWAY ROAD, LONDON N7
17574	16 PARLIAMENT HILL, HAMPSTEAD NW3
19138	HORNSEY LANE
19155	HOLLYBUSH VALE, HAMPSTEAD
19174	395-405 ARCHWAY ROAD, LONDON N6
19196	WEST END LANE, HAMPSTEAD
19230	WEST END SIDINGS, WEST HAMPSTEAD
19472	ARCHWAY DEVELOPMENT
19671	GROVE END ROAD, ST. JOHNS WOOD
19841	A1 FALLODEN WAY & LYTLETON ROAD CULVERT RECONSTRUCTION
20710	HIGH ROAD, EAST FINCHLEY
20999	15 WEST HEATH ROAD, HAMPSTEAD, LONDON NW3
21112	SHEPHERDS HILL, HIGHGATE, LONDON
21288	CROMWELL LODGE
21321	SPRING PLACE
22023	ENDSLEIGH STREET LONDON WC1
22029	3-4 ENDSLEIGH STRET, LONDON, WC1
22106	THE LONDON - EDINBURGH - THURSO TRUNK ROAD (A1)
22943	WHITTINGTON HOSPITAL LONDON N19

Number	Site investigation title
25724	GROVEDALE ROAD LONDON N19
26152	MILL LANE HAMSTEAD
26292	LONG LANE EAST FINCHLEY LONDON N2
26556	DUNCOMBE ROAD LONDON N19
26709	36/42 NORTH HILL HIGHGATE
26736	90 MUSWELL ROAD LONDON N10
30320	13 COOLHURST ROAD CROUCH END
32912	698 FINCHLEY ROAD HOOP LANE
33013	THE ECONOMIST ST JAMES ST - RYDER ST LONDON
33471	LONDON BOROUGH OF BARNET CHRIST'S COLLEGE LOWER SCHOOL
33780	BRANCH HILL CAMDEN LONDON
33910	EAST FINCHLEY
34788	HAZELTON HOUSE CHEVERTON ROAD ISLINGTON
35692	3 NORTH END AVENUE HAMPSTEAD
36946	QUEENS WOOD HIGHGATE LONDON
42230	HORNSEY LANE HARINGEY
43375	THE ELMS HAMPSTEAD VOLUMES 1 & 2
43637	SPEDAN TOWERS HAMPSTEAD
43690	REDEVELOPMENT OF BLUE STAR GARAGE HAMPSTEAD
44865	DANE COURT THE BISHOPS AVENUE LONDON
44877	17 THE BISHOPS AVENUE LONDON
51865	15 STANHOPE GARDENS LONDON N6
53660	18 BISHOPSWOOD ROAD LONDON N6
53760	HEATHWAYS COURTENAY AVENUE LONDON N6
53794	EAST HEATH ROAD HAMSTEAD LONDON NW3
53798	378 FINCHLEY ROAD CHILDS HILL LONDON NW3
53890	31 THE BISHOPS AVENUE LONDON N2
53902	14 VIEW ROAD HIGHGATE LONDON N6
56254	NEW LIFT SHAFT AT LA SAINTE UNION CONVENT SCHOOL HIGHGATE ROAD NW5
56466	26 WILDWOOD RISE LONDON NW11
56867	THE RYDINGS COURTENAY AVENUE HAMPSTEAD LONDON N6

National Grid geological maps (1:10 000 and 1:10 560 scale)

Number of records in search area: 1

Map	Type	Survey
TQ28NE	C	1922

County Series geological maps (1:10 560 scale)

Number of records in search area: 7

Map	Type	Published
London1FS		1922
London1FS	C	0
London1SE	D	1934
London1SE	C	1934
London1SE		1934
London1SE	C	0
London2SE	C	0

New Series medium scale geological maps (1:50 000 and 1:63 360 scale)

Number of records in search area: 4

Sheet number	Sheet name	Type	Published
256	North London	C	2006
256	North London	C	1993
256	North London	D	1925
256	North London	D	1951

Old Series one inch geological maps (1:63 360 scale)

Number of records in search area: 2

Sheet number	Sheet name	Type	Published
7	St. Albans	D	1871
7	St. Albans	S	1861

Hydrogeological maps (various scales)

Number of records in search area: 0

BGS holds no hydrogeological maps for the selected area

Geological Memoirs

Number of records in search area: 2

Geological memoir	Date
Geology of London Sheets 256,257,270,271	2004
North London	1925

Technical reports

Technical reports may be available for this area. Please email sales@bgs.ac.uk for further information.

Waste sites

Number of records in search area: 0

Listing of some 3500 waste sites for England and Wales identified by BGS as part of a survey carried out on behalf of the Department of the Environment in 1973. Later information may be available from the Local authority.

BGS holds no records of waste sites for the selected area

Mining plans

Number of records in search area: 0

This listing includes plans of various types, principally relating to mining activity including abandonment plans. The coverage is not comprehensive; however that for Scotland is most complete.

BGS holds no records of mining plans for the selected area

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