Senior Urban Living (Epsom) Ltd

Land at Epsom Hospital

Ground Contamination Preliminary Risk Assessment

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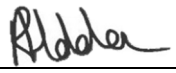
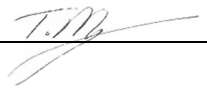
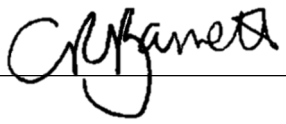
		Signature			
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Executive summary

This ground contamination preliminary risk assessment has been prepared for Senior Urban Living (Epsom) Ltd to support the redevelopment of the southern part of Epsom General Hospital (the site). The report presents and assesses the latest desk-based information for the site and surroundings, considering the historical and current land uses, the environmental setting and development proposals. This report presents a ground contamination preliminary risk assessment based on the conceptual model developed from the existing data for the site.

The scheme is a residential development comprising two new buildings between two and nine storeys, providing extra care accommodation (use class C2) and supporting uses including children's day care (use class D1), restaurants and gym. The proposals also include a two-storey car park and landscaping across the site, with greening of a central pedestrian route.

The site was originally open fields then gardens with small residential properties in the south of the site. Hospital buildings were constructed in the 1950's (specifically Rowan House) with some soft landscaping. The site was further developed in around 2003 with additional small buildings including generators and staff accommodation. Most of the site has remained unchanged until the present day with some buildings demolished and replaced with car parking.

The site is underlain by River Terrace Deposits (RTD) (absent in the northwest of the site), London Clay (present in the north and northwest only) and Lambeth Group, which is underlain by the Thanet Sands and Chalk. The aquifers in the RTD and Lambeth Group are both classified by the Environment Agency as secondary A aquifers. The principal Chalk aquifer lies at depth beneath the site. The site is not located within a source protection zone and there are no groundwater, surface water or potable water abstractions within 1km of the site. A small pond is located 10m south of the site. The environmental sensitivity of the site is assessed to be low to moderate.

Ground investigation undertaken by Arcadis in 2018 did not identify any significant sources of contamination over most of the site. One round of groundwater monitoring was undertaken as part of the investigation which identified hydrocarbon contamination in both secondary A aquifers (Lambeth Group and RTD) in one borehole (BH102) near existing fuel tanks. A second borehole located down gradient of the fuel tanks did not identify any contamination (BH103).

Based on the site history and limited investigations there is low potential for significant contamination on most of the site. However, the potential for contamination increases to moderate near the tanks. Hydrocarbon staining was noted at the surface during the site reconnaissance and hydrocarbons have been confirmed in underlying water. The previous ground investigation was limited in extent, and further investigation is required to adequately characterise the site.

The preliminary risk assessment and initial conceptual site model have identified several potential plausible pollutant linkages (PPL) associated with the site and the Proposed Development. The outcome of the assessment is summarised in the table below.

Item	Risk characterisation (without mitigation)
Site sensitivity	Low to moderate
Potential for significant contamination to be present	Generally low, moderate around the tanks
Risk of harm to human health during construction	Low to moderate
Risk of harm to human health during operation	Low to moderate
Risk of pollution to groundwater in the RTD secondary A aquifer	Moderate to high
Risk of pollution to groundwater in the Lambeth Group secondary A aquifer	Moderate to high
Risk of pollution to groundwater in the Chalk principal aquifer	Moderate
Risk of pollution to surface water courses	Very low
Risk of harm to building materials and services	Low to moderate
Risk of harm to ecological receptors (planting in landscaped areas)	Low

An intrusive ground contamination investigation is required to provide more information on ground conditions and the presence of contamination at the site. The objectives of the ground investigation will be to characterise the ground conditions and enable quantitative risk assessment of PPL identified in the conceptual model and preliminary risk assessment, taking into consideration the future use of the site. The proposed scope of the ground investigation is included within the conclusions of this report (Section 6).

A ground investigation, risk assessment and remediation strategy will be required to further characterise the site including further delineation of potential hydrocarbon contamination around the tanks. The objectives of the ground investigation will be to characterise the ground conditions and to enable quantitative risk assessment (QRA) of the potential pollutant linkages identified in the conceptual model and preliminary risk assessment taking into consideration the future use of the site. The remediation strategy and verification plan will need to be defined and agreed with the Epsom and Ewell Borough Council contaminated land officer prior to commencement of development.

1 Introduction

1.1 Background

Senior Urban Living (Epsom) Ltd is seeking outline planning approval for the redevelopment of the southern part of Epsom General Hospital (the site); the northern part will remain in hospital use. The scheme is a residential development comprising assisted living apartments, shared residential landscaped amenity spaces, commercial space (retail), spaces for community use and an automated parking system (APS).

Ove Arup and Partners Ltd (Arup) has been commissioned by Senior Urban Living (Epsom) Ltd to provide ground contamination consultancy services for the scheme. This report presents a desk study and preliminary risk assessment and is intended to support the planning application for the development.

The objectives of this report are to:

- Identify and assess relevant sources of information concerning historical site uses, environmental setting, site sensitivity, ground conditions and the potential for ground contamination at the site and in the surrounding area;
- Assess the potential for ground contamination and undertake a preliminary risk assessment for the Proposed Development;
- Identify next steps, including the requirement for ground investigation and further contamination assessments; and
- Provide information sufficient to support the planning application and to satisfy the requirement for a preliminary risk assessment, which is expected to comprise the first stage of a contaminated land planning condition.

1.2 Scope of work

The scope of work for this desk study and preliminary risk assessment comprises the following tasks:

- Undertake a review of desk-based information collated for the site concerning historical and current site uses and provide an assessment of the potential for ground contamination and nature of any contaminative sources.
- Outline the local geology, hydrogeology and hydrology conditions and provide an appraisal of the environmental setting and site sensitivity.
- Undertake an environmental reconnaissance survey to establish the current site configuration and condition.
- Consider relevant information and details of the Proposed Development to inform an initial conceptual site model and preliminary risk assessment, to assess potential implications from ground contamination to the development.
- Provide recommendations for the redevelopment of the site and identify requirements for intrusive ground investigation.

This desk-based ground contamination preliminary risk assessment has been prepared in general accordance with the National Planning Policy Framework, BS10175:2011+A2:2017 Investigation of potentially contaminated sites, Code of practice [1] and online Environment Agency 'Land Contamination: Risk Management' guidance, based on the model procedures for the management of land contamination (CLR11) [2].

1.3 Limitations

This report has been produced by Arup for use by Senior Urban Living (Epsom) Ltd in connection with the Proposed Development of the site. It is not intended for and should not be relied upon by any third party except as provided for in Arup's agreement with Senior Urban Living (Epsom) Ltd.

Arup has based this desk study on the sources of information detailed within the report and believes them to be reliable but cannot and does not guarantee the authenticity or reliability of third party information. Notwithstanding the efforts made by the professional team in undertaking this contamination assessment, it is possible that ground conditions and contamination other than those potentially indicated by this report may exist at the site.

This report has been prepared based on current legislation, statutory requirements, planning policy and industry good practice prevalent at the time of writing. Any subsequent changes or new guidance may require the findings, conclusions and recommendations made in this report to be reassessed in the light of the circumstances.

This report does not present a survey or assessment of the location, condition or liabilities associated with hazardous materials in the building fabric such as (but not limited to) asbestos containing materials or lead.

It does not present a risk assessment for the potential presence or disturbance of unexploded ordnance (UXO) at the site.

2 The site

2.1 Information sources

This report provides an assessment of the latest desk-based information for the site. The report is presented based on the information summarised below and referenced within subsequent sections:

- A Groundsure environmental search report, dated August 2019. This comprises environmental sensitivity maps and permitting records (EnviroInsight), geological sensitivity maps and records (GeoInsight) and historical Ordnance Survey maps and Goad insurance plans (MapInsight), and is presented in Appendix A [3].
- A response from Epsom and Ewell Borough Council in November 2019 to a request for an environmental search which is presented in Appendix B.
- An environmental reconnaissance survey of the site was conducted on 29th August 2019. The survey findings are described in Section 2.3;
- Previous ground contamination assessments and ground investigation information including:
  - Arcadis (2018) Epsom Hospital – Plot 2A, Phase 1 Geo-Environmental Desk Study [4]; and
  - Arcadis (2018) Epsom Hospital – Plot 2A, Phase 2 Geo-Environmental and Geotechnical Assessment Report [5] (Appendix D).
- Web-based databases including the British Geological Survey (BGS) [6] and MAGIC [7].

2.2 Site location

The site is in Epsom, Surrey to the southwest of London and centred approximately at National Grid Reference 520402E 159766N. The site occupies 1.48ha of the southern portion of Epsom General Hospital along Woodcote Green Road (Figure 1**Error! Reference source not found.**). The site is approximately 100m north to south and 150m east to west.

Figure 1 Site location

The site is bounded by residential development to the west, open space to the south and the rest of Epsom General Hospital to the north and east.

2.3 Current site uses

An environmental reconnaissance survey of the site was undertaken on 29th August 2019. The site is currently occupied by several multi-storey buildings including redundant healthcare buildings and associated infrastructure. This includes car parking, administrative space, temporary structures, a brick boiler house and chimney stack, the four storey Rowan House and the two storey York House.

Between these buildings the site includes access roads, parking spaces, storage including waste disposal units and oxygen tanks. Several buildings have recently been demolished to slab level and cleared for additional car parking.

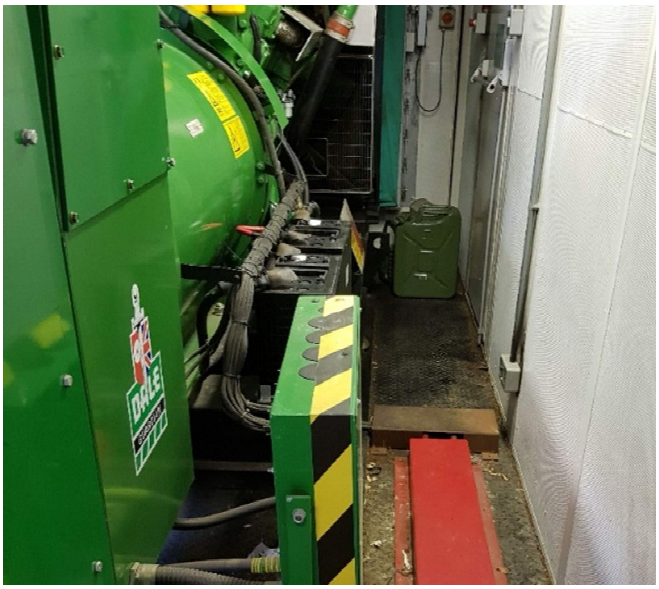
A series of photos depicting the site during the August 2019 environmental reconnaissance survey are included in Table 1, together with a description of potential contaminative sources that were identified during the visit.

Table 1 Photos taken during Arup site reconnaissance

Photo	Description
Boiler house and associated chimney	
	The boiler house is located in the north of the site and houses three diesel-fueled boilers. During the summer these are used in rotation. The boiler water is treated with bisulphate and sodium hydroxide. These chemicals are stored within the boiler house. Each boiler sits on a concrete platform surrounded by pits (covered by metal plates to make a walkway and to cover pipework).
	One of the three boilers located within the boiler house.
	Pipe work and pits within the boiler house which showed evidence of staining.

Photo	Description
	Water treatment chemicals are stored within the boiler house in a bund.
Diesel fuel store	
	The diesel store was not accessed during the survey. The tanks are housed in a brick building with a fuel filling point on the southern wall. Several vents were located on the roof of the fuel store.
	Covered pipework runs from the diesel/fuel storage tanks towards the boiler house. Black staining was observed around the edges of the pit and on the concrete slabs covering the pipework.

Photo	Description
Rowan House	
	The pump room in the basement of Rowan House could not be fully accessed as the pump room was flooded at the time of the site walkover. The interior of Rowan House was not accessed during the site walkover.
Chemical store	
	The chemical store contained miscellaneous items including paint, gas canisters, builder's sand and oil containers. A pool of oily water was noted on the floor of the chemical store. This had a purple colour in some areas.
Generators	
Generator 1	
	Two backup generators are present at the site. The largest generator was housed in a secure concrete/ metal building on the northern boundary of the site. Parts of the concrete and wooden flooring were noted to be in disrepair. Oil canisters were stored within the building. Small stains were noted on the concrete floor around the canisters.

Photo	Description
Generator 2	
	The smaller generator in the northwest of the site is housed in a small metal container. The floor was metal plated and in good condition.

2.4 Proposed Development

The Proposed Development consists of two new buildings between two and nine storeys, providing extra care accommodation (use class C2) and supporting uses including children's day care (use class D1), restaurants and gym.

The existing buildings will be demolished before development commences. The foundation design for the new buildings has not yet been confirmed, however, it is anticipated that piles will be used. Building heights are stepped and range from four storeys at the western boundary and along Woodcote Green Road to nine storeys at the northern edge, bordering Epsom Hospital. In addition, a two-storey car park will be constructed in the northwest of the site. Vehicular access will be from Woodcote Green Road. Measures to promote biodiversity such as green roofs are included.

3 Site history and industrial land use

3.1 Information sources

This section describes the historical development of the site based on the following data sources:

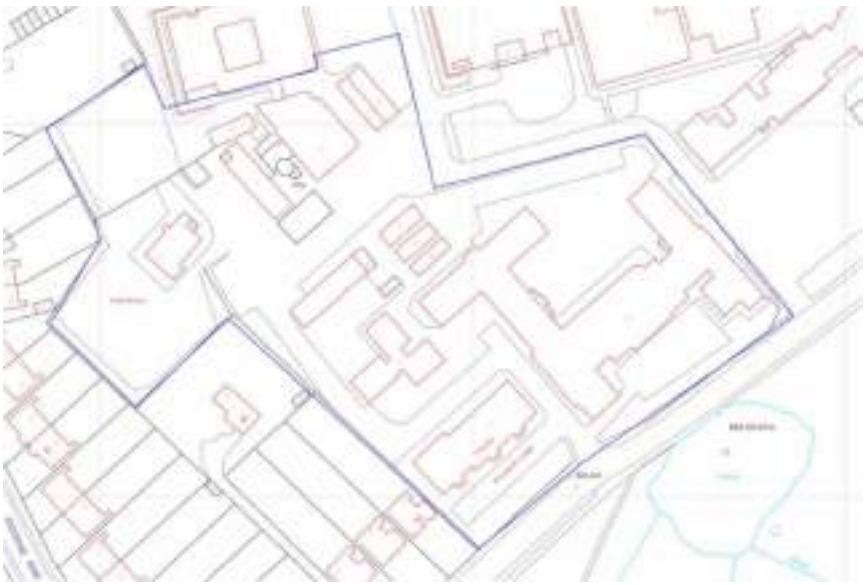
- Groundsure Ltd (2019) (Appendix A); [2]
- Arcadis (2018) Epsom Hospital – Plot 2 A, Phase one Geoenvironmental Desk Study [4];
- Epsom and Ewell Borough Council response to environmental search report request dated 1st November 2019 (Appendix B); and
- Google Inc (2019) Google Earth. Accessed 1st October 2019 [8].

3.2 Site history

A description of the site history detailing the potentially contaminative land uses identified onsite is presented in Table 2 below.

Table 2 Site history covering the key stages of site redevelopment and extracts from the Groundsure.

Date	Onsite feature	Offsite feature
1840 1:2,500 Country series		
1880s	Residential buildings with associated gardens are in the south of the site. The centre and north of the site is covered by woodland and an open field. By 1890s, the wooded area is removed, and the site is shown as open fields and small residential properties.	Epsom Union Workhouse is recorded 25m north of the site and Woodcote pond with associated small streams (later labelled as drains) is located 10m to the south. The site is surrounded by open fields and small residential buildings. In the 1890s, church grounds are shown in the northeast corner of the site.

Date	Onsite feature	Offsite feature
1952 1:1,250 National Grid map		
1950s	By 1954, the residential buildings have been replaced with a large hospital building. The centre of the site is shown as a large open area of soft landscaping and small buildings can be seen in the north of the site. A chimney is noted in the north of the site associated with the boiler house.	The surrounding area has been developed and is predominantly residential buildings with gardens. 'The Oaks' Home for the aged is located to the north of site. A tennis court is shown on the site boundary. In the 1930s, Epsom hospital buildings and associated carparks are constructed to the north of the site.
2003 1:1,250 LandLine		
2019	The building layout has remained predominantly unchanged. Staff housing, which is first shown on the 1965 mapping, has been demolished and replaced with carparking.	The surrounding area has remained largely unchanged.

3.3 Commercial and industrial land uses

There are no tanks recorded by the Groundsure report onsite or within 140m of the site boundary (although it is known there are various tanks on site). An electricity substation is recorded by the Groundsure 54m northeast of the site between 1979 and 1984.

No petrol or fuel filling stations are recorded by the Groundsure report onsite or within 500m of the site boundary.

There are no records of Control of Major Accident Hazards (COMAH) sites, Notification of Installations Handling Hazardous Substances (NIHHS) sites, sites determined as contaminated under Part 2A, landfill (including historic) sites or operational/non-operational waste treatment transfer and disposal sites within 1km of the site boundary.

3.4 Regulator information

The response from Epsom & Ewell Borough Council (EEBC) states that the council do not 'hold a contaminated land search for the site'. Part of the site is on the Epsom General Hospital complex, which is included in a database of potentially contaminated sites (reference 03/00031/CLHIST), but further details are not provided.

4 Ground data and environmental setting

4.1 Introduction

This section describes the mapped geology, existing ground investigation, anticipated ground conditions beneath the site, environmental setting and hydrogeology and hydrology onsite. Reference has been made to the following data sources:

- British Geological Survey viewers [6];
- Groundsure GeoInsight (2019) historical OS maps and historical data report, including geological maps (Appendix A) [3];
- Arcadis (2018) Epsom Hospital – Plot 2A, Phase 2 Geo-Environmental and Geotechnical Assessment Report [5] (Appendix D).

4.2 Stratigraphy

Records, including nearby boreholes, indicate the site is underlain by Made Ground (between 1.1m and 1.9m thick) and RTD (not encountered in southwest of site) between 1.1m and 1.5m thick. The London Clay formation was encountered in the northwest of the site and Lambeth Group to the east. This is underlain by Thanet Sand and Lewes Nodular Chalk Formation.

Table 3 Anticipated stratigraphic sequence for the site

Strata	Description	Top of stratum (m bgl)	Thickness (m)
Made Ground	Brown/grey clayey/silty sandy gravel. Gravel is angular to subrounded of brick, flint, concrete, chalk and mudstone. Occasional cobbles of brick and flint.	Ground level to 1.9	1.1 to 1.9
RTD (not recorded in northwest of site)	Loose to very dense light brown to grey slightly silty sandy to very sandy gravel. Gravel is fine to coarse subangular to subrounded of flint, chalk and quartz.	1.2 to 2.7	1.1 to 1.5
London Clay Formation (north and northwest)	Stiff to very stiff slightly sandy to sandy slightly gravelly clay. Gravel is fine to medium subangular to subrounded of flint.	1.1 to 2.7	Unknown
Lambeth Group Formation (centre and east)	Firm to very stiff brownish/greenish brown slightly sandy silty clay. Very stiff greenish brown slightly clayey very sandy silt.	2.0 to 15	Unknown
Thanet Sands	No description recorded on BGS logs	Not recorded	Unknown
Chalk	No description recorded on BGS logs	54	Unknown

4.2.1 Made Ground

Made Ground has been recorded by previous investigation. Various phases of demolition and redevelopment have been undertaken across the site. Residual demolition material may be present within the Made Ground. A shallow thickness of Made Ground was recorded in all exploratory locations during the 2018 Arcadis investigation. Made Ground predominantly consisted of gravels, sands and clay with anthropogenic materials such as brick and concrete.

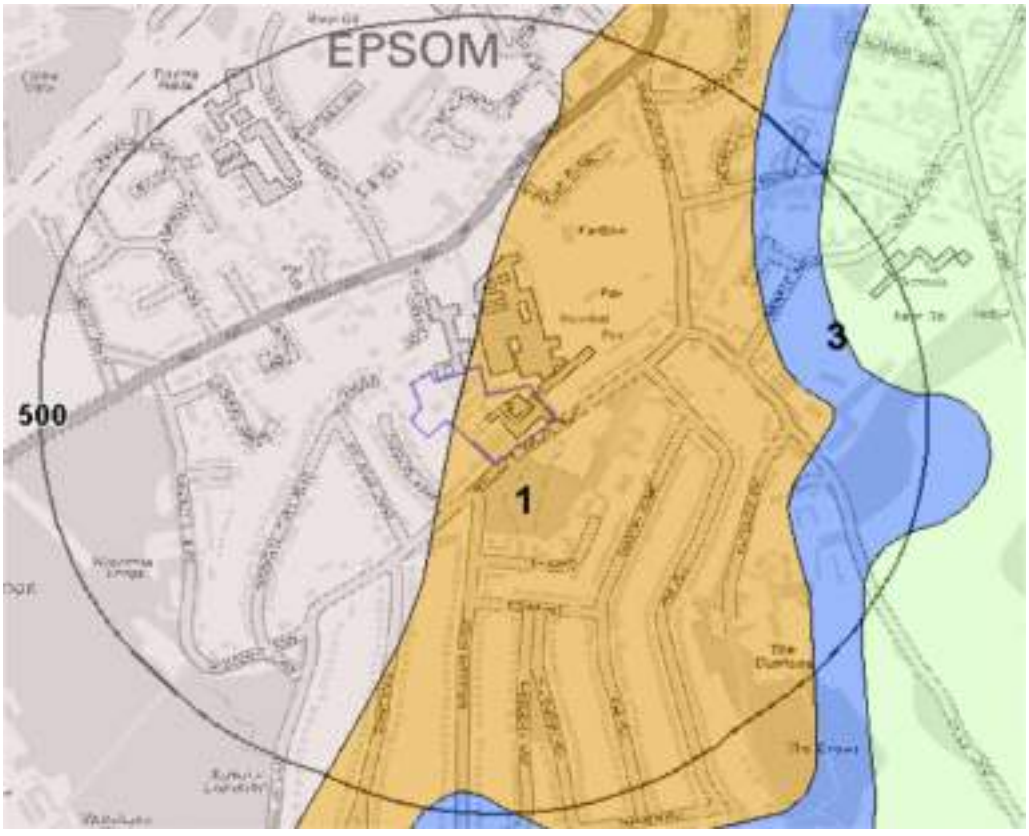
4.2.2 Superficial geology

RTD is present across most of the site under the Made Ground but was not recorded in the southwest of the site in the Arcadis 2018 investigation. The terrace deposits were recorded by the Arcadis investigation as a loose to very dense sandy gravels. Where the gravels were not encountered on the site, the Made Ground was encountered directly on top of the bedrock formation.

4.2.3 Bedrock geology

The site is underlain by London Clay in the northwest and Lambeth Group in the east (as shown on Figure 2). The London Clay was recorded by the Arcadis 2018 investigation underlying the Made Ground in the southwest of the site (1.1m bgl). The clay was recorded as stiff dark grey silt and very stiff dark grey sandy clay.

Figure 2 Extract from Groundsure geological mapping.



Key: Pink - London Clay, Orange - Lambeth Group, Blue - Thanet Formation, Green - Lewes Nodular Chalk.

Lambeth Group was recorded under the RTD in the central and eastern parts of the site. No London Clay was recorded in these boreholes. The Lambeth Group was recorded as firm grey mottled reddish brown slightly sandy clay and firm stiff greenish brown slightly clayey very sandy silt around 11.8m bgl where water is noted on the logs.

The London Clay and Lambeth Group are underlain by Thanet Formation and the Lewes Nodular Chalk.

4.3 Hydrogeology and hydrology

The RTD is classified as a secondary A aquifer but is absent in the southwestern corner of the site. Groundwater flow in the RTD is expected to be towards the north. This was indicated by the Arcadis 2018 investigation.

London Clay is present across the northwest and west of the site and is classified as unproductive strata.

The centre and east of the site is underlain by Lambeth Group. This is designated by the Environment Agency as a secondary A aquifer. The top 8m of the Lambeth Group logged onsite is recorded as stiff greyish brown slightly sandy very silty clay. This clay layer acts as an aquitard and acts as a cohesive low permeability layer between the upper aquifer in the RTD and lower aquifer in the Lambeth Group.

The underlying Chalk is designated as a principal aquifer.

There are no source protection zones (SPZ) reported onsite. A SPZ Zone 2 (outer zone) is recorded approximately 190m northeast and a SPZ Zone 1 is located 260m northeast.

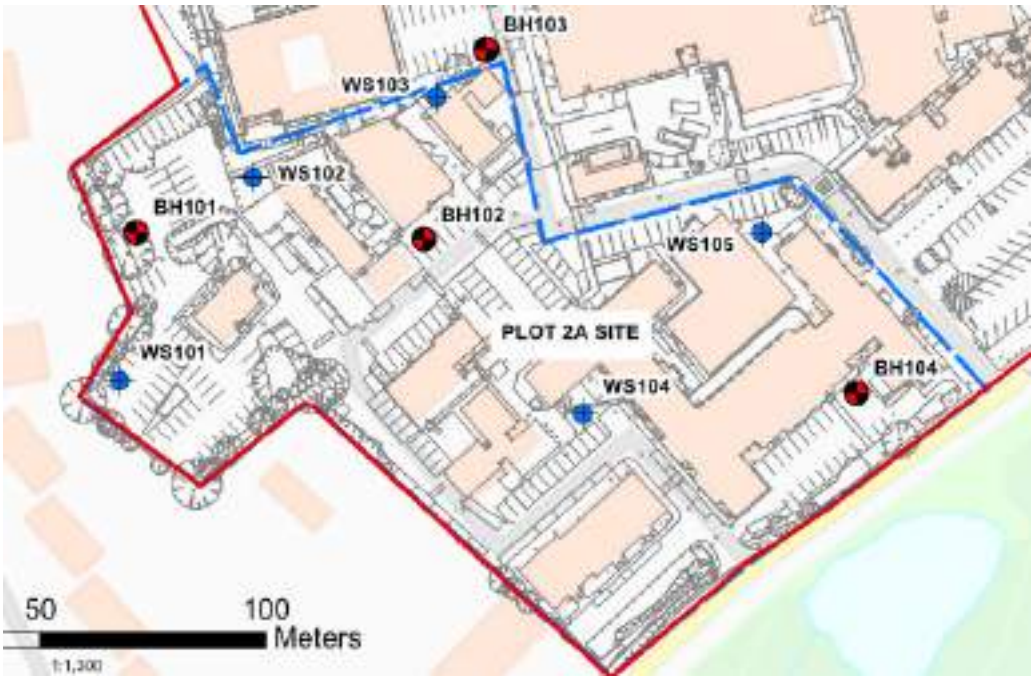
There are no groundwater, surface water or potable water abstractions within 1km of the site.

The nearest surface water feature is located 10m southeast in Woodcote Millennium Green. The pond is first recorded on the 1840 map. Several surface drains which appear to drain into the pond from the southeast and south and north can be seen on the map. The pond is not connected to a large watercourse such as a stream or river.

4.4 Soil and groundwater quality

A ground investigation was undertaken by Arcadis in August 2018 over the wider Epsom Hospital grounds including the southern part of the site (referred to as Plot 2A) [5] (Appendix D). The investigation within the Plot 2A boundary comprised three boreholes to 15m bgl and five window samples to a maximum depth of 5m bgl as shown in Figure 3). This is a relatively small amount of investigation given the size of the site.

Figure 3 Arcadis exploratory locations



Extract from Arcadis Plot 2A report [5] (Appendix D)

A total of 13 soil samples were collected for laboratory testing. This included 12 from the Made Ground with depths ranging between 0.2m bgl to 0.8m bgl and one from the RTD (BH104 1.2m bgl to 1.3m bgl).

Samples were analysed for a suite of determinands including metals, inorganics, phenols, speciated polyaromatic hydrocarbons (PAH) and speciated total petroleum hydrocarbons (TPH) CWG including benzene, toluene, ethylbenzene and xylene (BTEX). One sample from the Made Ground was a sample of tarmac and was tested only for coal tar (none was identified).

There was no reported visual or olfactory evidence of confirmation recorded during the site investigation.

Levels of chemical determinands in the soils were low. Concentrations of several PAH (benzo(b)fluoranthene, benzo(a)pyrene and dibenzo(a,h)anthracene) and lead were recorded above the generic assessment criteria (GAC) used by Arcadis for a residential land use. Most results above the GAC were recorded in BH102 close to the boiler house and diesel storage area (maximum concentration of benzo(a)pyrene recorded 10mg/kg at 0.2m bgl). Arcadis reported that all elevated results were noted in the shallow Made Ground (between 0.2m bgl and 0.8m bgl). This is where most of the testing was undertaken which may skew this conclusion. All samples were tested for the presence of asbestos which was detected in three of the 12 samples tested (25%). All three samples were in the northeast of the site (BH102 and WS102).

One round of groundwater monitoring was undertaken in August 2018. Benzene (8.7ug/l in the RTD and 9.3ug/l in the Lambeth Group), naphthalene (24.9ug/l in the RTD and 21.2ug/l in the Lambeth Group) and TPH (3,980ug/l in the RTD and

2,300ug/l in the Lambeth Group) were detected in BH102 (located near the fuel storage area) in both the shallow and deeper (Lambeth Group) aquifer. A concentration of zinc of 31ug/l was recorded above environmental quality standard (EQS) site specific predicted no effect concentrations (19.25ug/l) in BH104. All other groundwater results were low and below EQS and drinking water standards (DWS). Further comment on the hydrocarbon results are provided later in this report.

4.5 Ground gas and vapours

The Arcadis 2018 ground investigation recorded a maximum thickness of 1.9m of Made Ground.

Three rounds of ground gas monitoring were undertaken during the 2018 investigation. The maximum methane concentration recorded was 0.2% v/v, the maximum carbon dioxide concentration was 7% v/v and the maximum flow rate was 0.1l/hr. Arcadis report that this equates to a characteristic situation (CS) 1 which represents very low risk [5]. The amount of monitoring undertaken is however insufficient to provide a design for the ground gas regime.

TPH, BTEX and PAH data were screened against Arcadis GAC for vapour intrusion. The Arcadis assessment stated that risks from inhalation of vapour from groundwater were unlikely.

4.6 Radon

The site is within a lower probability radon area where less than 1% of homes are estimated to be at or above the Action Level (200Bq/m^3). The Groundsure report states that no radon protection measures are necessary in the construction of new dwellings or extensions for this type of classification.

4.7 Sensitive environmental land-use

There are no sensitive environmental land uses such as nature reserves, Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Areas of Outstanding Natural Beauty (AONB), ancient woodlands or Ramsar sites within 250m of the site boundary.

4.8 Environmental permits, incidents and registers

The Groundsure database confirms that there are no records of Integrated Pollution Control (IPC) authorisations, records of Part A (1) and Integrated Pollution Prevention and Control (IPPC) authorised activities, records or red list discharge consents, Part A (2) and Part B activities, records of licensed discharge consents or records or category 3 or 4 radioactive substances authorisations onsite or within 500m of the site boundary.

The Groundsure report confirms there are no records of use of radioactive materials onsite. The Environment Agency public register for environmental

permits (radioactivity) was also reviewed and no entries for the site were identified.

5 Preliminary risk assessment

5.1 Risk classification methodology

The method for risk evaluation has been based on a quantitative assessment taking into consideration the magnitude of the potential severity of the risk as well as the probability of the risk occurring. The definition of risk and risk characterisations are summarised in Appendix C which sets out the risk assessment methodology.

5.2 Potential sources

Potential current and historical sources of contamination have been identified and are presented in Table 4.

Table 4 Potential onsite sources of contamination

Source	Contaminants of concern	Comments	Ref
Made Ground	Metals and metalloids, hydrocarbons (TPH and PAH), asbestos. Ground gases and vapour.	Previous investigations have encountered up to 1.9m of Made Ground in some parts of the site which could include demolition rubble from previous phases of redevelopment.	S1
Fuel tanks	Hydrocarbons (TPH and PAH specifically diesel), oils Vapours	The fuel tanks located in the north of the site were not accessed during the site reconnaissance. However, black staining was noted around covered pipework between the fuel tanks and the boiler house. Hydrocarbons were recorded in the Arcadis 2018 investigation in the groundwater.	S2
Generators	Oils and hydrocarbons (TPH and PAH) Vapours	Two generators are located onsite. The older generator was noted to be in reasonable condition with some spills or leaks on the ground around the base. The new smaller generator was in good condition. No spills or leaks were noted.	S3
Chemical store (including paints and oily water)	Oils and hydrocarbons (TPH and PAH) Paints (volatile organic compounds (VOC), metals)	The chemical store contained miscellaneous equipment and paints but did not contain canisters of chemicals. Oily/ purple water was observed to be pooled on the floor of the store.	S4

The former hospital could potentially have used radioactive substances on the site. It is understood that the site was previously used as workshops, accommodation and for therapeutic use rather than any clinical or medical procedures. If previous use of radioactive substances occurred on the site, Epsom and St Helier University Hospitals NHS Trust would have been required to properly store, control, dispose of and then decommission these materials. No evidence for the use of radioactive substances on the site has been found and therefore this has not been taken forward as a potential source in the assessment.

5.3 Potential receptors

Based on the findings of the desk study review, the potential receptors associated with the site are summarised in Table 5.

Table 5 Summary of potential receptors

Potential receptor	Sensitivity	Ref
Human health		
Groundworkers and site visitors during construction	Moderate: workers will come into direct contact with the soil and without mitigation, dust could affect workers and site visitors during construction.	R1
Neighbours during construction	Moderate: commercial, residential and hospital users could be impacted during construction from dust and nuisance odours.	R2
Site residents, workers and visitors during operation	Moderate: the Proposed Development comprises a later living development, commercial (retail) space, and managed external soft landscaping. There is a potential for contact with residual soils in landscaped areas.	R3
Maintenance workers during operation	Low to moderate: the Proposed Development contains areas of new soft landscaping which will require ongoing maintenance.	R4
Controlled waters		
RTD secondary A aquifer	Moderate: the RTD (secondary A aquifer) has been encountered at shallow depths beneath the site. The Arcadis 2018 investigation (Appendix D) identified contamination around the fuel tanks and boiler house. The RTD is not recorded as being present in the northwest of the site.	R5
Lambeth Group secondary A aquifer	Moderate: the Lambeth Group (secondary A aquifer) is present across most of the site. The Arcadis 2018 investigation (Appendix D) [5] identified contamination around the fuel tanks and boiler house.	R6
Chalk (lower) principal aquifer	Moderate: The site is not located in a groundwater SPZ. There are no abstraction sites within 1km of the site. The Chalk is beneath a thickness of the London Clay across parts of the site which is of negligible permeability and regarded as an aquiclude. The remainder of the site has a thickness of Lambeth Group which has significant bands of firm clay and provides protection to the Chalk.	R7
Surface waters	Low: the closest surface water receptor is the small drainage pond located 10m south of the site boundary.	R8
Building materials		
Onsite buildings, materials and services	Low: building materials and services will come into direct contact with soils and there is the potential for these to be affected by contamination. However, appropriate material design can be used to mitigate the effects of any contamination.	R9

Potential receptor	Sensitivity	Ref
Ecological receptors		
Ecological receptors	Low: No designated ecological receptors on or surrounding the site. The development contains areas of new soft landscaping and plants could be affected by phytotoxic determinands.	R10

5.4 Potential pathways

Based on the findings of the desk study review, the potential contaminant pathways associated with the site are summarised in Table 6.

Table 6 Summary of potential contaminant pathways

Potential contaminant pathway	Existence of pathway	Ref.
Ingestion of soil or dust Inhalation of dust or fibres Dermal contact with soil or dust	Construction stage bulk earthworks and excavation, including stockpiling and material movement. Post-construction in limited areas of soft landscaping or associated with works involving ground disturbance.	P1
Migration of hazardous gas and vapours to confined spaces Inhalation of ground gases or vapours	Migration, including along any preferential pathways (such as utility trenches) and accumulation in confined spaces, such as excavations (during construction) or future buildings.	P2
Plant uptake from soil and human consumption of home-grown produce	The development does not include private gardens. The pathway is only relevant in areas of garden which could grow fruit and vegetables for human consumption. There is the possibility produce may be grown in the communal gardens.	P3
Vertical and lateral migration of free phase product (such as petroleum hydrocarbons)	Associated with the fuel/diesel tanks. Hydrocarbons recorded in the groundwater in BH102 close to the tanks.	P4
Leaching of contaminants from the soil	Limited to areas of soft landscaping, permeable paving or soakaway drainage, where precipitation and surface water run-off can percolate through Made Ground.	P5
Vertical and lateral migration of dissolved phase contamination	Associated with perched groundwater and upper aquifer. Potential for mobile contamination to laterally migrate both on and offsite.	P6
Creation of preferential pathways during construction	Foundation design has not been confirmed but it is likely that piled foundations which terminate within the London Clay or Lambeth Group will be used. As the depth and method of piling has not been confirmed, piling is considered to be a viable pathway to the lower aquifer. Drainage and other service trenches could aid the lateral migration of contamination on and offsite.	P7

Potential contaminant pathway	Existence of pathway	Ref.
Direct contact with construction materials and services	Materials such as below ground concrete and potable water supply pipes will be in direct contact with underlying soils.	P8
Plant uptake	Residual soils may include phytotoxic elements. This can be managed through specification of an appropriate new planting medium for landscaped areas	P9

5.5 Initial conceptual model

Based on the potential sources, pathways and receptors identified above, an initial conceptual site model (CSM) has been produced as Table 7, which includes a risk assessment of the potential pollutant linkages.

Table 7 Initial CSM and assessment of potentially unacceptable risk

Potential Pollutant Linkage				Classification/ Risk Estimation			Assessment of potentially unacceptable risk
Ref	**Source**	**Pathway**	**Receptor**	**Probability**	**Consequence**	**Risk**	
Risk to human health during construction							
PPL1	Contamination of the soil and groundwater associated with: S1 Made Ground S2 Fuel tanks S3 Generators S4 Chemical store	P1 Ingestion of soil or dust, inhalation of dust or fibres and/or dermal contact. P2 migration and inhalation of gas and vapours	R1 groundworkers and site visitors during construction	Likely	Medium	Moderate	The 2018 Arcadis investigation identified low levels of PAH and asbestos in 25% of the samples tested. These results were localised. Generally low levels were recorded across the remainder of the site. The PPL presents a low risk across most of the site, increasing around the tanks, which should be further assessed in the proposed ground investigation. Remediation may be required. Potential mitigation is likely to include industry good practice and environmental controls such as appropriate personal protection equipment (PPE) and good site hygiene (site workers), occupational air monitoring prior to, and during entry of confined spaces and dust suppression.
PPL2		P1 Inhalation of dust	R2 neighbours during construction	Low likelihood	Medium	Low to moderate	Appropriate pollution prevention measures and environmental management, to include active dust suppression, will be required during construction.
Risk to human health during operation of the development							

Potential Pollutant Linkage				Classification/ Risk Estimation			Assessment of potentially unacceptable risk
Ref	**Source**	**Pathway**	**Receptor**	**Probability**	**Consequence**	**Risk**	
PPL3	S1 Made Ground S2 Fuel tanks S3 Generators S4 Chemical store	P1 Ingestion of soil or dust, inhalation of dust or fibres and/or dermal contact	R3 site residents, workers and visitors during operation	Likely	Medium	Moderate	The 2018 Arcadis investigation identified low levels of PAH and asbestos in 25% of the samples tested. These results were localised. Generally low levels were recorded across the remainder of the site. The PPL presents a low risk across most of the site, with localised areas (around the tanks) potentially presenting an unacceptable risk without mitigation, which should be further assessed as part of the proposed ground investigation. Potential mitigation may include measures such as clean cover layers in soft landscaped areas.
		P2 migration and inhalation of gas and vapours		Low likelihood	Mild	Low	No significant sources of ground gas have been recorded onsite. The Made Ground encountered was predominantly sands and gravels with low levels of organic content which has a low gassing potential. Gas monitoring recorded low levels. There is the potential for localised hydrocarbon contamination which may result in low levels of vapours or ground gas. This will be assessed by ground investigation to allow characterisation of the gas regime and the requirement for gas protection measures to be adopted in new buildings if required.

Potential Pollutant Linkage				Classification/ Risk Estimation			Assessment of potentially unacceptable risk
Ref	**Source**	**Pathway**	**Receptor**	**Probability**	**Consequence**	**Risk**	
		P3 consumption of home grown produce		Low likelihood	Mild	Low	There are no proposed private gardens onsite. The communal gardens may be used to grow produce. If growing beds are proposed or likely to be installed potential mitigation may include measures such as the additional clean cover layers.
PPL4	S1- Made Ground	P1 Ingestion of soil or dust, inhalation of dust or fibres and/or dermal contact.	R4 Maintenance workers during operation.	Likely	Medium	Moderate	Asbestos was recorded during the 2018 investigation at low levels in 25% of the samples. Additional ground investigation is required to assess the risk to maintenance workers. Any works are likely to be infrequent and for short duration and should be controlled through appropriate good practices and PPE.
Risk of pollution to controlled waters							
PPL5	S1 Made Ground S2 Fuel tanks S3 Generators S4 Chemical store	P4 Migration of free phase product	R5 RTD (secondary A aquifer)	High likelihood	Medium	High	Limited investigation has been undertaken across the site. Hydrocarbon contamination has been previously identified in the aquifer in the RTD and Lambeth Group. The existing data suggests the hydrocarbon contamination is localised, however, further investigation is required. These PPLs could present an unacceptable risk without mitigation, which should be further assessed as part of the proposed ground investigation.
		P5 Leaching of contaminants		Low likelihood	Mild	Low	
		P6 Vertical and lateral migration of dissolved phase contamination		Likely	Medium	Moderate	
PPL6		P4 Migration of free phase product	R6 Lambeth Group (secondary A aquifer)	Likely	Medium	Moderate	
		P5 Leaching of contaminants		Low likelihood	Mild	Low	

Potential Pollutant Linkage				Classification/ Risk Estimation			Assessment of potentially unacceptable risk
Ref	**Source**	**Pathway**	**Receptor**	**Probability**	**Consequence**	**Risk**	
		P6 Vertical and lateral migration of dissolved phase contamination		Likely	Medium	Moderate	
PPL7		P6 Vertical and lateral migration of dissolved phase contamination	R7 Chalk (principal aquifer)	Low likelihood	Medium	Low to moderate	Based on Section 6.3 of the EnviroInsight report in Appendix D and based on National House Building Council (NHBC) guidance although the principal aquifer is sensitive there are no abstractions on or near the site, hence the consequence is considered medium rather than severe. The principal aquifer in the Chalk is at a significant depth. The Chalk is beneath a thickness of London Clay across parts of the site which is regarded as an aquiclude. The remainder of the site has a thickness of Lambeth Group which provides protection to the Chalk. However, hydrocarbon contamination has been identified in the lower layers of the Lambeth Group. The development is likely to include piled foundations in the London Clay/Lambeth Group.
		P4 Migration of free phase product		Low likelihood	Medium	Low to moderate	
PPL7		P4 Migration of free phase product	R8 Surface waters (pond to the south of the site)	Low likelihood	Minor	Very low	The closest surface water feature to the site is a small drainage pond located 10m south of the site. The PPL will be assessed further as part of the ground investigation through characterisation of groundwater quality in the RTD.
		P6 Vertical and lateral migration of dissolved phase contamination		Low likelihood	Minor	Very low	

Potential Pollutant Linkage				Classification/ Risk Estimation			Assessment of potentially unacceptable risk
Ref	**Source**	**Pathway**	**Receptor**	**Probability**	**Consequence**	**Risk**	
Risk to building materials and services							
PPL8	Residual potentially contaminated soils	P8 Direct contact with construction materials and services	R9 Onsite buildings, materials and services	Likely	Mild	Low to moderate	PPL may present an unacceptable risk without mitigation. This will be further assessed as part of the proposed ground investigation and is normally mitigated by appropriate design, including selection of construction material.
Risk to ecological receptors							
PPL9	Residual potentially contaminated soils after development	P9 plant uptake	R10 soft landscaping	Low likelihood	Mild	Low	PPL may present a risk without mitigation. This can be managed through specification of an appropriate thickness of clean soils or barriers for landscaped areas.

6 Conclusions and recommendations

6.1 Conclusions

The site was originally open fields and subsequently gardens with small residential properties in the south of the site. Hospital buildings were constructed in the 1950s (including Rowan House) with some soft landscaping. The site was further developed in around 2003 with additional small buildings including generators and staff accommodation. Most of the site has remained unchanged until the present day with some buildings demolished and replaced with car parking.

The site is underlain by RTD (absent in the northwest of the site), London Clay (in the north and northwest only), Lambeth Group, Thanet Sands and Chalk. The aquifers in the RTD and Lambeth Group are both classified by the Environment Agency as secondary A aquifers. The principal Chalk aquifer lies at depth beneath the site. The site is not located within an SPZ and there are no groundwater, surface water or potable water abstractions within 1km of the site. A small pond is located 10m south of the site. The environmental sensitivity of the site is assessed to be low.

A ground investigation undertaken by Arcadis in 2018 identified hydrocarbon contamination in both secondary A aquifers (Lambeth Group and RTD) in one borehole (BH102) near the fuel tanks. A second borehole located down gradient of the fuel tanks did not identify any contamination (BH103). The results of testing elsewhere indicated no significant contamination.

Based on the site history and limited existing investigation, the site is considered to have a generally low potential for site wide significant ground contamination. This increases to locally moderate around the tanks. However, further investigation is required to adequately characterise the site.

The preliminary risk assessment and initial conceptual site model have identified several potential pollutant linkages (PPLs) associated with the site and the Proposed Development. A summary of the PPLs is presented in Table 8.

Table 8 Summary of potential pollutant linkages

Item	Risk characterisation (without mitigation)
Site sensitivity	Low to moderate
Potential for significant contamination to be present	Generally low, locally moderate around the tanks
Risk of harm to human health during construction	Low to moderate
Risk of harm to human health during operation	Low to moderate
Risk of pollution to groundwater in the RTD secondary A aquifer	Moderate to high
Risk of pollution to groundwater in the Lambeth Group secondary A aquifer	Moderate to high
Risk of pollution to groundwater in the Chalk principal aquifer	Moderate

Item	Risk characterisation (without mitigation)
Risk of pollution to surface water courses	Very low
Risk of harm to building materials and services	Moderate to low
Risk of harm to ecological receptors (planting in landscaped areas)	Low

6.2 Recommendations

6.2.1 Proposed ground investigation

The risk assessment has identified potential pollutant linkages which have been assessed to pose a low to moderate risk to receptors associated with the site and the Proposed Development. A ground investigation is required to characterise the contamination condition of the site and form the basis of a contaminated land risk assessment.

Table 9 Summary of recommended ground investigation

Type of investigation	Rationale
Exploratory holes	
A total of 44 exploratory locations consisting of 13 boreholes, 10 window samples and, 21 trial pits. Selected locations will have ground gas and/or groundwater monitoring. The placement is based on the current layout, information from the previous phase of investigation, the Proposed Development and historical features. Four boreholes have been positioned around tanks and BH102 where contamination was previously identified. Groundwater monitoring should be undertaken in the RTD, Lambeth Group across the site and one borehole should have an installation in the Chalk aquifer. The investigation may be spilt over two phases. One prior to building demolition and one post-demolition.	To investigate the nature and occurrence of any contamination within soils beneath the site and obtain representative samples for chemical testing.
Soil sampling and testing	
Chemical analysis of the soils recovered from the investigation locations. Analysis to include metals, hydrocarbons, PAH, BTEX, phenols, PCBs, asbestos, VOC (including chlorinated solvents) and various other inorganic compounds.	To allow risk assessment of soil contamination existing on site.
Groundwater monitoring and sampling	
Shallow aquifer monitoring to include metals and non-aqueous phase liquids (NAPL). Two rounds of monitoring from all locations. Analysis of groundwater samples from boreholes for metals, hydrocarbons, VOC (including chlorinated solvents), phenols and various other inorganic compounds.	To establish presence, nature and concentrations of potential contaminants within groundwater and enable risk assessment.
Ground gas monitoring and sampling	
Shallow ground gas monitoring. Analysis to include six rounds of in situ monitoring over six weeks. Measured parameters to	To identify the presence, nature and concentrations of any ground gases, and

Type of investigation	Rationale
include methane, carbon dioxide, hydrogen sulphide, oxygen, and VOCs.	enable assessment of the potential influence they may have on any future development.

6.2.2 Further assessment

A ground investigation and risk assessment will be required. The objectives of the ground investigation will be to characterise the ground conditions and to enable quantitative risk assessment (QRA) of the potential pollutant linkages identified in the conceptual model and preliminary risk assessment taking into consideration the future use of the site. Depending on the outcome of the QRA, a remediation strategy and verification plan may be required. If remediation is undertaken, it should be verified in accordance with the verification plan and a verification report agreed with the regulators. If significant groundwater contamination is encountered, then the Environment Agency should be consulted.

6.3 Assessment and remediation

6.3.1 Approach to development

The risk assessment and conceptual model will be updated based on the findings of the ground investigations. The QRA will be carried out in accordance with Environment Agency Land Contamination: Risk Management guidance [2]. Based on the findings of the QRA, if required, mitigation measures will be recommended with respect to contamination which will be presented in a remediation strategy and a remediation method statement (RMS) where necessary.

A remediation strategy will be developed based on the findings of the ground investigation. Some outline recommendations for the development phase are provided below with more detailed descriptions in subsequent sections:

- Where contaminants are identified, an appropriate remediation strategy will be developed. If contamination of groundwater is identified, then specific clean up may be required depending on the quantitative risk assessment.
- Where asbestos in soils is identified on the site, the requirements described in the Control of Asbestos Regulations (CAR) 2012 [9], CIRIA C733 [10] and CAR-SOIL [11] should be adhered to where they apply.
- The UK Sustainable Remediation Forum (SuRF-UK) has published a framework [12] (via CL:AIRE) for assessing sustainable remediation; describing how it links with the relevant regulatory guidance; the factors to be considered and describing sustainability appraisal tools to evaluate the wider benefits and impacts of remediation. There is benefit in early consideration of developing sustainable solutions in remediation options during the project. Remediation in its widest definition includes actions to assess potentially contaminated sites or break a source-pathway-receptor linkage and as such includes a wide range of risk management techniques. This approach complements the use of risk assessment and risk management in decision making for contaminated land management.

- Surplus soils arising from the excavations requiring disposal should be disposed of in accordance with the current waste management regulations and guidance or sent to off-site treatment/recycling centres. It is necessary to carry out waste classification and compliance testing in line with current regulations prior to export from site. It is a legal requirement to treat wastes before disposal. Treatment may occur on site or alternatively off-site treatment facilities may be utilised. This may also minimise the amount of hazardous waste and maximise the quality of inert waste for disposal or re-use.
- Topsoil, subsoil and engineered fill imported for use at the site (or generated from site-won soils) would be certified as chemically suitable for purpose. Samples of imported topsoil and secondary aggregates would be taken in-situ and scheduled for laboratory testing to verify certification. All supplier and verification chemical results would be collated by the contractor for inclusion in the remediation verification report.
- A watching brief should be maintained with regard to the ground conditions during the development works. The watching brief should be recorded and reported in the verification report. More details are provided below.
- A verification report will be required on completion.
- The relevant water supply company should be consulted regarding the pipe material specification of potable water supply pipes. Further details are provided in Section 6.3.5.
- A foundation works risk assessment should be completed if foundations will fully penetrate the London Clay. Mitigation arising out of this assessment should be followed to minimise risks of pollution of controlled waters from piling activities and should be recorded and reported in the verification report.
- Monitoring wells installed on the site during the ground investigation should be decommissioned prior to development. Where required these boreholes would be decommissioned in line with the Environment Agency guidance [13] to ensure that no preferential flow pathways, from the surface and Made Ground to the underlying aquifers, are created during the development works. This should be undertaken before any significant ground works take place.

6.3.2 Tank decommissioning

Above ground tanks and associated pipework should be decommissioned and removed appropriately, and relevant records maintained for the verification report. This will include:

- photographs of what is found;
- a detailed description of the tank including the location and depth indicated on a plan;
- details of the tank decommissioning and removal, with supporting documentation, of works undertaken during construction;
- relevant duty of care information for the tanks (and its contents), pipework, base, and any contaminated soils demonstrating appropriate removal and disposal; and

- Testing and assessment of the base and sides of any excavation to demonstrate that any residual contamination has been adequately removed if necessary. The assessment should be risk based taking account of the formation level assessment criteria and methodology.

6.3.3 Regulator liaison

The contaminated land officer (CLO) at Epsom and Ewell Borough Council will be consulted on the outcome of the findings of the investigation and risk assessment. The remediation strategy will be agreed with the CLO.

6.3.4 Dust control

Given the proximity of residential receptors, control of fugitive dust will be a priority. As a minimum, it is anticipated the works will be undertaken in accordance with BRE The Control of Dust and Emissions from Construction and Demolition, Best Practice Guidance [14] and the following mitigation measures will be introduced to assist with control of dust generation:

- access roads and stockpiles will be regularly damped down with water;
- all vehicles entering and leaving the site during the construction period will pass through a wheel washing facility;
- vehicles used to transport materials and aggregates will be enclosed or tarpaulined;
- local roads will be regularly cleaned;
- vehicle movements will be kept to a minimum and vehicle speeds within the site will be limited;
- dust generating equipment e.g. mobile crushing and screening equipment will be located to minimise potential nuisance impacts to receptors, as far as practicable;
- handling areas will be kept as clean as practicable to avoid nuisance from dust;
- dusty materials will be dampened down using water sprays in dry weather and liquids will be bunded and stored away from controlled waters to avoid surface water pollution;
- dust complaints will be investigated at the earliest opportunity and appropriate action taken to control the source or remedy the effect as appropriate; and
- additional measures may be specified dependant on the results of the ground investigation, especially if asbestos is identified in soils.

6.3.5 Soil materials for service trenches

The UK Water Industry Research Ltd (UKWIR) has published a series of booklets regarding pipe selection on brownfield sites [15]. In addition, to the guidance written in the published booklets, a computer database has been developed that details the identity, likely combinations, effects and trigger levels for pipeline protection from contaminants found on brownfield development sites.

The relevant water supply company should be consulted regarding the pipe material specification of potable water supply pipes. It is possible that they will require precautions associated with the contaminants identified on site.

6.3.6 Waste management

Prior to works commencing on site, the Contractor should develop a Site Waste Management Plan (SWMP) for the removal, transportation and disposal of all waste materials resulting from excavations. The Contractor should investigate opportunities to maximise the recycling potential of demolition and construction materials. Recyclable materials such as metals, timber and cardboard should be segregated and stored separately.

All residual waste shall be removed from site by permitted carriers to suitable permitted disposal sites. Further waste classification testing and waste acceptance criteria testing may be required by the Contractor to allow materials to be suitably classified and disposed.

References

[1] British Standards Institution (2017) BS10175:2011+A2:2017, Investigation of Potentially Contaminated Sites - Code of Practice.

[2] Environment Agency (2019), Land contamination: risk management [Online] https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks [Accessed 14th October 2019).

[3] Groundsure Ltd (2019), Groundsure Insight Report (Ref. GS-6266218).

[4] Arcadis (2018) Epsom Hospital – Plot 2A, Phase 1 Geo-Environmental Desk Study 10020221-ARC-01-XX-RP-ZZ-0001-01.

[5] Arcadis (2018) Epsom Hospital – Plot 2A, Phase 2 Geo-Environmental and Geotechnical Assessment Report 10020221-ARC-XX-XX-RP-ZZ-0008-01, October 2018.

[6] British Geological Society (BGS) Geology of Britain Viewer [http://mapapps.bgs.ac.uk/geologyofbritain/home.html?] (Accessed October 2019).

[7] Natural England MAGIC website [https://magic.defra.gov.uk/] Accessed October 2019.

[8] Google Inc, Google Earth (Accessed October 2019)

[9] The Control of Asbestos Regulations (CAR), 2012.

[10] CIRIA C733 (2014), Asbestos in Soil and Made Ground: A guide to understanding and managing risks.

[11] CL:AIRE (2016), Control of Asbestos Regulations 2012, Interpretation for managing and working with asbestos in soil and construction and demolition materials, Industry guidance.

[12] CL:AIRE (2010) A Framework for Assessing the Sustainability of Soil and Groundwater Remediation.

[13] Environment Agency (March 2012), Good practice for decommissioning redundant boreholes and wells.

[14] BRE (2006), The control of dust and emissions from construction and demolition, best practice guidance.

[15] UK Water Industry Research Ltd (2010) Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites.

[16] CIRIA DETR (2001), CIRIA C552: Contaminated land risk assessment, a guide to good practice

[17] EA, NHBC & CIEH (2008), Guidance for the Safe Development of Housing on Land Affected by Contamination, R&D66

Appendix A

Groundsure EnviroInsight and MapInsight reports

Ove Arup & Partners International Ltd

OVE ARUP & PARTNERS,13, FITZROY STREET, LONDON, W1T 4BQ

Groundsure Reference:	GS-6266218
Your Reference:	Epsom_Hospital_
Report Date	23 Aug 2019
Report Delivery Method:	Email - pdf

Enviro Insight

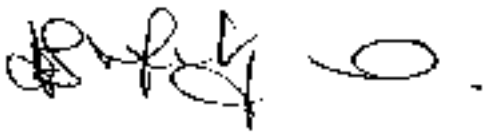
Address: ROWAN HOUSE, EPSOM GENERAL HOSPITAL, DORKING ROAD, EPSOM, KT18 7EG

Dear Sir/ Madam,

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

If you need any further assistance, please do not hesitate to contact our helpline on 08444 159000 quoting the above Groundsure reference number.

Yours faithfully,



Managing Director
Groundsure Limited

Enc.
Groundsure Enviroinsight

Enviro Insight

Address:	**ROWAN HOUSE, EPSOM GENERAL HOSPITAL, DORKING ROAD, EPSOM, KT18 7EG**
Date:	**23 Aug 2019**
Reference:	**GS-6266218**
Client:	**Ove Arup & Partners International Ltd**

NW N NE

W E

SW S SE

Aerial Photograph Capture date:	20-Apr-2018
Grid Reference:	520414,159757
Site Size:	1.4682ha

Report Reference: GS-6266218
Client Reference: Epsom_Hospital_

Contents Page

Overview of Findings

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

Section 1: Historical Industrial Sites	On-site	0-50	51-250	251-500
1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping	10	1	2	21
1.2 Additional Information – Historical Tank Database	0	0	11	14
1.3 Additional Information – Historical Energy Features Database	0	0	17	21
1.4 Additional Information – Historical Petrol and Fuel Site Database	0	0	0	0
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	0	0	0	6
1.6 Historical military sites	0	0	0	0
1.7 Potentially Infilled Land	0	7	6	35

Section 2: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	0
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	0
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	0	0	0
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	0	0	0	1
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
2.1.8 Records of Licensed Discharge Consents	0	0	0	0
2.1.9 Records of Water Industry Referrals	0	0	0	0
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	0	0	0	0
2.2 Records of COMAH and NIHHS sites	0	0	0	0
2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents				
2.3.1 National Incidents Recording System, List 2	0	0	0	1
2.3.2 National Incidents Recording System, List 1	0	0	0	0
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0

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

Section 4: Current Land Use	On-site	0-50m	51-250	251-500
4.1 Current Industrial Sites Data	1	1	8	Not searched
4.2 Records of Petrol and Fuel Sites	0	0	0	1
4.3 National Grid Underground Electricity Cables	0	0	0	0
4.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 5: Geology	
5.1 Records of Artificial Ground and Made Ground present beneath the study site	None identified
5.2 Records of Superficial Ground and Drift Geology present beneath the study site	Identified
5.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.	

Section 6: Hydrogeology and Hydrology	0-500m
6.1 Records of Strata Classification in the Superficial Geology within 500m of the study site	Identified
6.2 Records of Strata Classification in the Bedrock Geology within 500m of the study site	Identified

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
6.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	7
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	5
6.6 Source Protection Zones (within 500m of the study site)	0	0	1	3	Not searched	Not searched
6.7 Source Protection Zones within Confined Aquifer	0	0	0	0	Not searched	Not searched
6.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	1	0	1	5	Not searched	Not searched

Section 6: Hydrogeology and Hydrology

	0-500m					
	On-site	0-50m	51-250	251-500	501-1000	1000-1500
6.9 Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site	No	No	No	No	No	No
6.10 Ordnance Survey MasterMap Water Network entries within 500m of the site	0	14	4	60	Not searched	Not searched
6.11 Surface water features within 250m of the study site	No	Yes	Yes	Not searched	Not searched	Not searched

Section 7: Flooding

7.1 Enviroment Agency Zone 2 floodplains within 250m of the study site	None identified
7.2 Environment Agency/Natural Resources Wales Zone 3 floodplains within 250m of the study site	None identified
7.3 Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site	Very Low
7.4 Flood Defences within 250m of the study site	None identified
7.5 Areas benefiting from Flood Defences within 250m of the study site	None identified
7.6 Areas used for Flood Storage within 250m of the study site	None identified
7.7 Maximum BGS Groundwater Flooding susceptibility within 50m of the study site	Potential at Surface
7.8 BGS confidence rating for the Groundwater Flooding susceptibility areas	Moderate

Section 8: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	1	1
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	2
8.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
8.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
8.5 Records of Ramsar sites	0	0	0	0	0	0
8.6 Records of Ancient Woodlands	0	0	0	1	0	5
8.7 Records of Local Nature Reserves (LNR)	0	0	0	1	0	1
8.8 Records of World Heritage Sites	0	0	0	0	0	0
8.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0

Section 8: Designated Environmentally Sensitive Sites	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0
8.11 Records of National Parks	0	0	0	0	0	0
8.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
8.13 Records of Nitrate Vulnerable Zones	1	0	1	2	0	0
8.14 Records of Green Belt land	0	0	0	3	3	5

Section 9: Natural Hazards

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

Section 10: Mining

10.1 Coal mining areas within 75m of the study site	None identified
10.2 Non-Coal Mining areas within 50m of the study site boundary	Identified
10.3 Brine affected areas within 75m of the study site	None identified

Using this report

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

1. Historical Industrial Sites

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

2. Environmental Permits, Incidents and Registers

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

3. Landfills and Other Waste Sites

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

4. Current Land Uses

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

5. Geology

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

6. Hydrogeology and Hydrology

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

7. Flooding

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

8. Designated Environmentally Sensitive Sites

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

9. Natural Hazards

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

10. Mining

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

11. Contacts

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

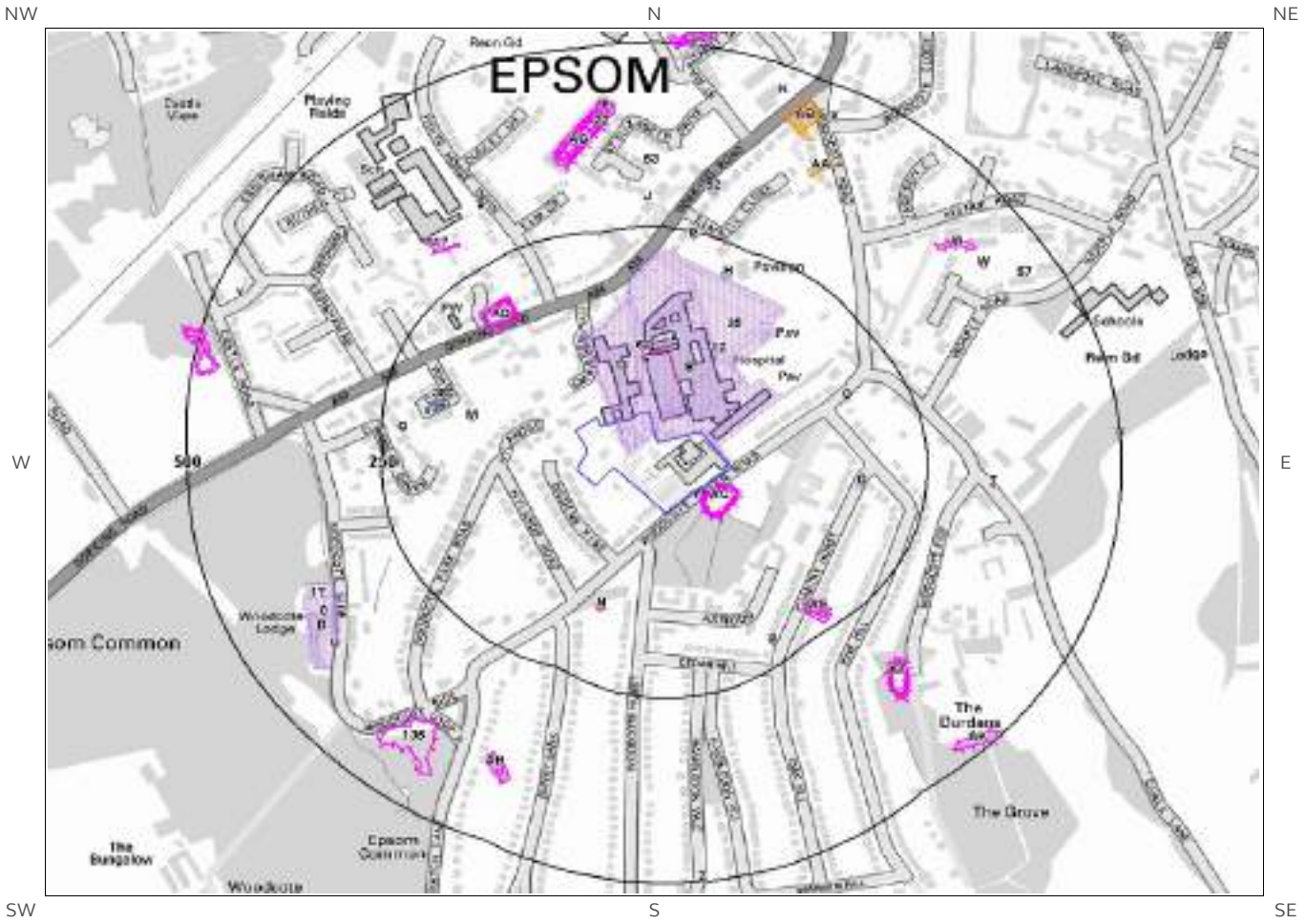
Note: Maps

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

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

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

1. Historical Land Use



Site Outline

250
500
Search Buffers (m)

Historical 1:10,000 and 1:10,560 scale mapping

Industrial Land Use

Potentially Infilled Land

Historical 1:2,500, 1:1,250 and 1:500 scale mapping

Energy Features

Petrol Stations

Historical military sites

Tanks

Garages

1. Historical Industrial Sites

1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping

The systematic analysis of data extracted from standard 1:10,560 and 1:10,000 scale historical maps provides the following information:

Records of sites with a potentially contaminative past land use within 500m of the search boundary: 34

ID	Distance [m]	Direction	Use	Date
1B	0	On Site	Hospital	1974
2A	0	On Site	Hospital	1938
3A	0	On Site	Unspecified Workhouse	1895
4A	0	On Site	Union Workhouse	1912
5B	0	On Site	Hospital	1990
6B	0	On Site	Hospital	1961
7	0	On Site	Unspecified Workhouse	1912
8A	0	On Site	Hospital	1938
9A	0	On Site	Union Workhouse	1897
10A	0	On Site	Hospital	1932
11	14	NW	Unspecified Workhouse	1866
12	105	N	Mortuary	1938
13H	206	NE	Unspecified Tank	1938
14C	347	SW	Laundry	1912
15C	347	SW	Laundry	1932
16C	348	SW	Laundry	1938
17	349	SW	Laundry	1959
18D	353	SW	Unspecified Works	1974
19D	353	SW	Unspecified Works	1987
20C	358	SW	Laundry	1938
21C	373	SW	Laundry	1912
22	383	N	Unspecified Heap	1897
23AI	391	NE	Unspecified Pit	1866
24E	402	N	Unspecified Heap	1895
25E	406	N	Unspecified Heap	1992
26E	406	N	Unspecified Heap	1973
27AK	472	SE	Unspecified Heap	1866
28F	474	N	Unspecified Ground Workings	1897
29F	492	N	Unspecified Ground Workings	1973
30F	492	N	Unspecified Ground Workings	1965
31F	492	N	Unspecified Ground Workings	1992
32F	492	N	Unspecified Ground	1962

			Workings	
33F	495	N	Unspecified Pit	1895
34AL	498	N	Unspecified Ground Workings	1866

1.2 Additional Information – Historical Tank Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical tanks within 500m of the search boundary: 25

ID	Distance (m)	Direction	Use	Date
35	144	N	Unspecified Tank	1896
36G	160	E	Unspecified Tank	1896
37G	160	E	Unspecified Tank	1913
38	171	W	Unspecified Tank	1896
39H	202	NE	Unspecified Tank	1867
40H	202	NE	Unspecified Tank	1868
41H	202	NE	Unspecified Tank	1913
42H	202	NE	Unspecified Tank	1896
43H	202	NE	Unspecified Tank	1932
44I	244	NE	Tanks	1952
45I	245	NE	Tanks	1952
46J	285	N	Unspecified Tank	1868
47J	285	N	Unspecified Tank	1867
48J	286	N	Unspecified Tank	1952
49J	286	N	Unspecified Tank	1957
50J	287	N	Unspecified Tank	1961
51J	287	N	Unspecified Tank	1952
52	305	N	Unspecified Tank	1896
53	335	N	Unspecified Tank	1952
54D	389	SW	Unspecified Tank	1868
55D	389	SW	Unspecified Tank	1867
56C	390	SW	Unspecified Tank	1974
57	454	NE	Unspecified Tank	1952
58K	464	N	Tank or Trough	1867
59K	464	N	Tank or Trough	1868

1.3 Additional Information – Historical Energy Features Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical energy features within 500m of the search boundary: 38

ID	Distance (m)	Direction	Use	Date
60L	54	NE	Electricity Substation	1984
61L	54	NE	Electricity Substation	1979
62	83	N	Electricity Substation	1979
63M	130	W	Electricity Substation	1996
64M	131	W	Electricity Substation	1984
65M	131	W	Electricity Substation	1987
66M	131	W	Electricity Substation	1979
67N	144	SW	Electricity Substation	1952
68N	145	SW	Electricity Substation	1952
69O	172	NE	Electricity Substation	1970
70O	172	NE	Electricity Substation	1992
71P	219	SE	Electricity Substation	1970
72P	219	SE	Electricity Substation	1992
73Q	220	W	Electricity Substation	1996
74Q	220	W	Electricity Substation	1987
75R	240	N	Electricity Substation	1998
76R	248	N	Electricity Substation	1998
77S	318	NW	Electricity Substation	1992
78S	318	NW	Electricity Substation	1970
79T	331	E	Electricity Substation	1992
80T	331	E	Electricity Substation	1974
81U	388	SW	Electricity Substation	1952
82U	388	SW	Electricity Substation	1952
83V	392	NW	Electricity Substation	1986
84V	392	NW	Electricity Substation	1986
85V	392	NW	Electricity Substation	1999
86V	392	NW	Electricity Substation	1969
87V	392	NW	Electricity Substation	1969
88W	419	NE	Electricity Substation	1986
89W	420	NE	Electricity Substation	1999
90W	420	NE	Electricity Substation	1992
91X	452	N	Electricity Substation	1974
92X	456	N	Electricity Substation	1992
93X	458	N	Electricity Substation	1970
94Y	466	NW	Electricity Substation	
95Y	466	NW	Electricity Substation	
96Z	496	S	Electricity Substation	
97Z	496	S	Electricity Substation	

1.4 Additional Information – Historical Petrol and Fuel Site Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical petrol stations and fuel sites within 500m of the search boundary: 0

Database searched and no data found.

1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical garage and motor vehicle repair sites within 500m of the search boundary: 6

ID	Distance (m)	Direction	Use	Date
98AA	372	N	Garage	1952
99AA	373	N	Garage	1952
100AB	415	N	Garage	1969
101AB	415	N	Garage	1961
102AB	422	N	Garage	1986
103AB	430	N	Garage	1961

1.6 Historical military sites

Certain military installations were not noted on historic mapping for security reasons. Whilst not all military land is necessarily of concern, Groundsure has researched and digitised a number of Ordnance Factories and other military industrial features (e.g. Ordnance Depots, Munitions Testing Grounds) which may be of contaminative concern. This research was drawn from a number of different sources, and should not be regarded as a definitive or exhaustive database of potentially contaminative military installations. The boundaries of sites within this database have been estimated from the best evidence available to Groundsure at the time of compilation.

Records of historical military sites within 500m of the search boundary: 0

Database searched and no data found.

1.7 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 48

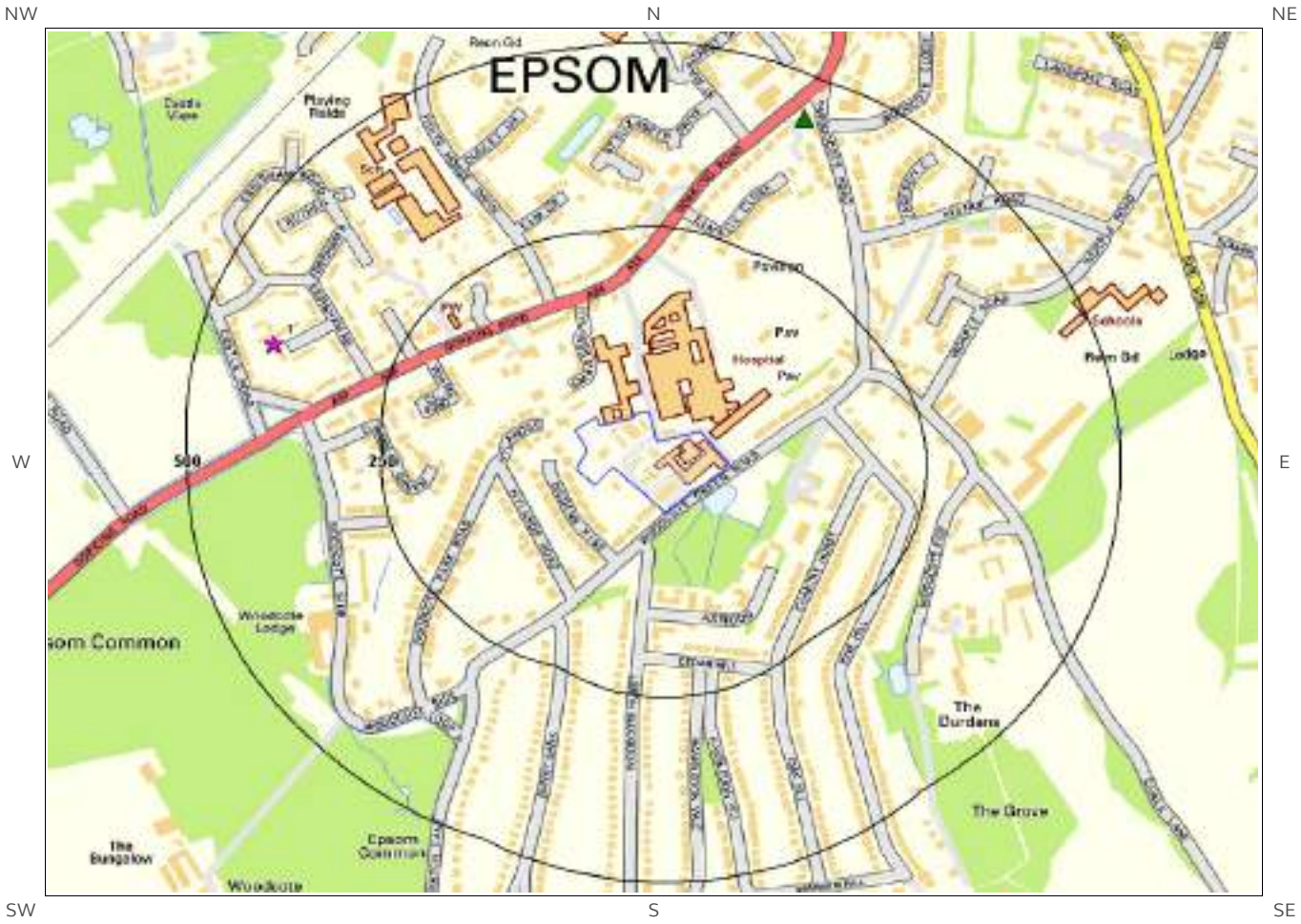
The following Historical Potentially Infilled Features derived from the Historical Mapping information is provided by Groundsure:

ID	Distance(m)	Direction	Use	Date
104AC	10	SE	Pond	1912
105AC	10	SE	Pond	1938
106AC	12	SE	Pond	1866

107AC	12	SE	Pond	1961
108AC	12	SE	Pond	1974
109AC	12	SE	Pond	1990
110AC	14	SE	Pond	1895
111AD	166	NW	Pond	1895
112AD	170	NW	Pond	1866
113AD	171	NW	Pond	1912
114AE	204	SE	Pond	1912
115AE	204	SE	Pond	1938
116AE	212	SE	Pond	1895
117	292	NW	Pond	1866
118AF	332	SE	Pond	1938
119AF	336	SE	Pond	1912
120AF	336	SE	Pond	1938
121AF	336	SE	Pond	1961
122AF	336	SE	Pond	1974
123AF	336	SE	Pond	1990
124AF	338	SE	Pond	1866
125AG	340	N	Pond	1895
126AF	342	SE	Pond	1895
127AG	345	N	Fish Pond	1866
128AG	347	N	Fish Pond	1912
129AG	347	N	Fish Pond	1938
130AG	351	N	Fish Pond	1938
131AG	353	N	Fish Pond	1973
132AG	353	N	Fish Pond	1992
133AG	353	N	Fish Pond	1965
134AG	353	N	Fish Pond	1962
135	380	SW	Ponds	1866
136AH	382	S	Pond	1912
137AH	382	S	Pond	1895
138AH	385	S	Pond	1866
139AI	391	NE	Unspecified Pit	1866
140E	402	N	Unspecified Heap	1895
141E	406	N	Unspecified Heap	1992
142E	406	N	Unspecified Heap	1973
143AJ	467	W	Ponds	1866
144AJ	471	W	Pond	1912
145AK	472	SE	Unspecified Heap	1866
146F	492	N	Unspecified Ground Workings	1992
147F	492	N	Unspecified Ground Workings	1973
148F	492	N	Unspecified Ground Workings	1965
149F	492	N	Unspecified Ground Workings	1962

150F	495	N	Unspecified Pit	1895
151AL	498	N	Unspecified Ground Workings	1866

2. Environmental Permits, Incidents and Registers Map



Site Outline

250
500
Search Buffers (m)

Recorded Pollution Incident

Dangerous Substances (List 1)

Dangerous Substances (List 2)

Water Industry Referrals

Licenced Discharge Consents

Red List Discharge Consents

RAS 3 & 4 Authorisations

Part A(1) Authorised Processes and Historic IPC Authorisations

Part A(2) and Part B Authorised Processes

COMAH / NIHHS Sites

Sites Determined as Contaminated Land

Hazardous Substance Consents and Enforcements

2. Environmental Permits, Incidents and Registers

2.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency/Natural Resources Wales and Local Authorities reveal the following information:

2.1.1 Records of historic IPC Authorisations within 500m of the study site:

0

Database searched and no data found.

2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site:

0

Database searched and no data found.

2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site:

0

Database searched and no data found.

2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

1

The following Part A(2) and Part B Activities are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
2	441	N	520578 160218	Address: BP Express, 1 - 3 Dorking Road, Epsom, Surrey, KT18 7JW Process: Unloading of Petrol into Storage at Service Stations Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified

2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:

0

Database searched and no data found.

2.1.8 Records of Licensed Discharge Consents within 500m of the study site:

0

Database searched and no data found.

2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site:

0

Database searched and no data found.

2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site:

0

Database searched and no data found.

2.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site: 0

Database searched and no data found.

2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents

2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site:

1

The following NIRS List 2 records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
1	405	W	519897.0 159915.0	Incident Date: 03-Sep-2003 Incident Identification: 187212.0 Pollutant: Sewage Materials Pollutant Description: Other Sewage Material	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)

2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site:

0

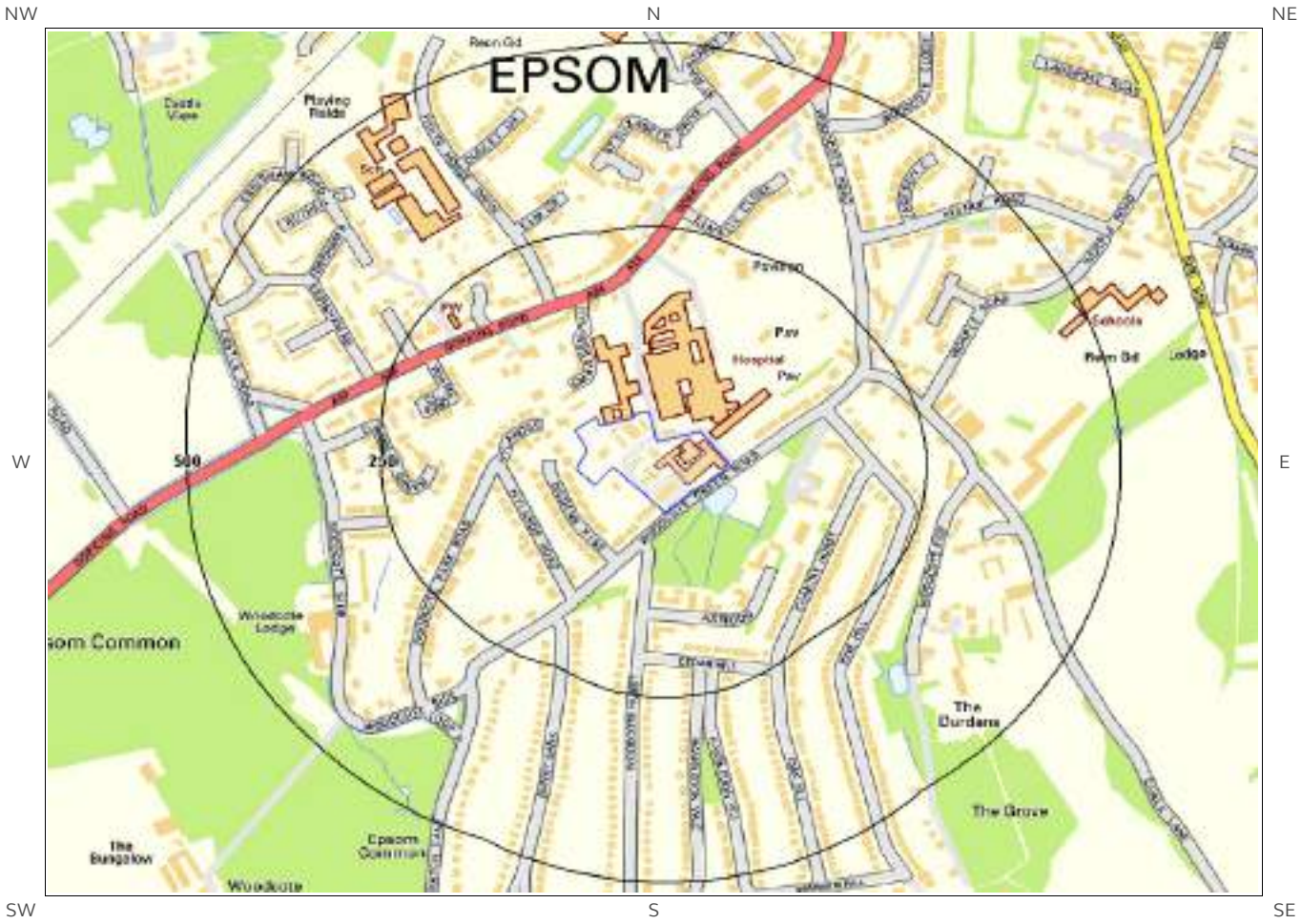
Database searched and no data found.

2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

Records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site 0

Database searched and no data found.

3. Landfill and Other Waste Sites Map



Site Outline

250
500
Search Buffers (m)

EA/NRW Active Landfill

EA/NRW Historic Landfill

BGS / DoE Survey Landfill

Historic and Planned Waste Sites

EA/NRW Licensed Waste Site

Local Authority/Historical Mapping Landfill Records

3. Landfill and Other Waste Sites

3.1 Landfill Sites

3.1.1 Records from Environment Agency/Natural Resources Wales landfill data within 1000m of the study site:

0

Database searched and no data found.

3.1.2 Records of Environment Agency/Natural Resources Wales historic landfill sites within 1500m of the study site:

2

The following landfill records are represented as either points or polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1443	S		Site Address: Headley Road Chalk Pit, Headley Road, Ashstead Waste Licence: - Site Reference: S/6, EE/3/W, S27 Waste Type: Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: - Licence Holder: Epsom and Ewell Borough Counnicl First Recorded: 31-Dec-1966 Last Recorded: 31-Dec-1975
Not shown	1477	S		Site Address: Land to East of Knowle House, Knowle House Waste Licence: - Site Reference: S/219 Waste Type: - Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: - Licence Holder: - First Recorded: - Last Recorded: -

3.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site:

0

Database searched and no data found.

3.1.4 Records of Landfills from Local Authority and Historical Mapping Records within 1500m of the study site:

2

The following landfill records are represented as points or polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Site Address	Source	Data Type
Not shown	1435	S	519961 158219	Headley Road Tip, Pleasure Pit Road, Ashtead	Mole Valley District Council	Polygon
Not shown	1467	S	519895 158257	Land to east of Knowle House	Mole Valley District Council	Polygon

3.2 Other Waste Sites

3.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site:

0

Database searched and no data found.

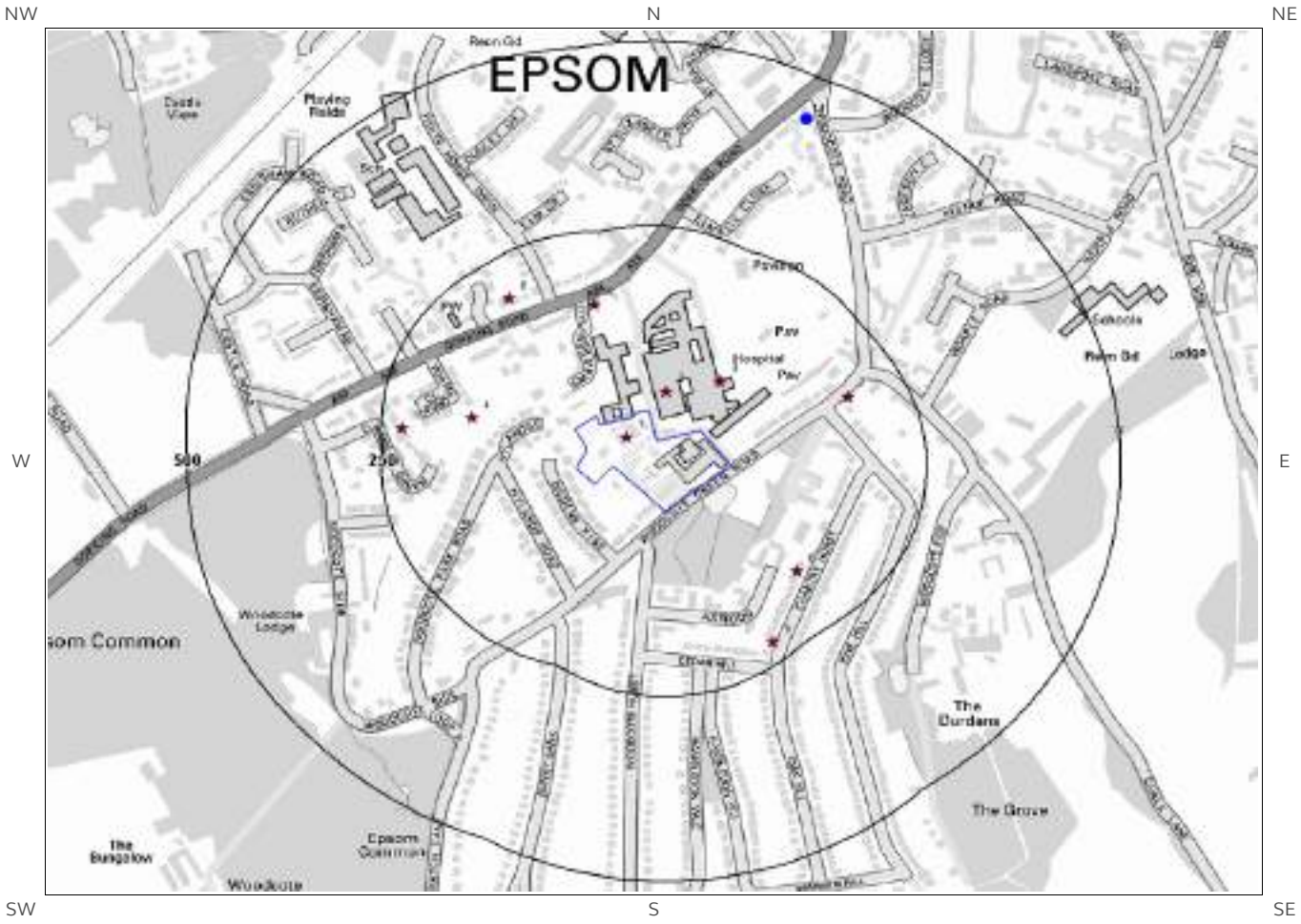
3.2.2 Records of Environment Agency/Natural Resources Wales licensed waste sites within 1500m of the study site:

1

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1458	NE	521100 161100	Site Address: British Gas Plc, 29, East Street, Epsom, Surrey, KT17 1BG Type: Transfer Station taking Non-Biodegradable Wastes Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: BRI003 EPR reference: EA/EPR/JP3893EB/S002 Operator: British Gas plc Waste Management licence No: 83176 Annual Tonnage: 30000.0	Issue Date: 29/07/1993 Effective Date: - Modified: - Surrendered Date: Feb 17 2000 12:00AM Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: British Gas Epsom, East St, Kt17 Correspondence Address: -

4. Current Land Use Map



Site Outline

Search Buffers (m)
250
500

Current Industrial Sites

Petrol & Fuel Sites

Electricity Transmission Cables

Gas Transmission Pipelines

4. Current Land Uses

4.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site: 10

The following records are represented as points on the Current Land Uses map.

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1	0	On Site	Chimney	520350 159788	Surrey, KT18	Chimneys	Industrial Features
2	34	NE	Epsom General Hospital	520401 159850	Epsom General Hospital, Dorking Road, Epsom, Surrey, KT18 7EG	Hospitals	Health Practitioners and Establishments
3	71	N	Epsom General Hospital	520470 159864	Epsom General Hospital, Dorking Road, Epsom, Surrey, KT18 7EG	Accident and Emergency Hospitals	Health Practitioners and Establishments
4	134	W	Electricity Sub Station	520152 159815	Surrey, KT18	Electrical Features	Infrastructure and Facilities
5	152	N	Aims Care Store Ltd	520309 159968	63, Dorking Road, Epsom, Surrey, KT18 7JU	Cleaning Equipment and Supplies	Industrial Products
6	164	SE	Heart of the Beat	520569 159606	12, Chantry Hurst, Epsom, Surrey, KT18 7BW	Electronic Equipment	Industrial Products
7	176	NE	Electricity Sub Station	520634 159843	Surrey, KT18	Electrical Features	Infrastructure and Facilities
8	196	NW	Marc L E D Ltd	520198 159976	30, Dorking Road, Epsom, Surrey, KT18 7NH	Distribution and Haulage	Transport, Storage and Delivery
9	222	SE	Electricity Sub Station	520538 159511	Surrey, KT18	Electrical Features	Infrastructure and Facilities
10	223	W	Electricity Sub Station	520062 159800	Surrey, KT18	Electrical Features	Infrastructure and Facilities

4.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: 1

The following petrol or fuel site records provided by Catalist are represented as points on the Current Land Use map:

ID	Distance (m)	Direction	NGR	Company	Address	LPG	Status
11	443	N	520581 160219	BP	1-3 Dorking Road, Woodcote Road, Woodcote, Epsom, Surrey, KT18 7JW	No	Open

4.3 National Grid High Voltage Underground Electricity Transmission Cables

This dataset identifies the high voltage electricity transmission lines running between generating power plants and electricity substations. The dataset does not include the electricity distribution network (smaller, lower voltage cables distributing power from substations to the local user network). This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high voltage underground electricity transmission cables within 500m of the study site: 0

Database searched and no data found.

4.4 National Grid High Pressure Gas Transmission Pipelines

This dataset identifies high-pressure, large diameter pipelines which carry gas between gas terminals, power stations, compressors and storage facilities. The dataset does not include the Local Transmission System (LTS) which supplies gas directly into homes and businesses. This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high pressure gas transmission pipelines within 500m of the study site: 0

Database searched and no data found.

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5. Geology

5.1 Artificial Ground and Made Ground

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

5.2 Superficial Ground and Drift Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
RTDU-XSV	RIVER TERRACE DEPOSITS (UNDIFFERENTIATED)	SAND AND GRAVEL

5.3 Bedrock and Solid Geology

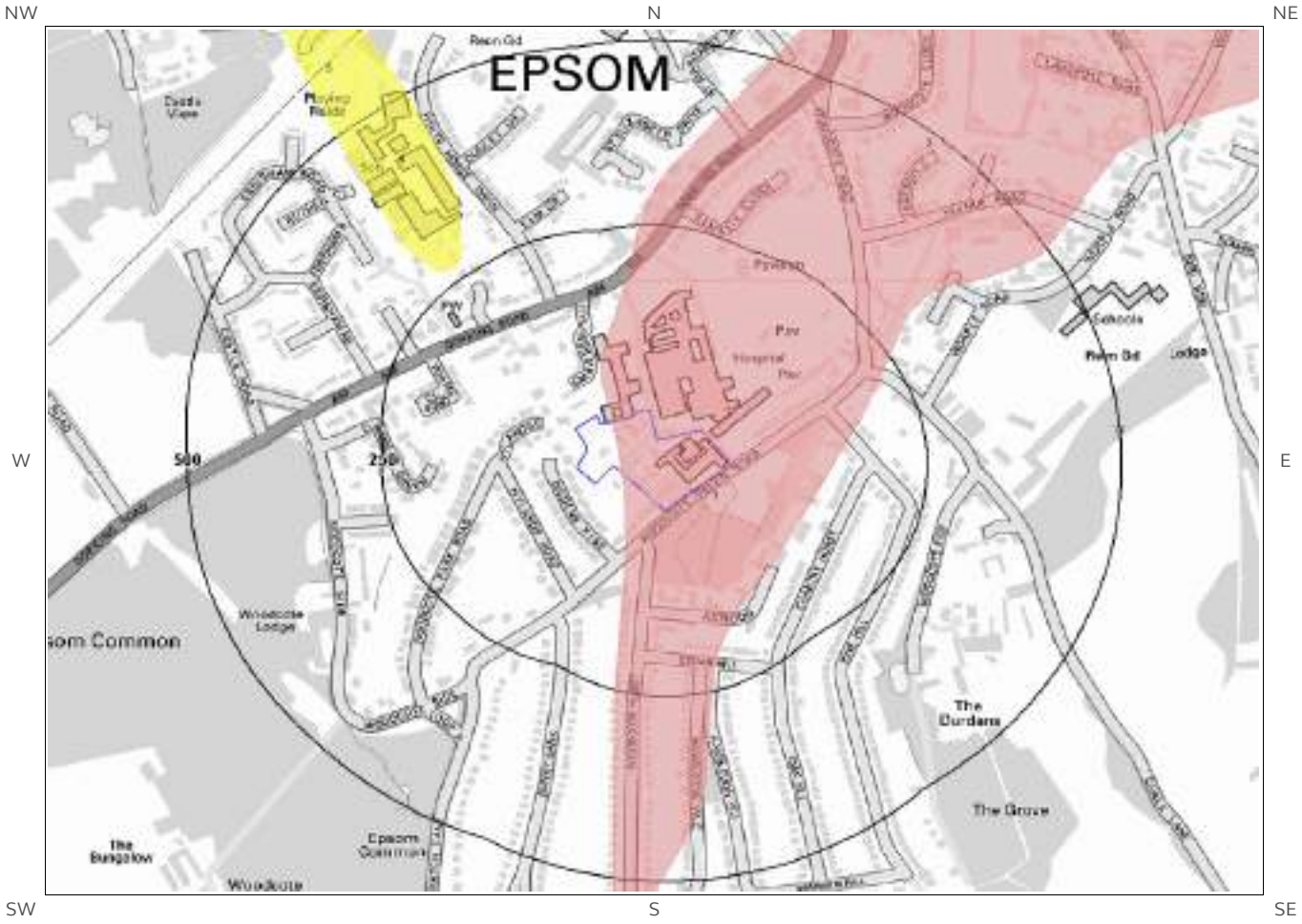
The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
LMBE-XCZS	LAMBETH GROUP	CLAY, SILT AND SAND
LC-XCZ	LONDON CLAY FORMATION	CLAY AND SILT

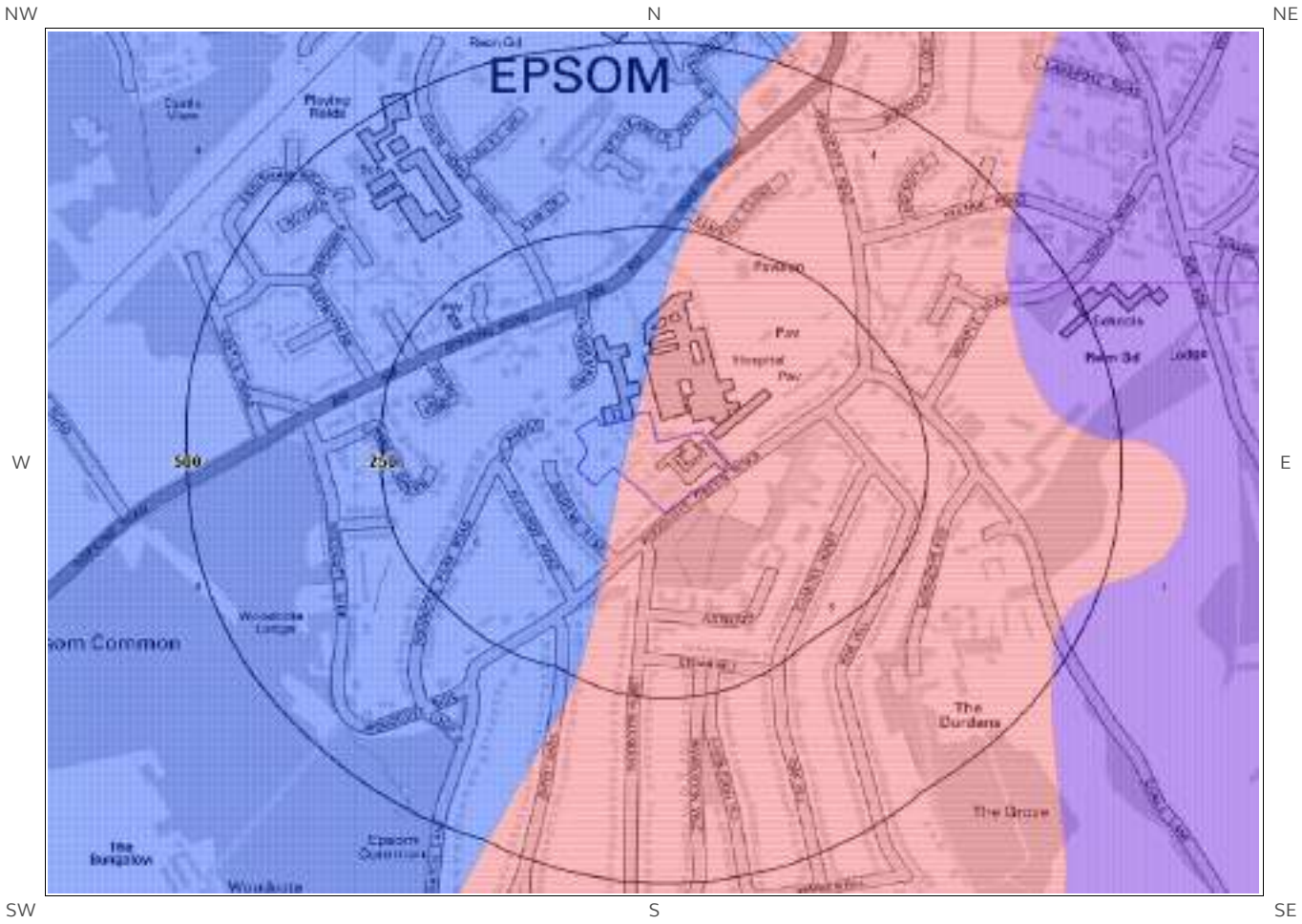
(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

6 Hydrogeology and Hydrology

6a. Aquifer Within Superficial Geology



6b. Aquifer Within Bedrock Geology and Abstraction Licences



Site Outline

250
500
Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

Secondary (B) Aquifer - Lower Permeability Layers

Groundwater Abstraction Licence

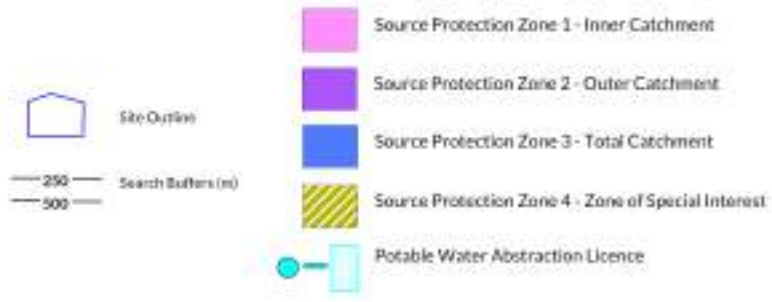
Secondary Aquifer - Undifferentiated Layers

Unproductive

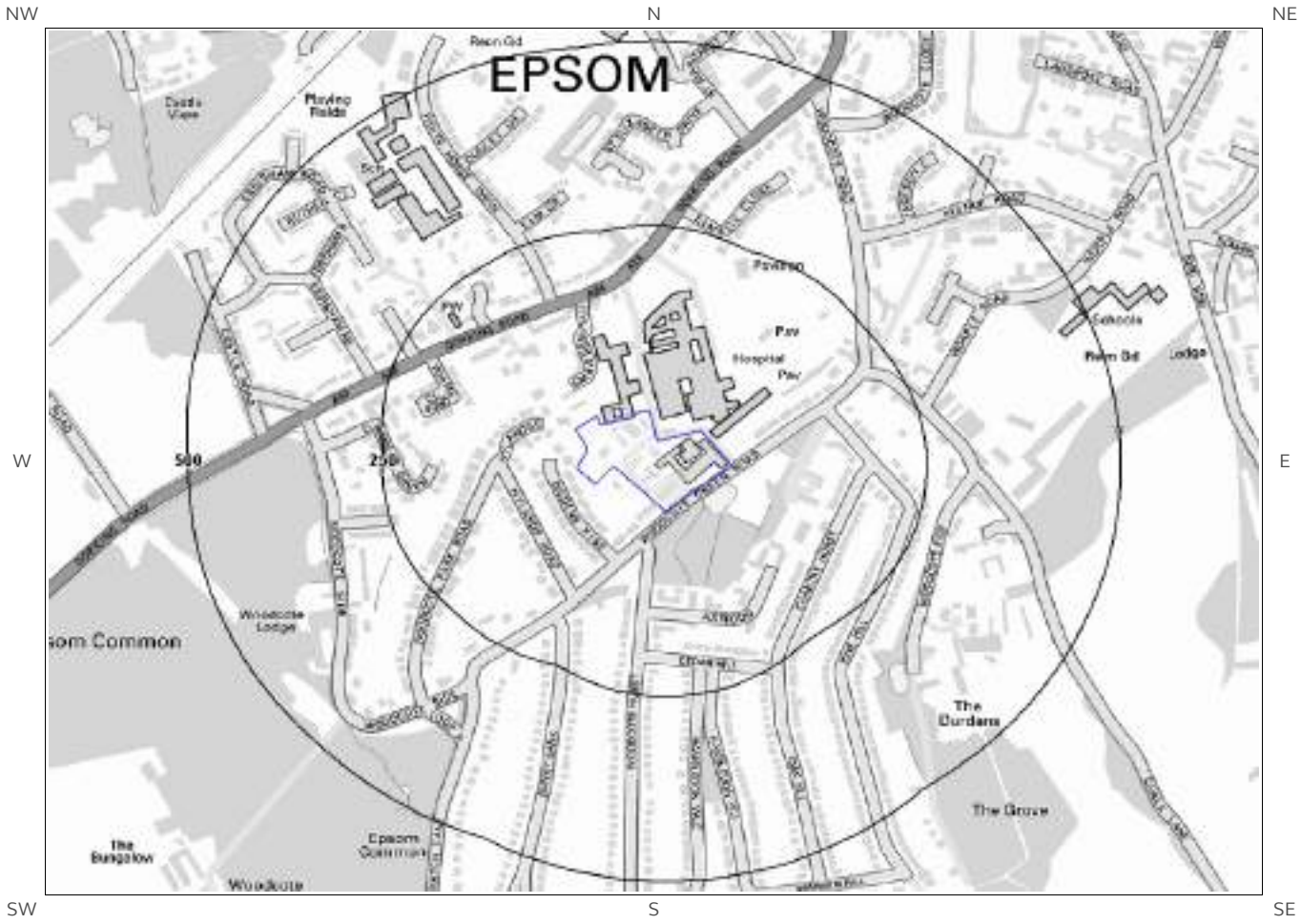
Unknown (lakes and landslip)

Surface Water Abstraction Licence

6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licences



6d. Hydrogeology – Source Protection Zones within confined aquifer



Site Outline

250
500
Search Buffers (m)

Source Protection Zone 1 - Inner Catchment

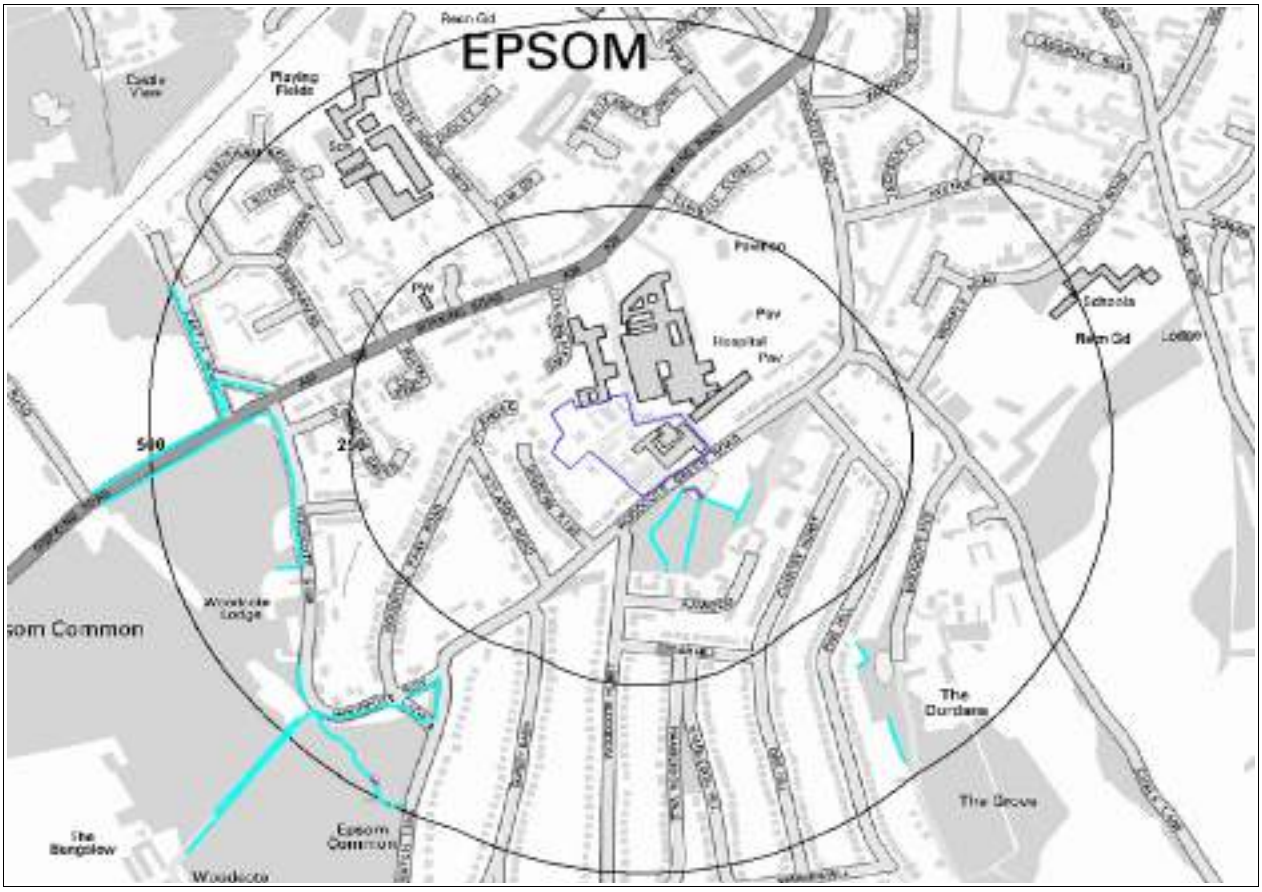
Source Protection Zone 2C - Outer Catchment within Confined Aquifer

Source Protection Zone 3C - Total Catchment within Confined Aquifer

Potable Water Abstraction Licence

6e. Hydrology – Watercourse Network and River Quality

NW N NE



Site Outline

250 Search Buffers (m)
500

Watercourse type

- Tidal River
- Inland River
- Canal
- Lock or Flight of Locks
- Lake, Reservoir, or Marsh
- Foreshore
- Drain or Transfer

Watercourse level

- On ground surface
- Underground or Elevated
- Level unknown

- General Quality Assessment: Biology
- General Quality Assessment: Chemistry

6.Hydrogeology and Hydrology

6.1 Aquifer within Superficial Deposits

Records of strata classification within the superficial geology at or in proximity to the property Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (6a):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	176	N	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
4	269	NW	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
5	458	NW	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

6.2 Aquifer within Bedrock Deposits

Records of strata classification within the bedrock geology at or in proximity to the property Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	Designation	Description
3	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
6	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
7	176	N	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
4	177	N	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
8	285	W	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

ID	Distance (m)	Direction	Designation	Description
9	349	NW	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
1	399	E	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers
2	433	NE	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers

6.3 Groundwater Abstraction Licences

Groundwater Abstraction Licences within 2000m of the study site Identified

The following Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details	
Not shown	1553	S	520965 158239	Status: Active Licence No: TH/039/0032/015 Details: Spray Irrigation - Storage Direct Source: THAMES GROUNDWATER Point: SMALL BOREHOLE AT WOODCOTE PARK, EPSOM (HOGSMILL CATCHMENT) Data Type: Point Name: PALL MALL AND WOODCOTE PARK CLUBHOUSES LIMITED	Annual Volume (m^3): 44,800 Max Daily Volume (m^3): 144 Original Application No: - Original Start Date: Expiry Date: Issue No: Version Start Date: 02/07/2014 Version End Date:
Not shown	1580	NE	521210 161180	Status: Historical Licence No: 28/39/33/0008 Details: Potable Water Supply - Direct Direct Source: THAMES GROUNDWATER Point: EAST STREET WATERWORKS POINT A Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: Expiry Date: Issue No: Version Start Date: 08/05/1967 Version End Date:
Not shown	1580	NE	521210 161180	Status: Active Licence No: 28/39/33/0008 Details: Potable Water Supply - Direct Direct Source: THAMES GROUNDWATER Point: EAST STREET WATERWORKS POINT 'A' Data Type: Point Name: Thames Water Utilities Ltd	Annual Volume (m^3): 7,071,300 Max Daily Volume (m^3): 21,584 Original Application No: - Original Start Date: Expiry Date: Issue No: Version Start Date: 09/07/2014 Version End Date:
Not shown	1666	N	521050 161350	Status: Historical Licence No: 28/39/33/0008 Details: Potable Water Supply - Direct Direct Source: THAMES GROUNDWATER Point: EAST STREET WATERWORKS POINT B Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: Expiry Date: Issue No: Version Start Date: 08/05/1967 Version End Date:
Not shown	1666	N	521050 161350	Status: Active Licence No: 28/39/33/0008 Details: Potable Water Supply - Direct Direct Source: THAMES GROUNDWATER Point: EAST STREET WATERWORKS POINT 'B' Data Type: Point Name: Thames Water Utilities Ltd	Annual Volume (m^3): 7,071,300 Max Daily Volume (m^3): 21,584 Original Application No: - Original Start Date: Expiry Date: Issue No: Version Start Date: 09/07/2014 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1887	S	520174 157812	Status: Active Licence No: TH/039/0032/015 Details: Spray Irrigation - Storage Direct Source: THAMES GROUNDWATER Point: RESERVOIR BOREHOLE AT WOODCOTE PARK, EPSOM (MOLE CATCHMENT) Data Type: Point Name: PALL MALL AND WOODCOTE PARK CLUBHOUSES LIMITED	Annual Volume (m^3): 44,800 Max Daily Volume (m^3): 144 Original Application No: - Original Start Date: Expiry Date: Issue No: Version Start Date: 02/07/2014 Version End Date:
Not shown	1896	S	520600 157800	Status: Active Licence No: 28/39/33/0015 Details: Potable Water Supply - Direct Direct Source: THAMES GROUNDWATER Point: EPSOM PUMPING STATION 'D' Data Type: Point Name: Thames Water Utilities Ltd	Annual Volume (m^3): 1,663,870 Max Daily Volume (m^3): 6,819 Original Application No: - Original Start Date: Expiry Date: Issue No: Version Start Date: 09/07/2014 Version End Date:

6.4 Surface Water Abstraction Licences

Surface Water Abstraction Licences within 2000m of the study site — None identified

Database searched and no data found.

6.5 Potable Water Abstraction Licences

Potable Water Abstraction Licences within 2000m of the study site — Identified

The following Potable Water Abstraction Licences records are represented as points, lines and regions on the SPZ and Potable Water Abstraction Licences Map (6c):

ID	Distance (m)	Direction	NGR	Details	
Not shown	1580	NE	521210 161180	Status: Historical Licence No: 28/39/33/0008 Details: Potable Water Supply - Direct Direct Source: THAMES GROUNDWATER Point: EAST STREET WATERWORKS POINT A Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 08/05/1967 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:
Not shown	1580	NE	521210 161180	Status: Active Licence No: 28/39/33/0008 Details: Potable Water Supply - Direct Direct Source: THAMES GROUNDWATER Point: EAST STREET WATERWORKS POINT 'A' Data Type: Point Name: Thames Water Utilities Ltd	Annual Volume (m^3): 7,071,300 Max Daily Volume (m^3): 21,584 Original Application No: - Original Start Date: 08/05/1967 Expiry Date: - Issue No: 101 Version Start Date: Version End Date:
Not shown	1666	N	521050 161350	Status: Historical Licence No: 28/39/33/0008 Details: Potable Water Supply - Direct Direct Source: THAMES GROUNDWATER Point: EAST STREET WATERWORKS POINT B Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 08/05/1967 Expiry Date: - Issue No: 100 Version Start Date:

ID	Distance (m)	Direction	NGR	Details	
					Version End Date:
Not shown	1666	N	521050 161350	Status: Active Licence No: 28/39/33/0008 Details: Potable Water Supply - Direct Direct Source: THAMES GROUNDWATER Point: EAST STREET WATERWORKS POINT 'B' Data Type: Point Name: Thames Water Utilities Ltd	Annual Volume (m^3): 7,071,300 Max Daily Volume (m^3): 21,584 Original Application No: - Original Start Date: 08/05/1967 Expiry Date: - Issue No: 101 Version Start Date: Version End Date:
Not shown	1896	S	520600 157800	Status: Active Licence No: 28/39/33/0015 Details: Potable Water Supply - Direct Direct Source: THAMES GROUNDWATER Point: EPSOM PUMPING STATION 'D' Data Type: Point Name: Thames Water Utilities Ltd	Annual Volume (m^3): 1,663,870 Max Daily Volume (m^3): 6,819 Original Application No: - Original Start Date: 07/03/1980 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:

6.6 Source Protection Zones

Source Protection Zones within 500m of the study site — Identified

The following Source Protection Zones records are represented on the SPZ and Potable Water Abstraction Map (6c):

ID	Distance (m)	Direction	Zone	Description
3	186	E	2	Outer catchment
4	262	NE	2	Outer catchment
1	279	NE	1	Inner catchment
2	287	NE	1	Inner catchment

6.7 Source Protection Zones within Confined Aquifer

Source Protection Zones within the Confined Aquifer within 500m of the study site — None identified

Historically, Source Protection Zone maps have been focused on regulation of activities which occur at or near the ground surface, such as prevention of point source pollution and bacterial contamination of water supplies. Sources in confined aquifers were often considered to be protected from these surface pressures due to the presence of a low permeability confining layer (e.g. glacial till, clay). The increased interest in subsurface activities such as onshore oil and gas exploration, ground source heating and cooling requires protection zones for confined sources to be marked on SPZ maps where this has not already been done.

Database searched and no data found.

6.8 Groundwater Vulnerability and Soil Leaching Potential

Environment Agency/Natural Resources Wales information on groundwater vulnerability and soil leaching potential within 500m of the study site Identified

Distance (m)	Direction	Classification	Soil Vulnerability Category	Description
0	On Site	Minor Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.
176	N	Minor Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.
277	E	Minor Aquifer/High Leaching Potential	H1	Soils which readily transmit liquid discharges because they are shallow or susceptible to rapid flow directly to rock, gravel or groundwater.
283	NW	Minor Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.
382	NE	Major Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.
411	NW	Minor Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.
444	NE	Major Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.

6.9 River Quality

Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site None identified

6.9.1 Biological Quality:

Database searched and no data found.

6.9.2 Chemical Quality:

Database searched and no data found.

6.10 Ordnance Survey MasterMap Water Network

Ordnance Survey MasterMap Water Network entries within 500m of the study site

This watercourse information is provided by Ordnance Survey MasterMap Water Network. The data provides a detailed centre line following the curve of the waterway precisely, so all distances provided in the report should be understood as measurements to the centreline rather than a measurement to the nearest point of the watercourse. Underground watercourses are inferred from entry and exit points so caution is advised in using these to indicate precise locations of underground watercourses when planning site investigation and development.

The following Ordnance Survey MasterMap Water Network records are represented on the Hydrology Map (6e):

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
1	23 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
2	23 SE	-	Lake, loch or reservoir.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
11	23 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
12	23 SE	-	Lake, loch or reservoir.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
3	42 SE	-	Lake, loch or reservoir.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
13	42 SE	-	Lake, loch or reservoir.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
4	43 SE	-	Lake, loch or reservoir.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
5	43 SE	-	Lake, loch or reservoir.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
				conditions) Average Width in Watercourse Section (m): 3.1
14	43 SE	-	Lake, loch or reservoir.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
15	43 SE	-	Lake, loch or reservoir.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 3.1
6	44 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
16	44 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
7	45 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
17	45 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
8	70 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
18	70 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
9	88 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
19	88 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
10	313 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
20	313 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
11	321 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
21	321 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
12	323 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
13	323 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
22	323 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
23	323 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
14	324 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
24	324 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
15	327 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: Underground Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
25	327 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: Underground Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
16	329 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
26	329 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
17	331	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: Underground

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
	SW			Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
27	331 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: Underground Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
18	333 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
28	333 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
19	349 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
29	349 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
20	354 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	354 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
21	374 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: Underground Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	374 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: Underground Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
22	379 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	379 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
23	403 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions)

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
				Average Width in Watercourse Section (m): Not Provided
Not shown	403 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
24	407 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	407 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
25	413 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	413 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
26	415 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	415 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
27	422 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
37	422 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
28	431 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	431 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
29	448 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
Not shown	448 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
30	452 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: Underground Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
31	452 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	452 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: Underground Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	452 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
32	454 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	454 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
33	467 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	467 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
34	473 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	473 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
35	480 SW	-	Lake, loch or reservoir.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 6.7
Not shown	480	-	Lake, loch or reservoir.	Catchment Area: Thames Relationship to Ground Level: On ground surface

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
	SW			Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 6.7
36	484 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	484 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
37	487 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: Underground Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	487 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: Underground Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
38	488 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	488 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
39	495 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	495 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided

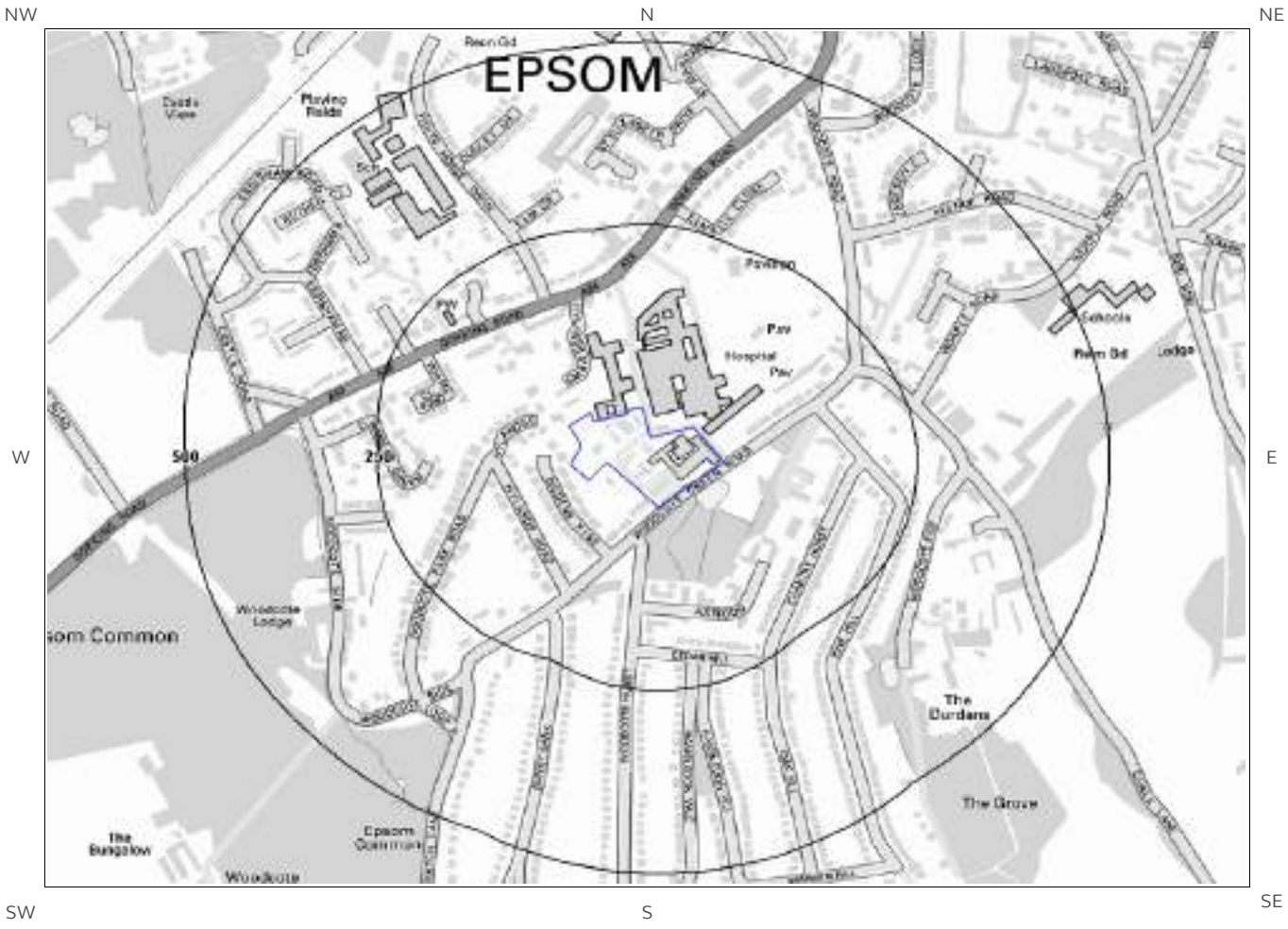
6.11 Surface Water Features

Surface water features within 250m of the study site | Identified

The following surface water records are not represented on mapping:

Distance (m)	Direction
10	SE
23	SE
44	SE
45	SE
70	SE
88	SE

7a. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)



Site Outline

100
250
Search Buffers (m)

Zone 2 Floodplain

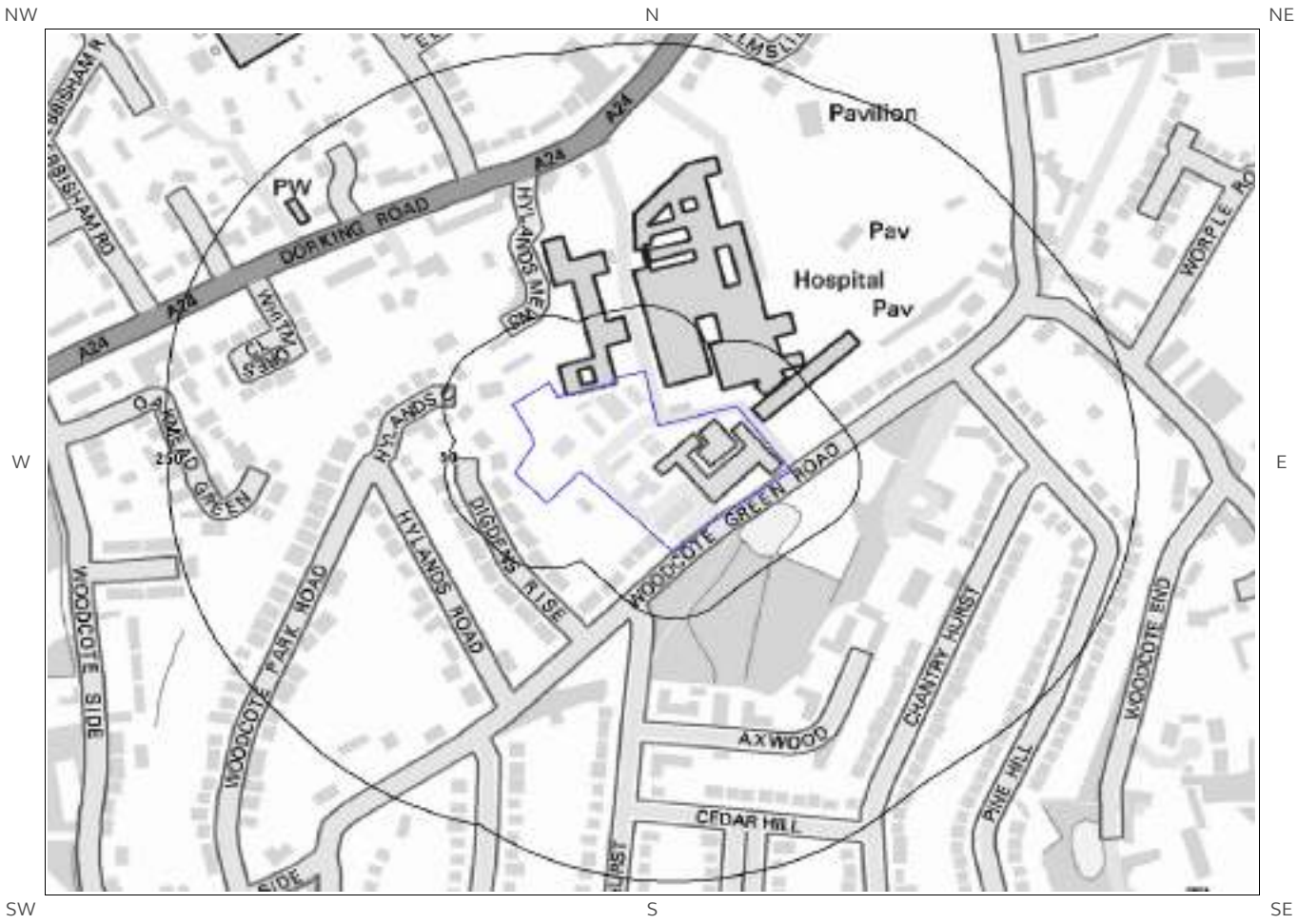
Zone 3 Floodplain

Flood Defences

Area used for Flood Storage

Area Benefiting from Flood Defences

7b. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) Map



Site Outline

100
250
Search Buffers (m)

RoFRaS Rating

- Very Low
- Low
- Medium
- High

7 Flooding

7.1 River and Coastal Zone 2 Flooding

Environment Agency/Natural Resources Wales Zone 2 floodplain within 250m — None identified

Environment Agency/Natural Resources Wales Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 7a – Flood Map for Planning:

Database searched and no data found.

7.2 River and Coastal Zone 3 Flooding

Environment Agency/Natural Resources Wales Zone 3 floodplain within 250m — None identified

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 7a – Flood Map for Planning.

Database searched and no data found.

7.3 Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating

Highest risk of flooding onsite — Very Low

The Environment Agency/Natural Resources Wales RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a Very Low (less than 1 in 1000) chance of flooding in any given year.

7.4 Flood Defences

Flood Defences within 250m of the study site — None identified

Database searched and no data found.

7.5 Areas benefiting from Flood Defences

Areas benefiting from Flood Defences within 250m of the study site — None identified

7.6 Areas benefiting from Flood Storage

Areas used for Flood Storage within 250m of the study site	None identified

7.7 Groundwater Flooding Susceptibility Areas

7.7.1 British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site: Identified

Clearwater Flooding or Superficial Deposits Flooding	Superficial Deposits Flooding

Notes: Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

7.7.2 Highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions

Potential at Surface

Where potential for groundwater flooding to occur at surface is indicated, this means that given the geological conditions in the area groundwater flooding hazard should be considered in all land-use planning decisions. It is recommended that other relevant information e.g. records of previous incidence of groundwater flooding, rainfall, property type, and land drainage information be investigated in order to establish relative, but not absolute, risk of groundwater flooding.

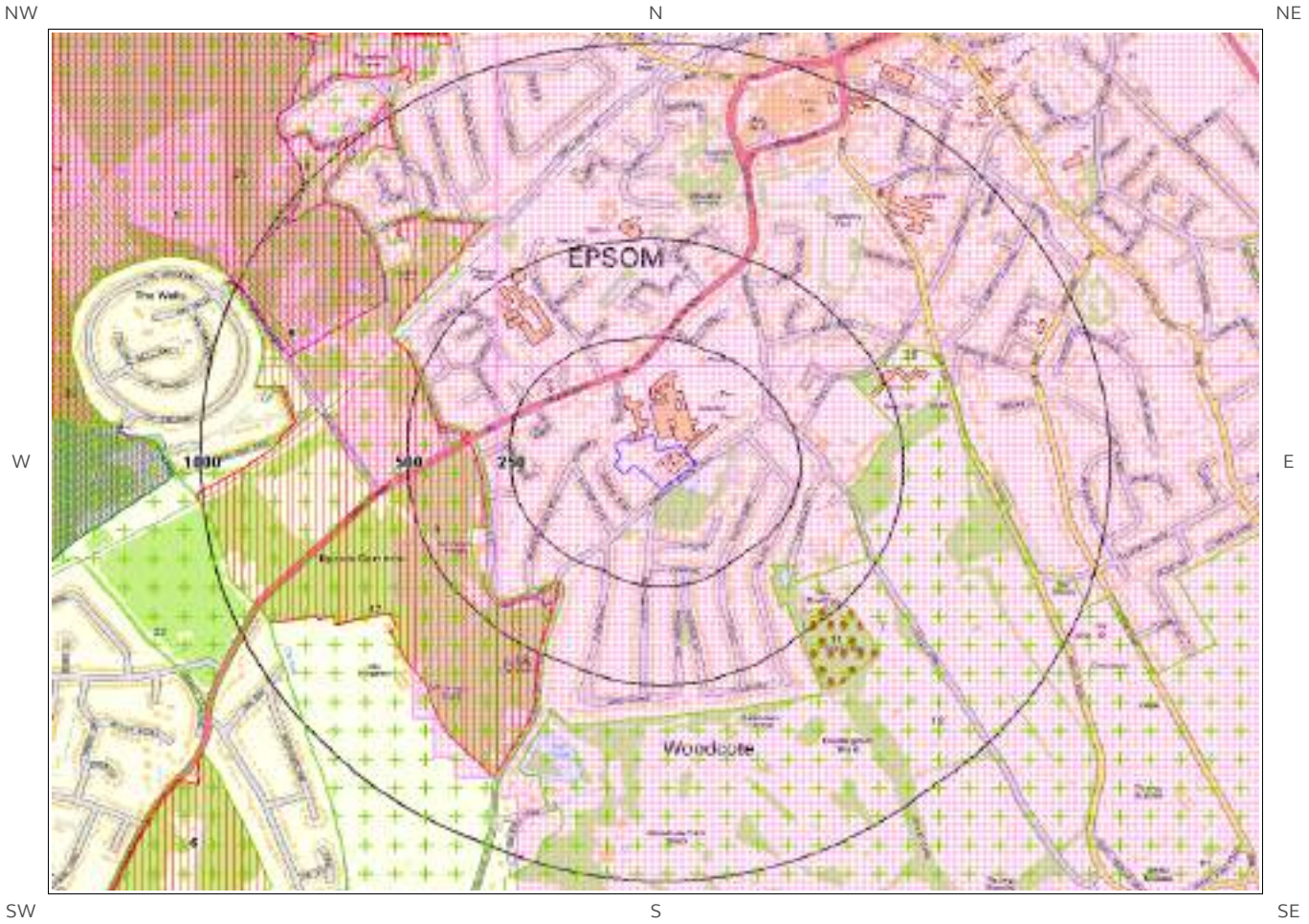
7.8 Groundwater Flooding Confidence Areas

British Geological Survey confidence rating in this result	Moderate

Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

8. Designated Environmentally Sensitive Sites Map



Site Outline

100
250
Search Buffers (m)

AONB

National Park

SSSI

Special Protection Areas

Nitrate Vulnerable Zones

Green Belt

Environmentally Sensitive Areas

Special Areas of Conservation

World Heritage Sites

Nitrate Sensitive Areas

Ancient Woodland

National Nature Reserve

Local Nature Reserves

Ramsar Sites

8. Designated Environmentally Sensitive Sites

Designated Environmentally Sensitive Sites within 2000m of the study site — Identified

8.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:

2

The following Site of Special Scientific Interest (SSSI) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	SSSI Name	Data Source
1	663	NW	Epsom and Ashtead Commons	Natural England
Not shown	1845	NE	Stones Road Pond	Natural England

8.2 Records of National Nature Reserves (NNR) within 2000m of the study site:

2

The following National Nature Reserve (NNR) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	NNR Name	Data Source
3	1065	W	Ashtead Common	Natural England
Not shown	1622	W	Ashtead Common	Natural England

8.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:

0

Database searched and no data found.

8.4 Records of Special Protection Areas (SPA) within 2000m of the study site:

0

Database searched and no data found.

8.5 Records of Ramsar sites within 2000m of the study site:

0

Database searched and no data found.

8.6 Records of Ancient Woodland within 2000m of the study site:

6

The following records of Designated Ancient Woodland provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	Ancient Woodland Name	Data Source
11	447	SE	UNKNOWN	Ancient Replanted Woodland
Not shown	1315	SE	UNKNOWN	Ancient Replanted Woodland
Not shown	1403	S	UNKNOWN	Ancient Replanted Woodland
Not shown	1647	W	UNKNOWN	Ancient Replanted Woodland
Not shown	1714	S	UNKNOWN	Ancient Replanted Woodland
Not shown	1733	S	UNKNOWN	Ancient Replanted Woodland

8.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:

2

The following Local Nature Reserve (LNR) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	LNR Name	Data Source
5	319	SW	Epsom Common	Natural England
6	1236	SW	Ashtead Park	Natural England

8.8 Records of World Heritage Sites within 2000m of the study site:

0

Database searched and no data found.

8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

0

Database searched and no data found.

8.11 Records of National Parks (NP) within 2000m of the study site:

0

Database searched and no data found.

8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

4

The following Nitrate Vulnerable Zone records produced by DEFRA are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	NVZ Name	Data Source
7	0	On Site	Existing	DEFRA
8	176	N	Existing	DEFRA
9	285	W	Existing	DEFRA
10	349	NW	Existing	DEFRA

8.14 Records of Green Belt land within 2000m of the study site:

11

Green Belt data contains Ordnance Survey data © Crown copyright and database right [2015].

ID	Distance	Direction	Green Belt Name	Local Authority Name
17	310	W	London Area Greenbelt	Epsom and Ewell District (B)
18	310	SE	London Area Greenbelt	Epsom and Ewell District (B)
19	313	SW	London Area Greenbelt	Epsom and Ewell District (B)
20	504	NE	London Area Greenbelt	Epsom and Ewell District (B)
21	519	NW	London Area Greenbelt	Epsom and Ewell District (B)
22	937	W	London Area Greenbelt	Mole Valley District
23	1199	W	London Area Greenbelt	Epsom and Ewell District (B)
24	1440	E	London Area Greenbelt	Epsom and Ewell District (B)
Not shown	1623	W	London Area Greenbelt	Mole Valley District
Not shown	1819	S	London Area Greenbelt	Mole Valley District
Not shown	1917	N	London Area Greenbelt	Epsom and Ewell District (B)

9. Natural Hazards Findings

9.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a Groundsure Geo Insight, available from our website. The following information has been found:

9.1.1 Shrink Swell

Maximum Shrink-Swell* hazard rating identified on the study site — Moderate

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Ground conditions predominantly high plasticity. Do not plant or remove trees or shrubs near to buildings without expert advice about their effect and management. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a probable increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a probable increase in insurance risk during droughts or where vegetation with high moisture demands is present.

9.1.2 Landslides

Maximum Landslide* hazard rating identified on the study site — Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
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.

9.1.3 Soluble Rocks

Maximum Soluble Rocks* hazard rating identified on the study site — Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
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.

* This indicates an automatically generated 50m buffer and site.

9.1.4 Compressible Ground

Maximum Compressible Ground* hazard rating identified on the study site — Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
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.

9.1.5 Collapsible Rocks

Maximum Collapsible Rocks* hazard rating identified on the study site — Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

9.1.6 Running Sand

Maximum Running Sand** hazard rating identified on the study site — Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. 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.

* This indicates an automatically generated 50m buffer and site.

9.2 Radon

9.2.1 Radon Affected Areas

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

The radon data in this report is supplied by the BGS/Public Health England and is the definitive map of Radon Affected Areas in Great Britain and Northern Ireland. The dataset was created using long-term radon measurements in over 479,000 homes across Great Britain and 23,000 homes across Northern Ireland, combined with geological data. The dataset is considered accurate to 50m to allow for the margin of error in geological lines, and the findings of this report supercede any answer given in the less accurate Indicative Atlas of Radon in Great Britain, which simplifies the data to give the highest risk within any given 1km grid square. As such, the radon atlas is considered indicative, whereas the data given in this report is considered definitive.

9.2.2 Radon Protection

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

10. Mining

10.1 Coal Mining

Coal mining areas within 75m of the study site — None identified

Database searched and no data found.

10.2 Non-Coal Mining

Non-Coal Mining areas within 50m of the study site boundary — Identified

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

Distance (m)	Direction	Name	Commodity	Assessment of likelihood
0.0	On Site	Not available	Chalk	Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered

Past underground mine workings are unlikely. The rock types present in these areas are such that mineral veins may be present on which it is possible that mining has been undertaken and/or it is possible that small scale underground extraction of other materials may have occurred. All such occurrences are likely to be of localised extent and infrequent. It should be noted, however, that there is always the possibility of the existence of other sub-surface excavations, such as wells, cess pits, follies, air raid shelters/bunkers and other military structures etc. that could affect surface ground stability but which are outside the scope of this dataset. However, if in a coalfield area you should still consider a Coal Authority mining search for the area of interest.

10.3 Brine Affected Areas

Brine affected areas within 75m of the study site — None identified
Guidance: No Guidance Required.

Contact Details

Groundsure Helpline
Telephone: 08444 159 000
info@groundsure.com

British Geological Survey Enquiries
Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:
Web:**www.bgs.ac.uk**
BGS Geological Hazards Reports and general geological enquiries:
enquiries@bgs.ac.uk

Environment Agency
National Customer Contact Centre, PO Box 544
Rotherham, S60 1BY
Tel: 03708 506 506
Web: **www.environment-agency.gov.uk**
Email: enquiries@environment-agency.gov.uk

Public Health England
Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
www.gov.uk/phe
Email:**enquiries@phe.gov.uk**
Main switchboard**: 020 7654 8000**

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

Ordnance Survey
Adanac Drive, Southampton
SO16 0AS
Tel: 08456 050505

Local Authority
Authority: Epsom and Ewell Borough Council
Phone: 01372 732 000
Web: http://www.epsom-ewell.gov.uk/
Address: Town Hall, The Parade, Epsom, Surrey, KT18 5BY

Gemapping PLC
Virginia Villas, High Street, Hartley Witney,
Hampshire RG27 8NW
Tel: 01252 845444

Standard Terms and Conditions

Groundsure's Terms and Conditions can be viewed online at this link:

https://www.groundsure.com/terms-and-conditions-feb11-2019

Ove Arup & Partners International Ltd

OVE ARUP & PARTNERS,13, FITZROY STREET, LONDON, W1T 4BQ

Groundsure Reference:	GS-6266219
Your Reference:	Epsom_Hospital_
Report Date	23 Aug 2019
Report Delivery Method:	Email - pdf

Geo Insight

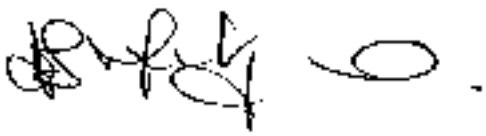
Address: ROWAN HOUSE, EPSOM GENERAL HOSPITAL, DORKING ROAD, EPSOM, KT18 7EG

Dear Sir/ Madam,

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

If you need any further assistance, please do not hesitate to contact our helpline on 08444 159000 quoting the above Groundsure reference number.

Yours faithfully,



Managing Director
Groundsure Limited

Enc.
Groundsure Geo Insight

Geo Insight

Address:	**ROWAN HOUSE, EPSOM GENERAL HOSPITAL, DORKING ROAD, EPSOM, KT18 7EG**
Date:	**23 Aug 2019**
Reference:	**GS-6266219**
Client:	**Ove Arup & Partners International Ltd**

NW N NE

W E

SW S SE

Aerial Photograph Capture date:	20-Apr-2018
Grid Reference:	520414,159757
Site Size:	1.4682ha

Contents Page

Overview of Findings

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

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

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

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

Section 2: Geology 1:50,000 Scale		
2.1 Artificial Ground	2.1.1 Is there any Artificial Ground/ Made Ground present beneath the study site?	No
	2.1.2 Are there any records relating to permeability of artificial ground within the study site*boundary?	No
2.2 Superficial Geology and Landslips	2.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site?*	Yes
	2.2.2 Are there any records of permeability of superficial ground within 500m of the study site?	Yes
	2.2.3 Are there any records of landslip within 500m of the study site boundary?	No
	2.2.4 Are there any records relating to permeability of landslips within the study site* boundary?	No

Section 2: Geology 1:50,000 Scale

2.3 Bedrock, Solid Geology and linear features	2.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
	2.3.2 Are there any records relating to permeability of bedrock ground within the study site boundary?	Yes
	2.3.3 Are there any records of linear features within 500m of the study site boundary?	No

Section 3: Radon

3. Radon	3.1Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
	3.2Radon Protection	No radon protective measures are necessary.

Section 4: Ground Workings	On-site	0-50m	51-250	251-500	501-1000
4.1 Historical Surface Ground Working Features from Small Scale Mapping	0	10	8	Not Searched	Not Searched
4.2 Historical Underground Workings from Small Scale Mapping	0	0	0	0	0
4.3 Current Ground Workings	0	0	0	0	2

Section 5: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
5.1 Historical Mining	0	0	0	0	0
5.2 Coal Mining	0	0	0	0	0
5.3 Johnson Poole and Bloomer Mining Area	0	0	0	0	0
5.4 Non-Coal Mining*	1	0	1	6	2
5.5 Non–Coal Mining Cavities	0	0	0	0	1
5.5 Natural Cavities	0	0	0	0	0

Section 5: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
5.6 Brine Extraction	0	0	0	0	0
5.7 Gypsum Extraction	0	0	0	0	0
5.8 Cornwall and Devon Metalliferous Mining	0	0	0	0	0
5.9 Clay Mining	0	0	0	0	0

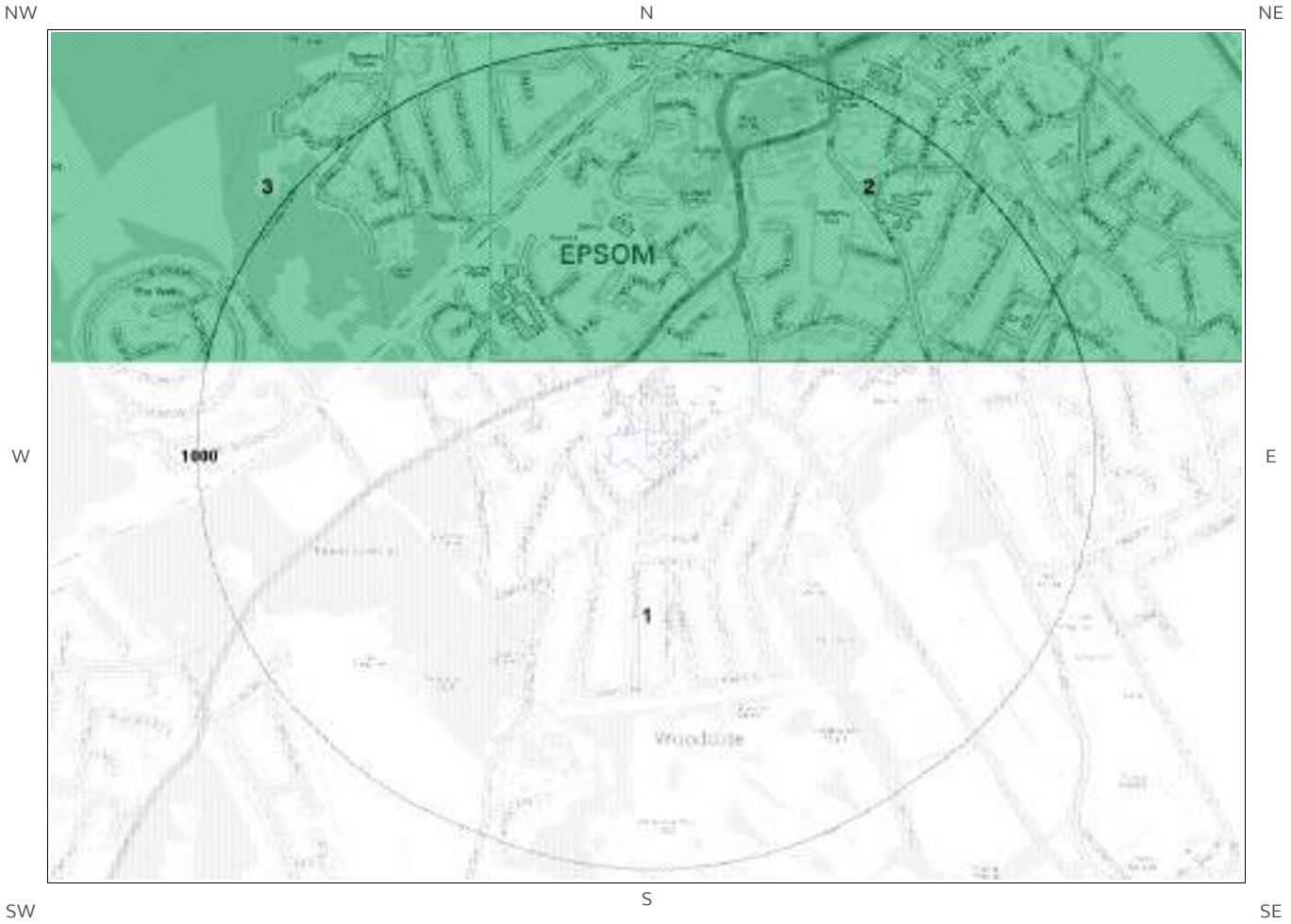
Section 6: Natural Ground Subsidence	On-site
6.1 Shrink-Swell Clay	Moderate
6.2 Landslides	Very Low
6.3 Ground Dissolution of Soluble Rocks	Negligible
6.4 Compressible Deposits	Negligible
6.5 Collapsible Deposits	Very Low
6.5 Running Sand	Very Low

Section 7: Borehole Records	On-site	0-50m	51-250
7 BGS Recorded Boreholes	0	0	1

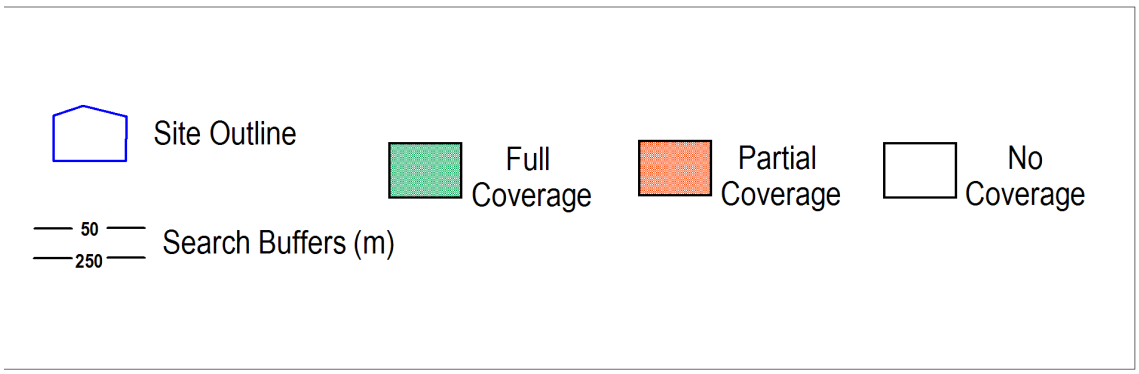
Section 8: Estimated Background Soil Chemistry	On-site	0-50m	51-250
8 Records of Background Soil Chemistry	4	1	0

Section 9: Railways and Tunnels	On-site	0-50m	51-250	250-500
9.1 Tunnels	0	0	0	Not Searched
9.2 Historical Railway and Tunnel Features	0	0	0	Not Searched
9.3 Historical Railways	0	0	0	Not Searched
9.4 Active Railways	0	0	0	Not Searched
9.5 Railway Projects	0	0	0	0

1:10,000 Scale Availability



1_10,000 Availability Legend



Availability of 1:10,000 Scale Geology Mapping

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

ID	Distance	Artificial Coverage	Superficial Coverage	Bedrock Coverage	Mass Movement Coverage
1	0.0	No deposits are mapped	No coverage	No coverage	No coverage
2	176.0	Some deposits are mapped	Full	Full	No coverage
3	349.0	Some deposits are mapped	Full	Full	No coverage

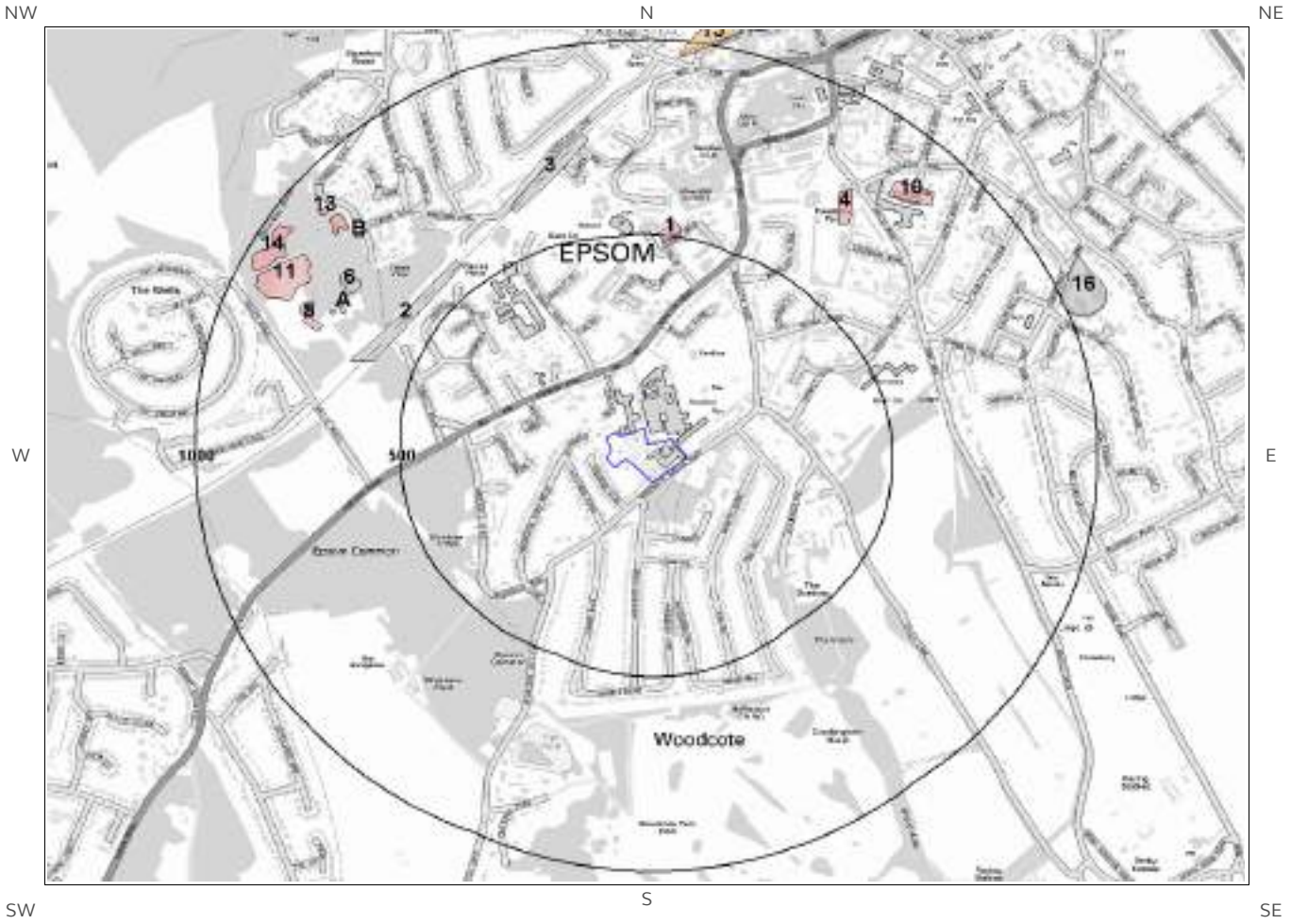
Guidance: The 1:10,000 scale geological interpretation is the most detailed generally available from BGS and is the scale at which most geological surveying is carried out in the field. The database is presented as four types of geology (artificial, mass movement, superficial and bedrock), although not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

The definitions of coverage are as follows:

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

1 Geology (1:10,000 scale).

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



Artificial Ground Legend

Site Outline

500
1000
Search Buffers (m)

Made Ground (undivided)

Disturbed Ground (undivided)

Worked Ground (undivided)

Landscaped Ground (undivided)

Infilled Ground

Reclaimed Ground

1. Geology 1:10,000 scale

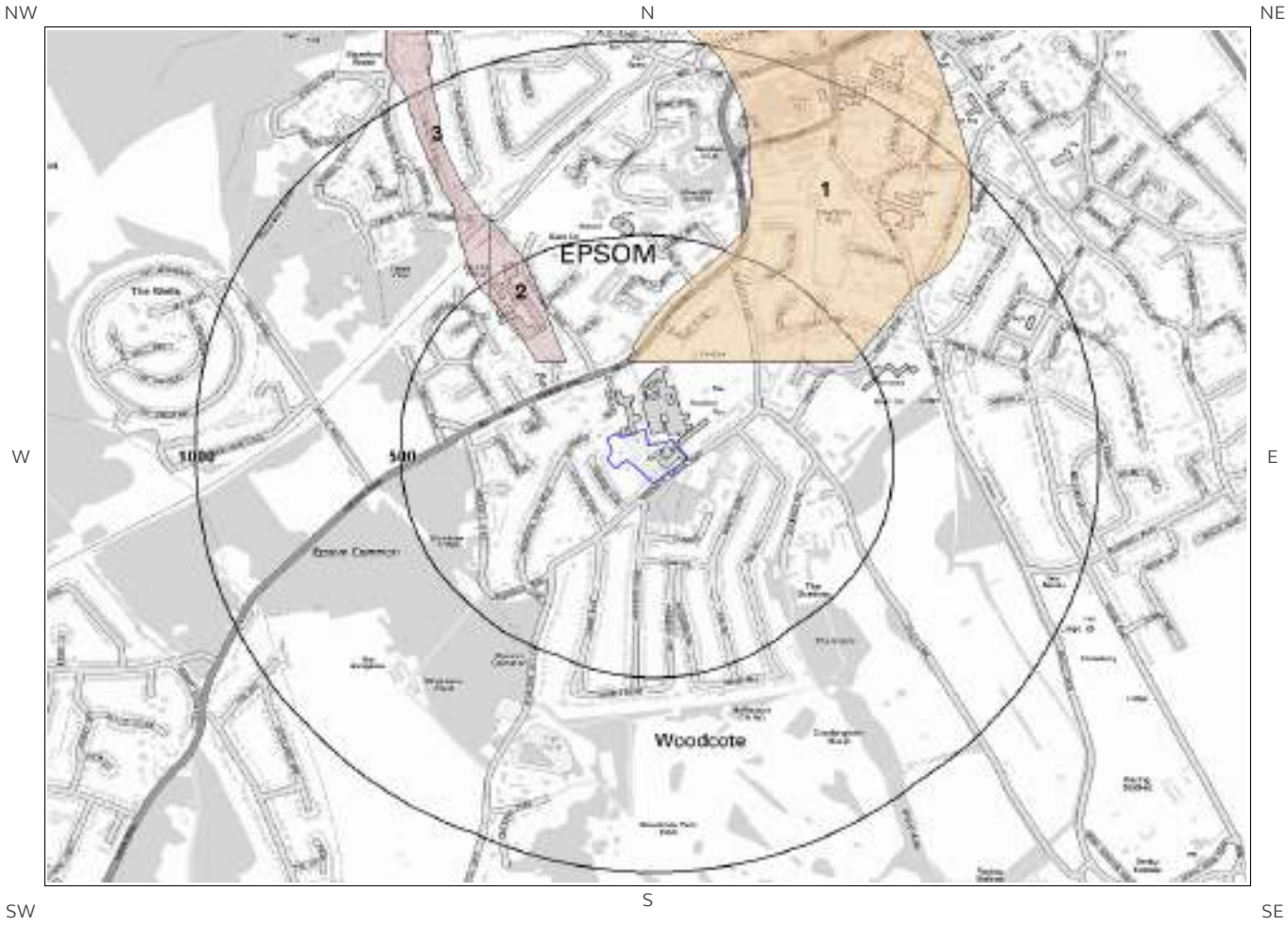
1.1 Artificial Ground

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

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

ID	Distance	Direction	LEX Code	Description	Rock Description
1	481.0	N	WMGR-ARTDP	Infilled Ground	Artificial Deposit

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



Artificial Ground Legend

Site Outline

500
1000
Search Buffers (m)

1.2 Superficial Deposits and Landslips

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

1.2.1 Superficial Deposits/ Drift Geology

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

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	176.0	N	RTDU-XSV	River Terrace Deposits (undifferentiated) - Sand And Gravel	Sand And Gravel
2	223.0	NW	HEAD-S	Head - Sand	Sand
3	465.0	NW	HEAD-C	Head - Clay (unlithified Deposits Coding Scheme)	Clay

1.2.2 Landslip

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

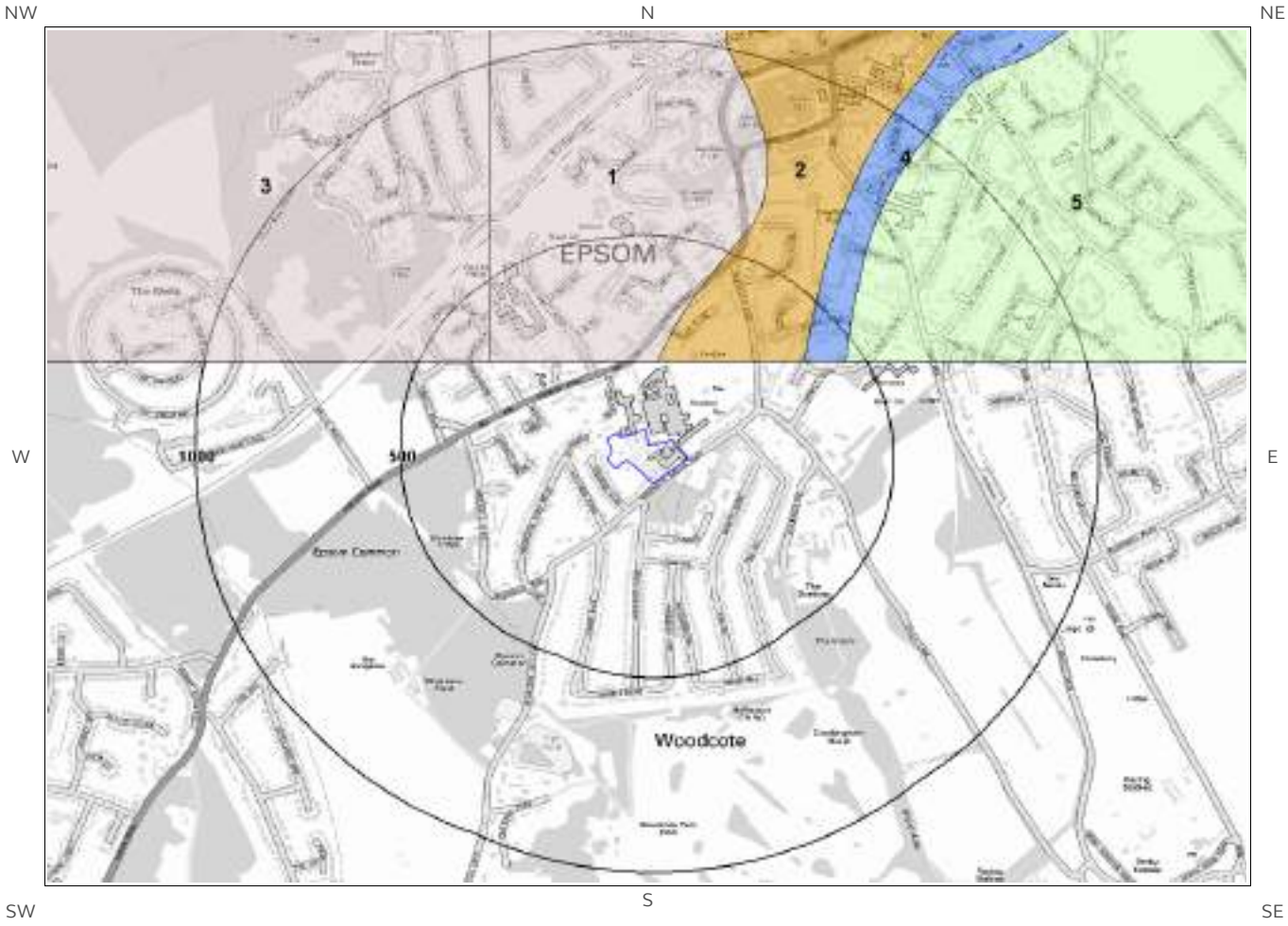
No

Database searched and no data found.

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

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

1.3 Bedrock and linear features map (1:10,000 scale)



Bedrock and linear features Legend

Site Outline

500
1000
Search Buffers (m)

1.3 Bedrock and linear features

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

1.3.1 Bedrock/ Solid Geology

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

ID	Distance (m)	Direction	LEX Code	Description	Rock Age
1	176.0	N	LC-CLAY	London Clay Formation - Clay	Eocene Epoch
2	178.0	N	LMBE-SANCL	Lambeth Group - Sand And Clay	Paleocene Epoch
3	349.0	NW	LC-CLAY	London Clay Formation - Clay	Eocene Epoch
4	377.0	NE	TAB-SANDU	Thanet Sand Formation - Sand	Thanetian Age
5	459.0	NE	LSNCK-CHLK	Lewes Nodular Chalk Formation, Seaford Chalk Formation And Newhaven Chalk Formation (undifferentiated) - Chalk	Campanian Age - Turonian Age

1.3.2 Linear features

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

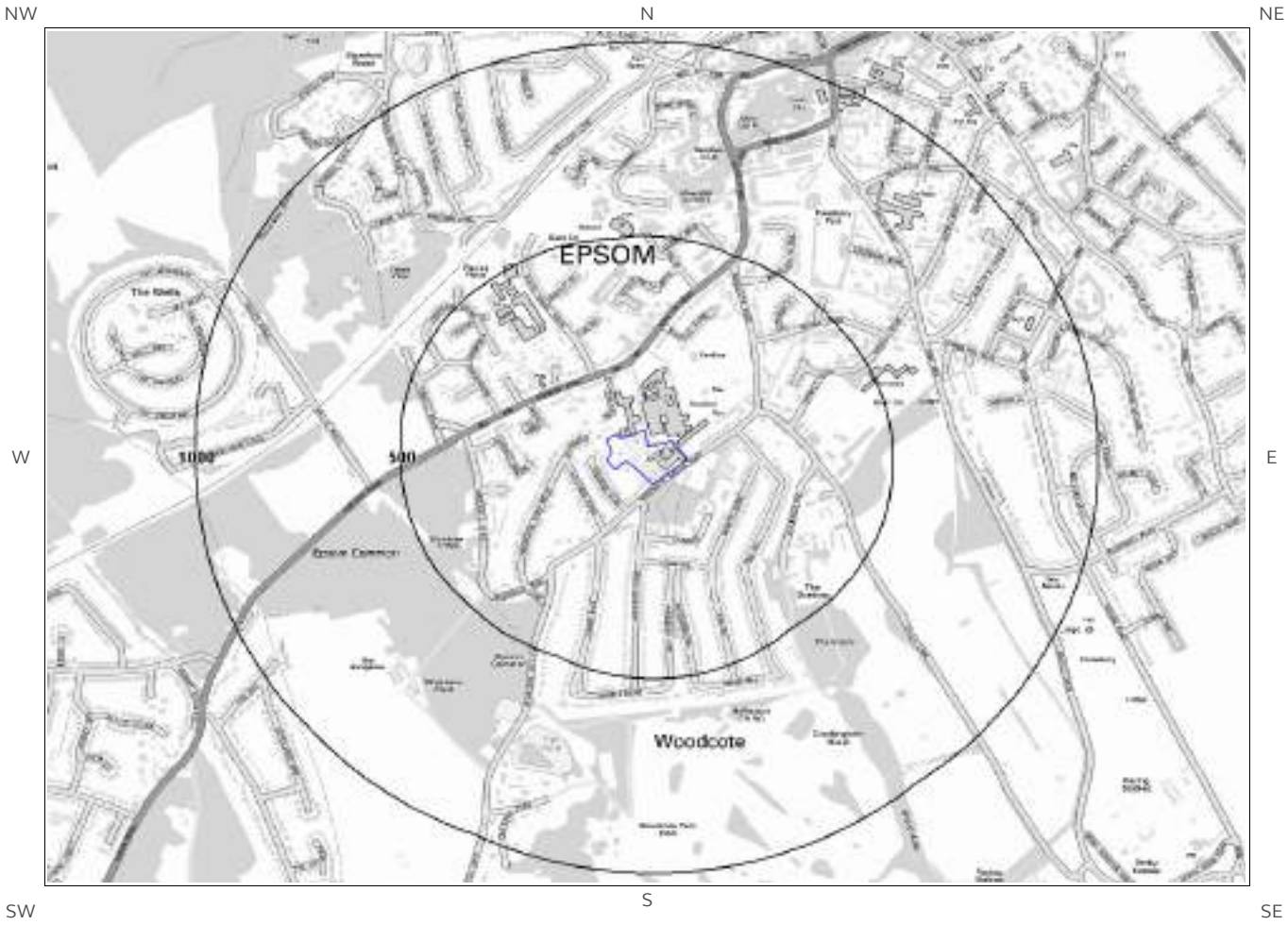
Database searched and no data found at this scale.

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

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

2 Geology 1:50,000 Scale

2.1 Artificial Ground map



Site Outline

500
1000
Search Buffers (m)

Made Ground (undivided)

Disturbed Ground (undivided)

Worked Ground (undivided)

Landscaped Ground (undivided)

Infilled Ground

Reclaimed Ground

2. Geology 1:50,000 scale

2.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 286

2.1.1 Artificial/ Made Ground

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

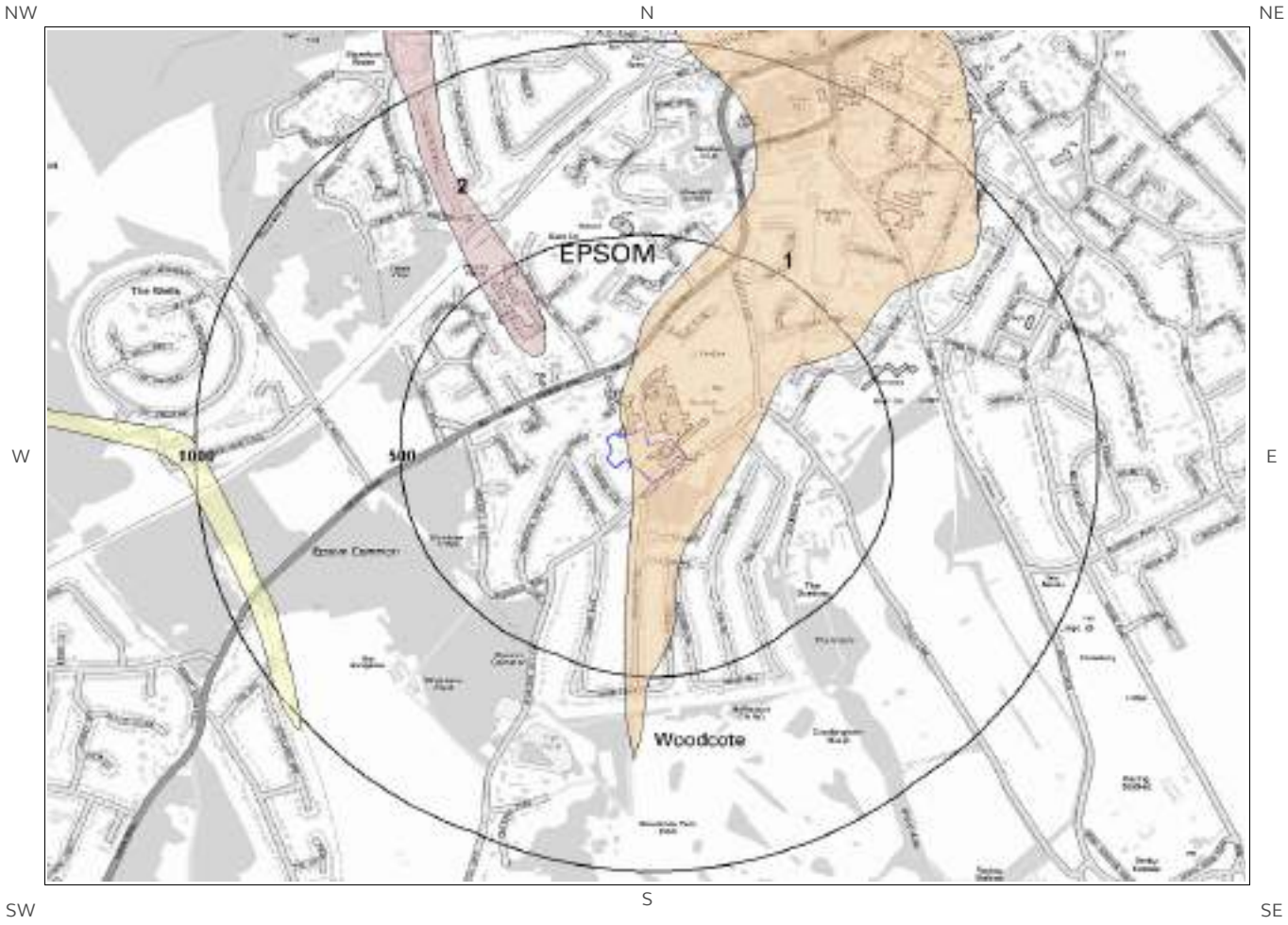
Database searched and no data found.

2.1.2 Permeability of Artificial Ground

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

Database searched and no data found.

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



Site Outline

500
1000
Search Buffers (m)

2.2 Superficial Deposits and Landslips

2.2.1 Superficial Deposits/ Drift Geology

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

ID	Distance	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	RTDU-XSV	RIVER TERRACE DEPOSITS (UNDIFFERENTIATED)	SAND AND GRAVEL
2	269.0	NW	HEAD-XCZSV	HEAD	CLAY, SILT, SAND AND GRAVEL

2.2.2 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
0.0	On Site	Intergranular	Very High	High

2.2.3 Landslip

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

Database searched and no data found.

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

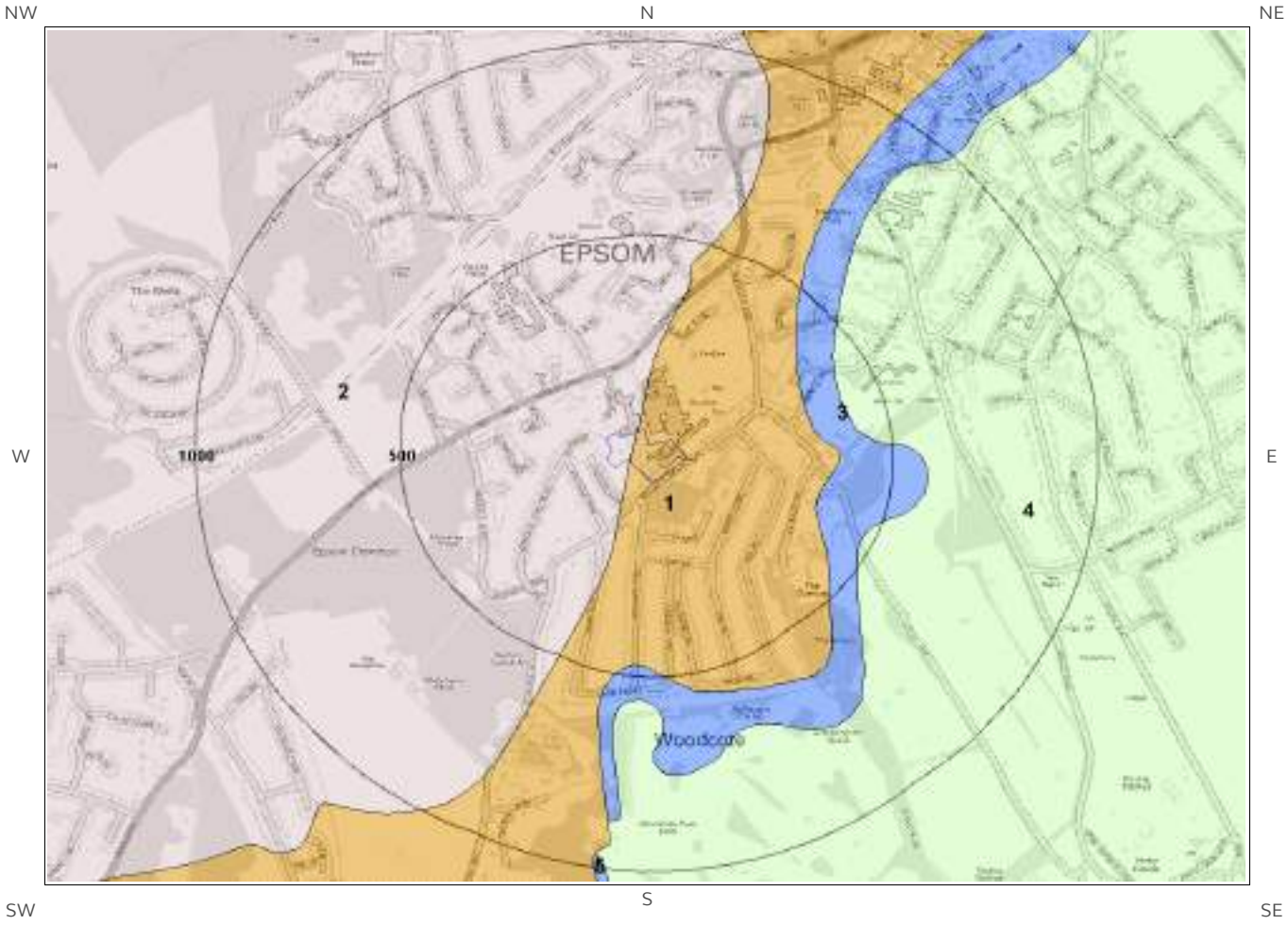
This Geology shows the main components as discrete layers, there are: Artificial/ Made Ground, Superficial/ Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

2.2.4 Landslip Permeability

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

Database searched and no data found.

2.3 Bedrock and linear features map (1:50,000 scale)



Site Outline

500
1000
Search Buffers (m)

2.3 Bedrock, Solid Geology & linear features

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 286

2.3.1 Bedrock/Solid Geology

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

ID	Distance	Direction	LEX Code	Rock Description	Rock Age
1	0.0	On Site	LMBE-XCZS	LAMBETH GROUP - CLAY, SILT AND SAND	THANETIAN
2	0.0	On Site	LC-XCZ	LONDON CLAY FORMATION - CLAY AND SILT	YPRESIAN
3	312.0	E	TAB-S	THANET FORMATION - SAND	THANETIAN
4	399.0	E	LSNCK-CHLK	LEWES NODULAR CHALK FORMATION, SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) - CHALK	TURONIAN

2.3.2 Permeability of Bedrock Ground

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

Distance	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Mixed	Moderate	Very Low
0.0	On Site	Mixed	Low	Very Low

2.3.3 Linear features

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

Database searched and no data found.

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

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

3 Radon Data

3.1 Radon Affected Areas

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

The radon data in this report is supplied by the BGS/Public Health England and is the definitive map of Radon Affected Areas in Great Britain and Northern Ireland. The dataset was created using long-term radon measurements in over 479,000 homes across Great Britain and 23,000 homes across Northern Ireland, combined with geological data. The dataset is considered accurate to 50m to allow for the margin of error in geological lines, and the findings of this report supercede any answer given in the less accurate Indicative Atlas of Radon in Great Britain, which simplifies the data to give the highest risk within any given 1km grid square. As such, the radon atlas is considered indicative, whereas the data given in this report is considered definitive.

3.2 Radon Protection

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

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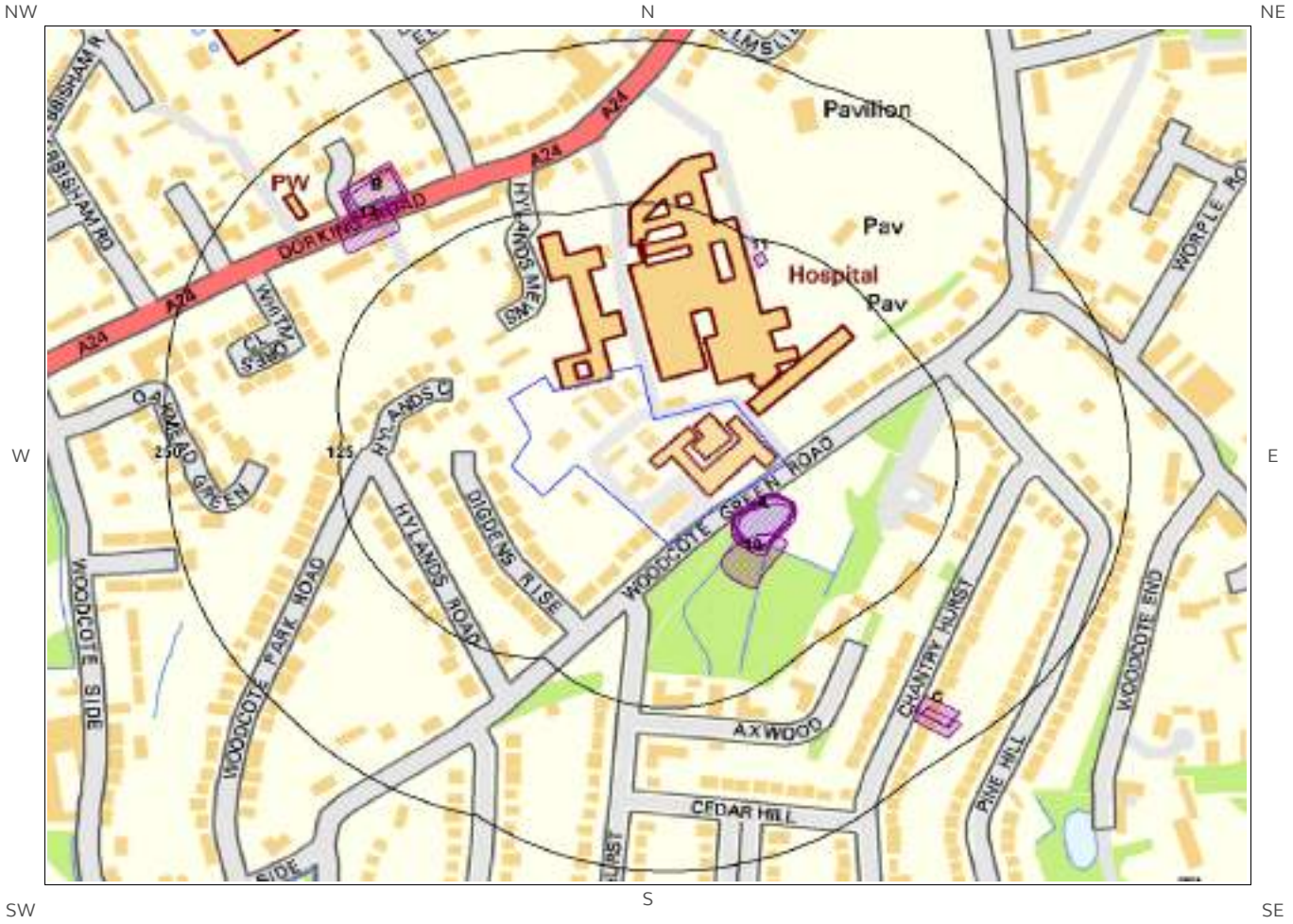
4 Ground Workings map



Ground Workings Legend

Site Outline

125
250
Search Buffers (m)

Historic Surface Ground Workings

Historic Underground Workings

Current Ground Workings

4 Ground Workings

4.1 Historical Surface Ground Working Features derived from Historical Mapping

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

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

ID	Distance (m)	Direction	NGR	Use	Date
1A	10.0	SE	520470 159706	Pond	1912
2A	10.0	SE	520470 159706	Pond	1938
3A	12.0	SE	520468 159702	Pond	1866
4A	12.0	SE	520470 159705	Pond	1961
5A	12.0	SE	520470 159705	Pond	1974
6A	12.0	SE	520470 159705	Pond	1990
7A	13.0	SE	520471 159704	Pond	1912
8A	13.0	SE	520471 159704	Pond	1932
9A	14.0	SE	520470 159698	Pond	1895
10	31.0	SE	520463 159674	Pond	1897
11	105.0	N	520467 159906	Mortuary	1938
12	151.0	NW	520181 159931	Pond	1897
13B	166.0	NW	520188 159953	Pond	1895
14B	170.0	NW	520184 159955	Pond	1866
15B	171.0	NW	520187 159959	Pond	1912
16C	204.0	SE	520596 159558	Pond	1912
17C	204.0	SE	520596 159559	Pond	1938
18C	212.0	SE	520597 159550	Pond	1895

4.2 Historical Underground Working Features derived from Historical Mapping

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

Are there any Historical Underground Working Features within 1000m of the study site boundary? No

Database searched and no data found.

4.3 Current Ground Workings

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

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

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

ID	Distance (m)	Direction	NGR	Commodity Produced	Pit Name	Type of working	Status
Not shown	891.0	NW	519499 160218	Sand & Gravel	Epsom Common Gravel Pits	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	939.0	NW	519482 160286	Sand & Gravel	Epsom Common Gravel Pits	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased

5 Mining, Extraction & Natural Cavities map

Mining, Extraction and Natural Cavities Legend

Site Outline

Search Buffers (m)

Historical Mining

Non-Coal Mining Cavities

Natural Cavities (point data)

Natural Cavities (polygon data)

Non-Coal Mining

Highly likely

Likely

Unlikely

Highly unlikely

Rare

5 Mining, Extraction & Natural Cavities

5.1 Historical Mining

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

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

Database searched and no data found.

5.2 Coal Mining

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

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

Database searched and no data found.

5.3 Johnson Poole and Bloomer

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

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

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

5.4 Non-Coal Mining

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

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

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

ID	Distance (m)	Direction	Name	Commodity	Assessment of likelihood
1	0.0	On Site	Not available	Chalk	Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered

ID	Distance (m)	Direction	Name	Commodity	Assessment of likelihood
2	176.0	N	Not available	Chalk	Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered
3	285.0	W	Not available	Chalk	Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered
4	312.0	E	Not available	Chalk	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
5	349.0	NW	Not available	Chalk	Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered
6	362.0	NE	Not available	Chalk	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
7	399.0	E	Not available	Chalk	Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered
8	433.0	NE	Not available	Chalk	Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered
Not shown	960.0	S	Not available	Chalk	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
Not shown	988.0	E	Not available	Chalk	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

5.5 Non-Coal Mining Cavities

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

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

The following Non-Coal Mining Cavities information provided by Peter Brett Associates:

ID	Distance (m)	Direction	NGR	Address	Superficial Deposits	Bedrock Deposits	Extracted Mineral
Not shown	716.0	E	521200 159700	Epsom, Surrey	-	Chalk Group	Man made i.e. secret tunnels, air raid shelters

5.6 Natural Cavities

This dataset provides information based on the Peter Brett Associates natural cavities database. The dataset is made up of points and polygons. Where polygons are used these represent an area in which it is expected the cavities could be found. It does not indicate that cavities are present everywhere within the polygon, and caution should be used in the interpretation of this data.

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

Database searched and no data found.

5.7 Brine Extraction

This data provides information from the Cheshire Brine Subsidence Compensation Board.

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

Database searched and no data found.

5.8 Gypsum Extraction

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

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

Database searched and no data found.

5.9 Cornwall and Devon Metalliferous Mining

This dataset provides information on metalliferous mining areas in Cornwall/Devon and is derived from records held by Mining Searches UK.

Are there any Cornwall and Devon Metalliferous Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.10 Clay Mining

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

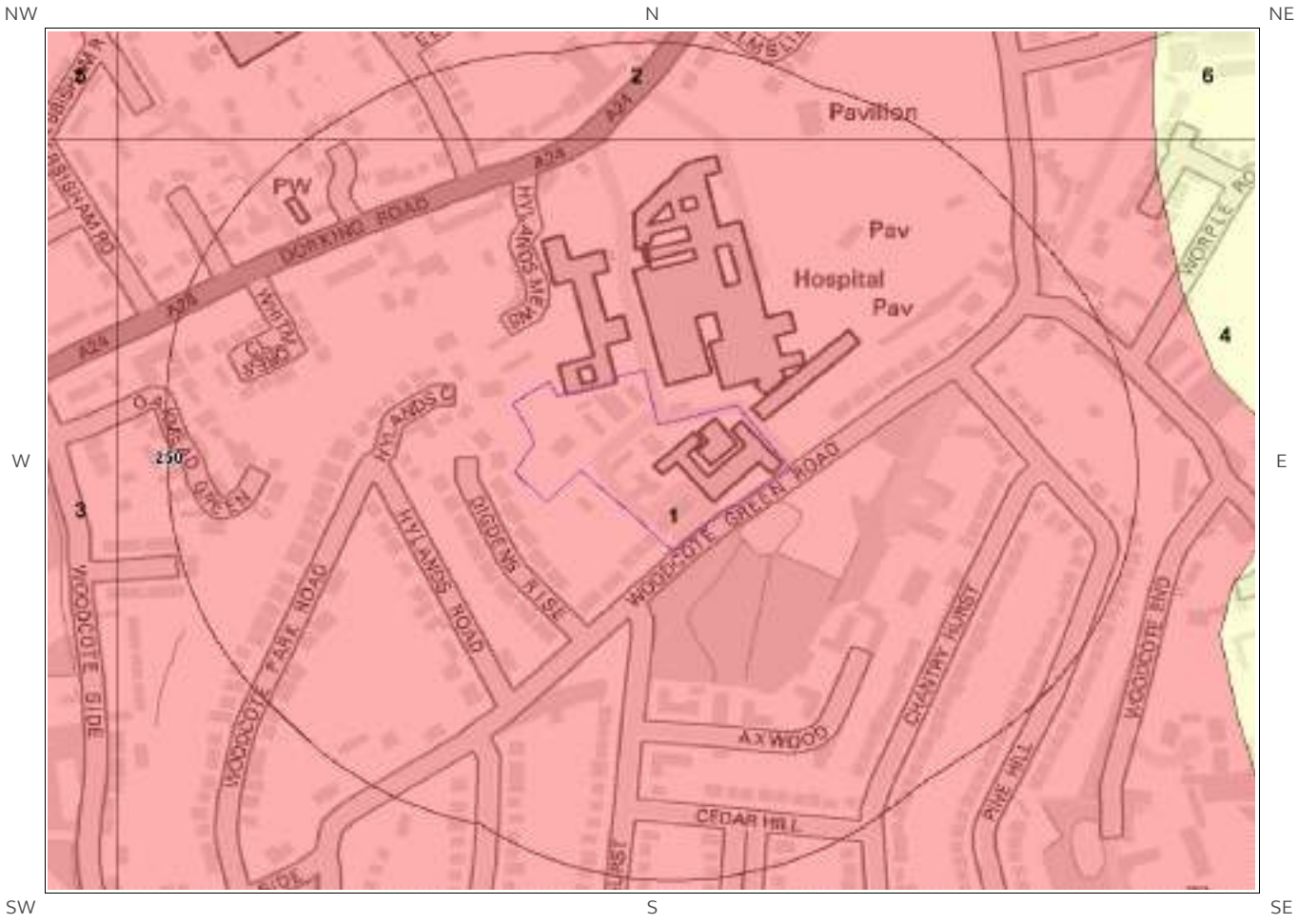
Are there any Clay Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

---

6 Natural Ground Subsidence

6.1 Shrink-Swell Clay map



Shrink Swell Clay Legend

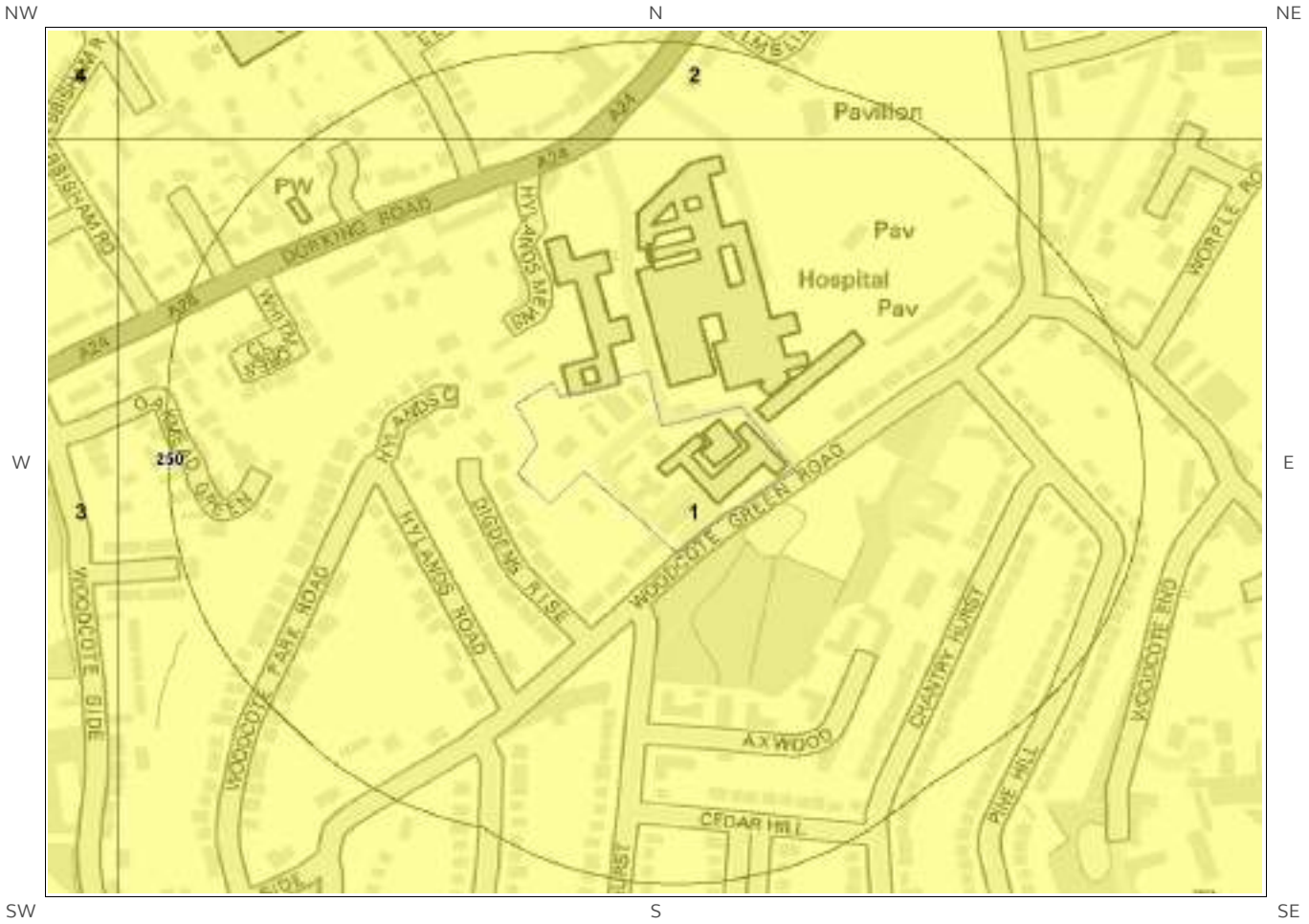
Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

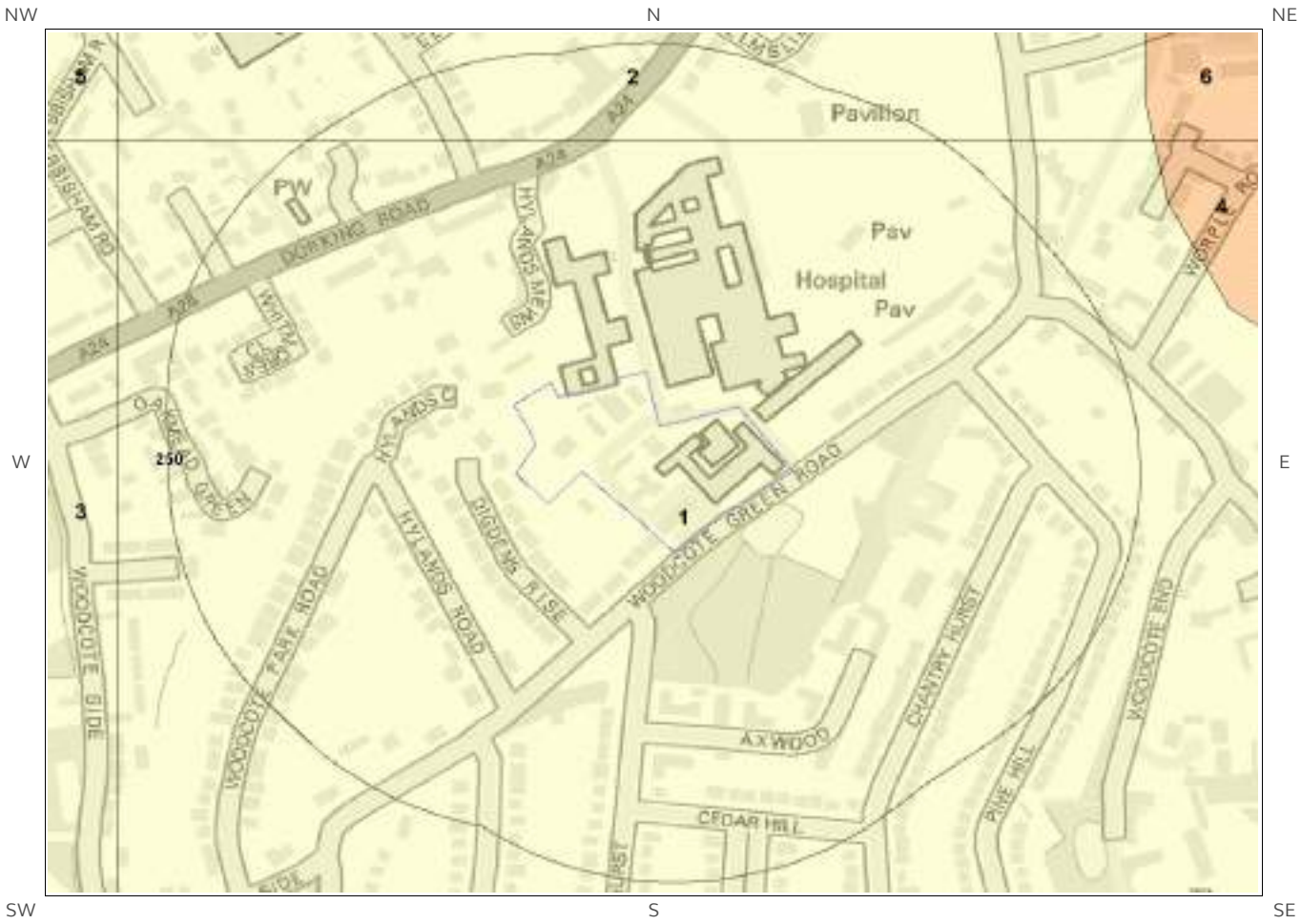
Low
Moderate
High

6.2 Landslides map



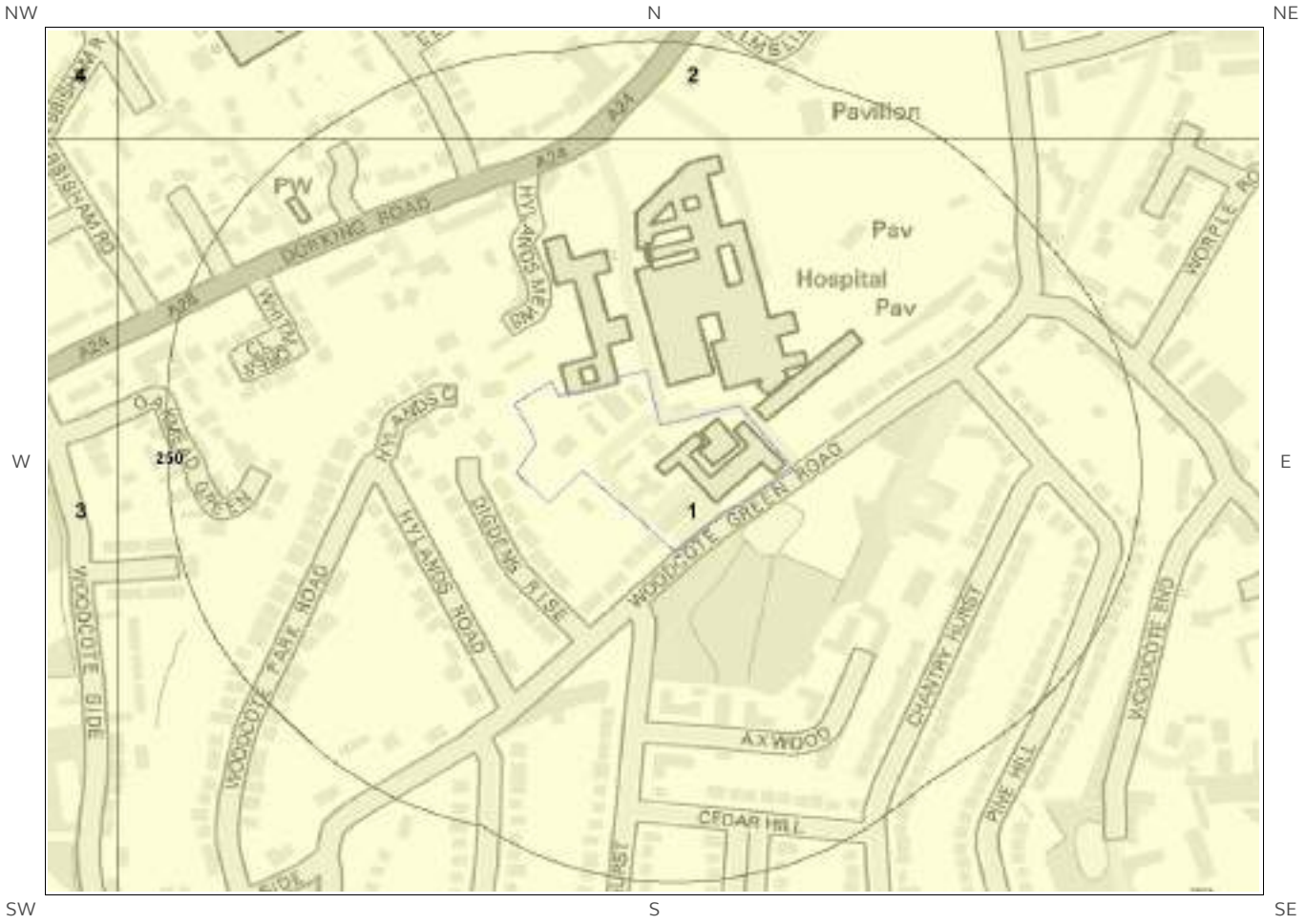
Landslides Legend

6.3 Ground Dissolution of Soluble Rocks map



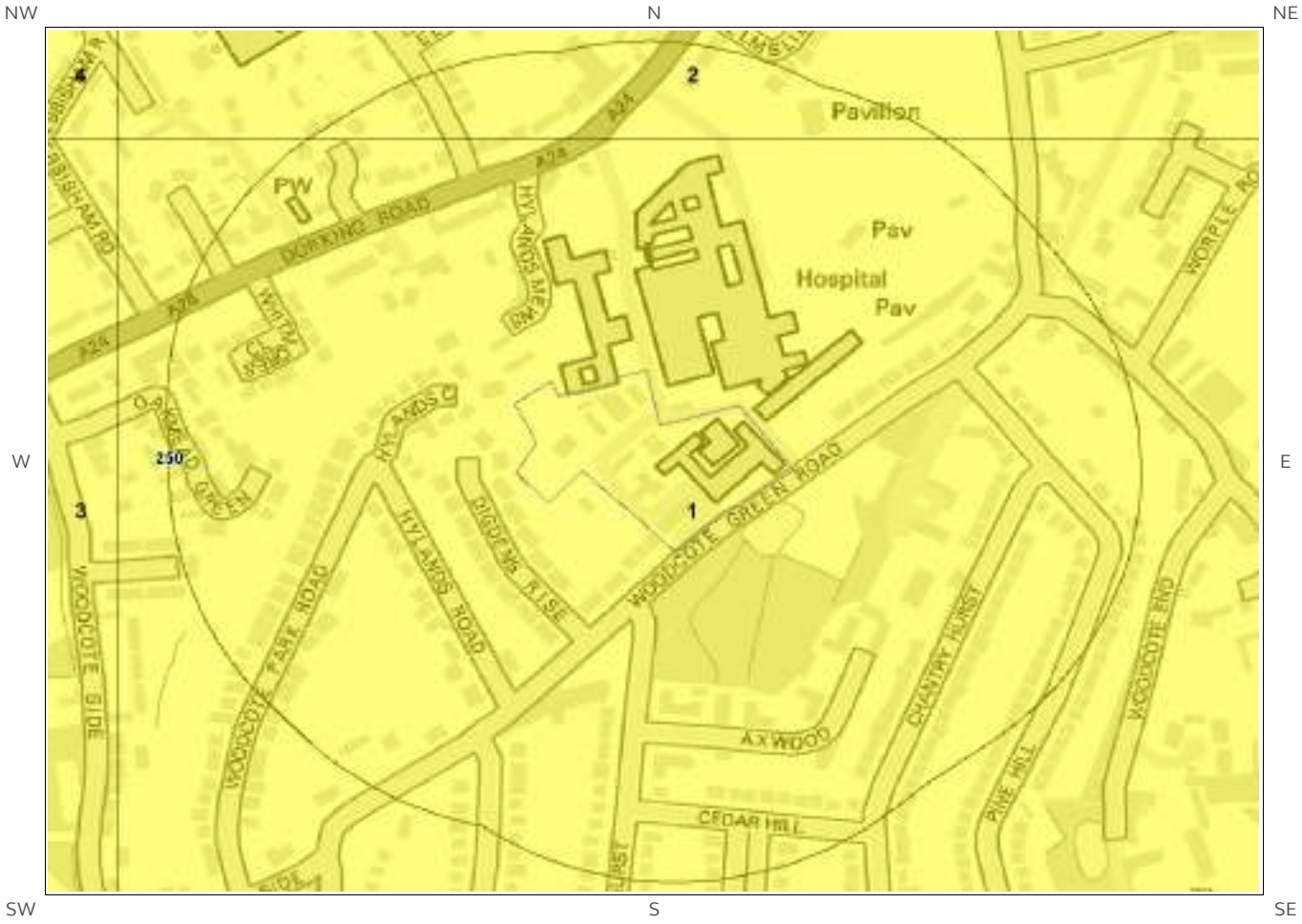
Ground Dissolution Soluble Rocks Legend

6.4 Compressible Deposits map



Compressible Deposits Legend

6.5 Collapsible Deposits map



Collapsible Deposits Legend

6.6 Running Sand map

Running Sand Legend

6 Natural Ground Subsidence

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

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

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

6.1 Shrink-Swell Clays

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

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Moderate	Ground conditions predominantly high plasticity. Do not plant or remove trees or shrubs near to buildings without expert advice about their effect and management. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a probable increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a probable increase in insurance risk during droughts or where vegetation with high moisture demands is present.

6.2 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.

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

6.3 Ground Dissolution of Soluble Rocks

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

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

6.4 Compressible Deposits

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

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

6.5 Collapsible Deposits

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

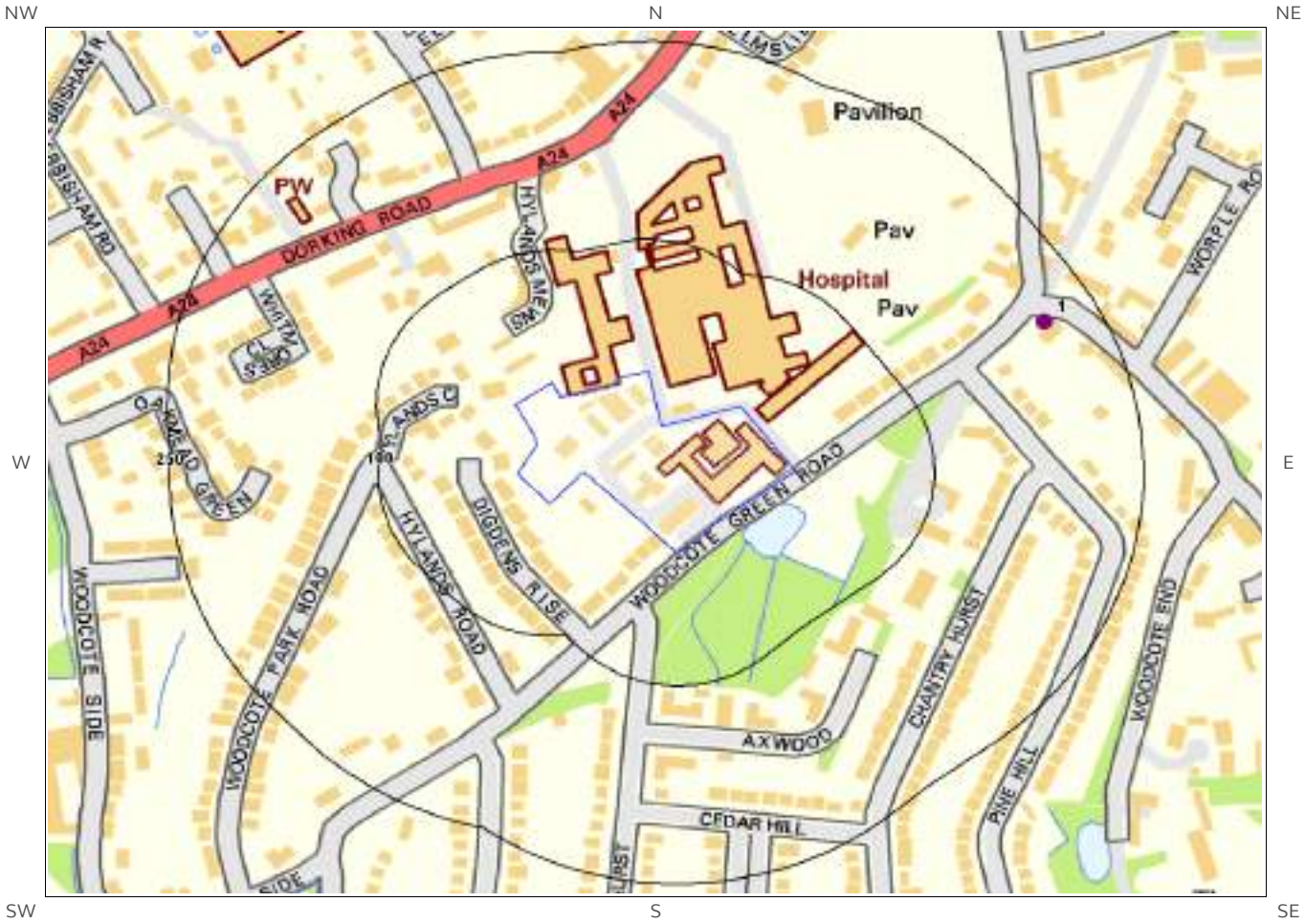
ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible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

6.6 Running Sands

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

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. 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.
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.

7 Borehole Records map



Borehole Records Legend

Site Outline

Borehole Locations

125
250
Search Buffers (m)

7 Borehole Records

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

Records of boreholes within 250m of the study site boundary: 1

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
1	211.0	NE	520664 159861	TQ25NW173	54	1 WOODCOTE GREEN ROAD EPSOM

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

#1: scans.bgs.ac.uk/sobi_scans/boreholes/19365951

8 Estimated Background Soil Chemistry

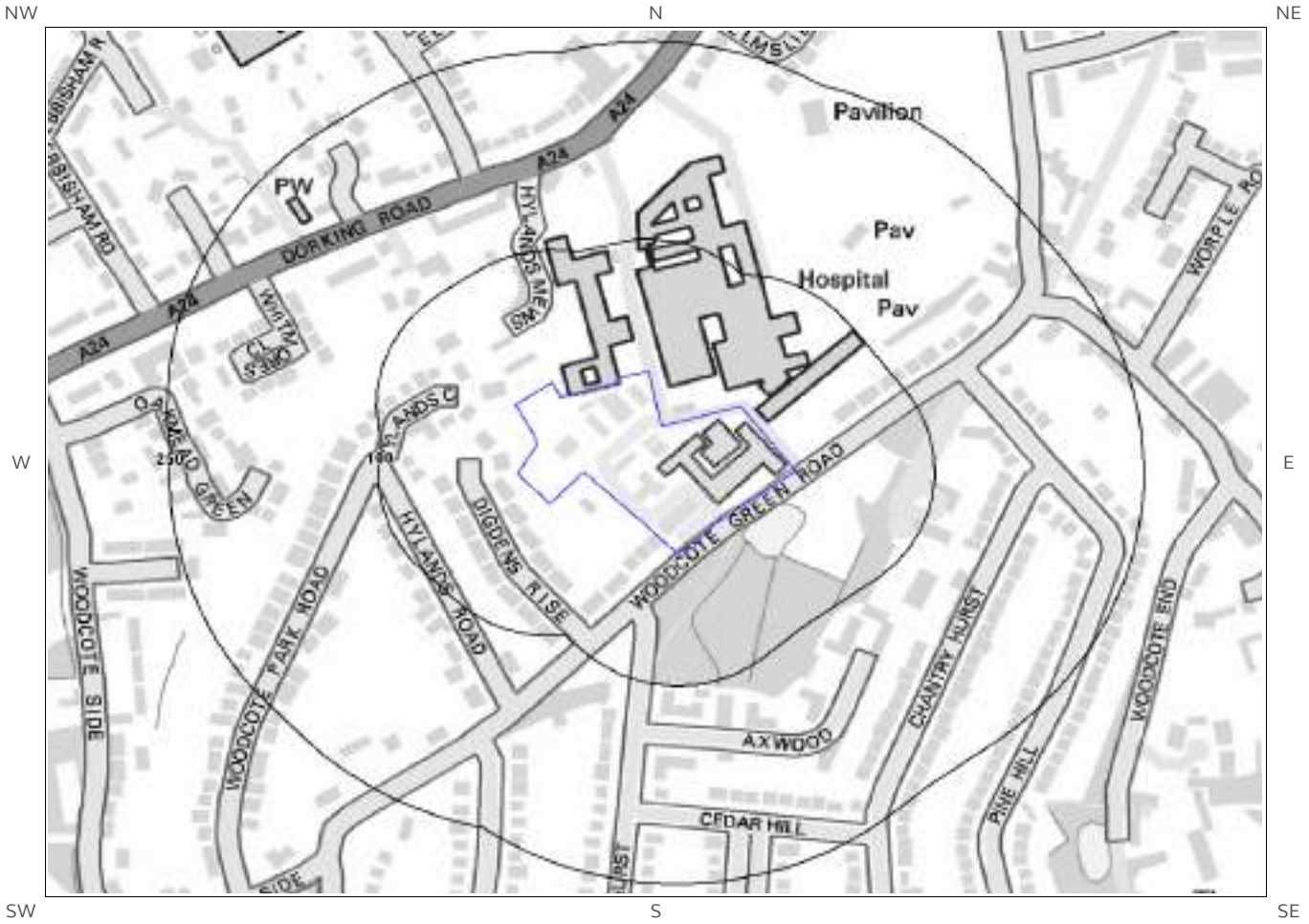
Records of background estimated soil chemistry within 250m of the study site boundary: 5

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

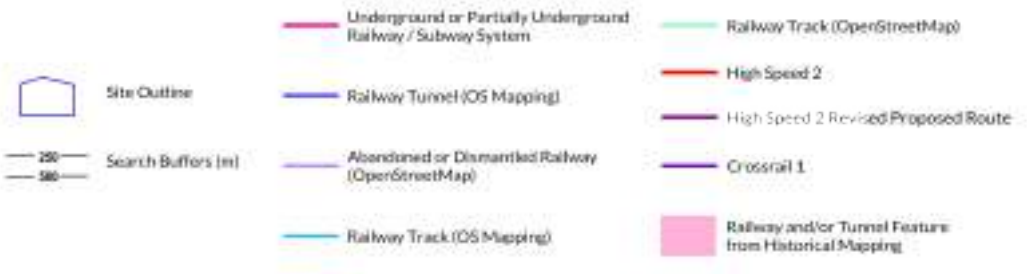
Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	RuSoilLond	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuSoilLond	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuSoilLond	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuSoilLond	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
14.0	E	RuSoilLond	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg

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

9 Railways and Tunnels map



Railways and Tunnels Legend



9 Railways and Tunnels

9.1 Tunnels

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

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

Database searched and no data found.

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

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

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

Database searched and no data found.

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

9.2 Historical Railway and Tunnel Features

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

Have any historical railway or tunnel features been identified within the study site boundary?	No
Have any historical railway or tunnel features been identified within 250m of the study site boundary?	No

Database searched and no data found.

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

9.3 Historical Railways

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

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

Database searched and no data found.

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

9.4 Active Railways

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

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

Database searched and no data found.

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

9.5 Railway Projects

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

Is the study site within 5km of the route of the High Speed 2 rail project?	No
Is the study site within 500m of the route of the Crossrail 1 rail project?	No

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

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

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

Contact Details

Groundsure Helpline

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info@groundsure.com

British Geological Survey Enquiries

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:**enquiries@bgs.ac.uk**
Web:**www.bgs.ac.uk**
BGS Geological Hazards Reports and general geological enquiries

British Gypsum

British Gypsum Ltd
East Leake
Loughborough
Leicestershire
LE12 6HX

The Coal Authority

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

Public Health England

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

Johnson Poole & Bloomer Limited

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

Ordnance Survey

Adanac Drive, Southampton
SO16 0AS

Tel: 08456 050505
Website: http://www.ordnancesurvey.co.uk/

Getmapping PLC

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

Peter Brett Associates
Caversham Bridge House
Waterman Place
Reading
Berkshire RG1 8DN
Tel: +44 (0)118 950 0761 E-mail:**reading@pba.co.uk**
Website:**http://www.peterbrett.com/home**

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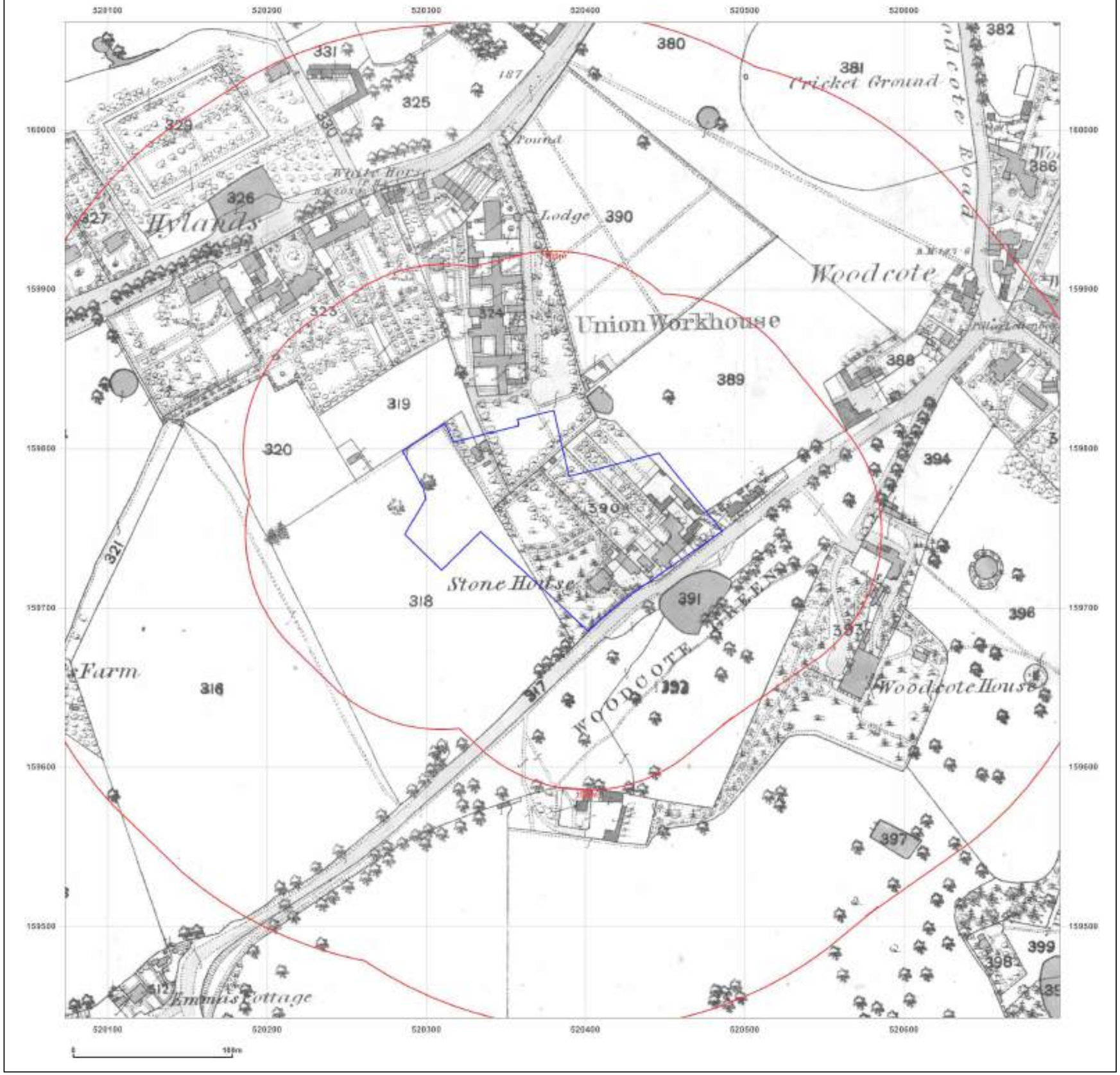

Groundsure INSIGHTS

Site Details:

ROWAN HOUSE, EPSOM GENERAL HOSPITAL, DORKING ROAD, EPSOM, KT18 7EG

Client Ref: Epsom_Hospital_
Report Ref: GS-6266220
Grid Ref: 520385, 159755

Map Name: County Series
Map date: **1840**
Scale: 1:2,500
Printed at: 1:2,500

N
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Surveyed 1840
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

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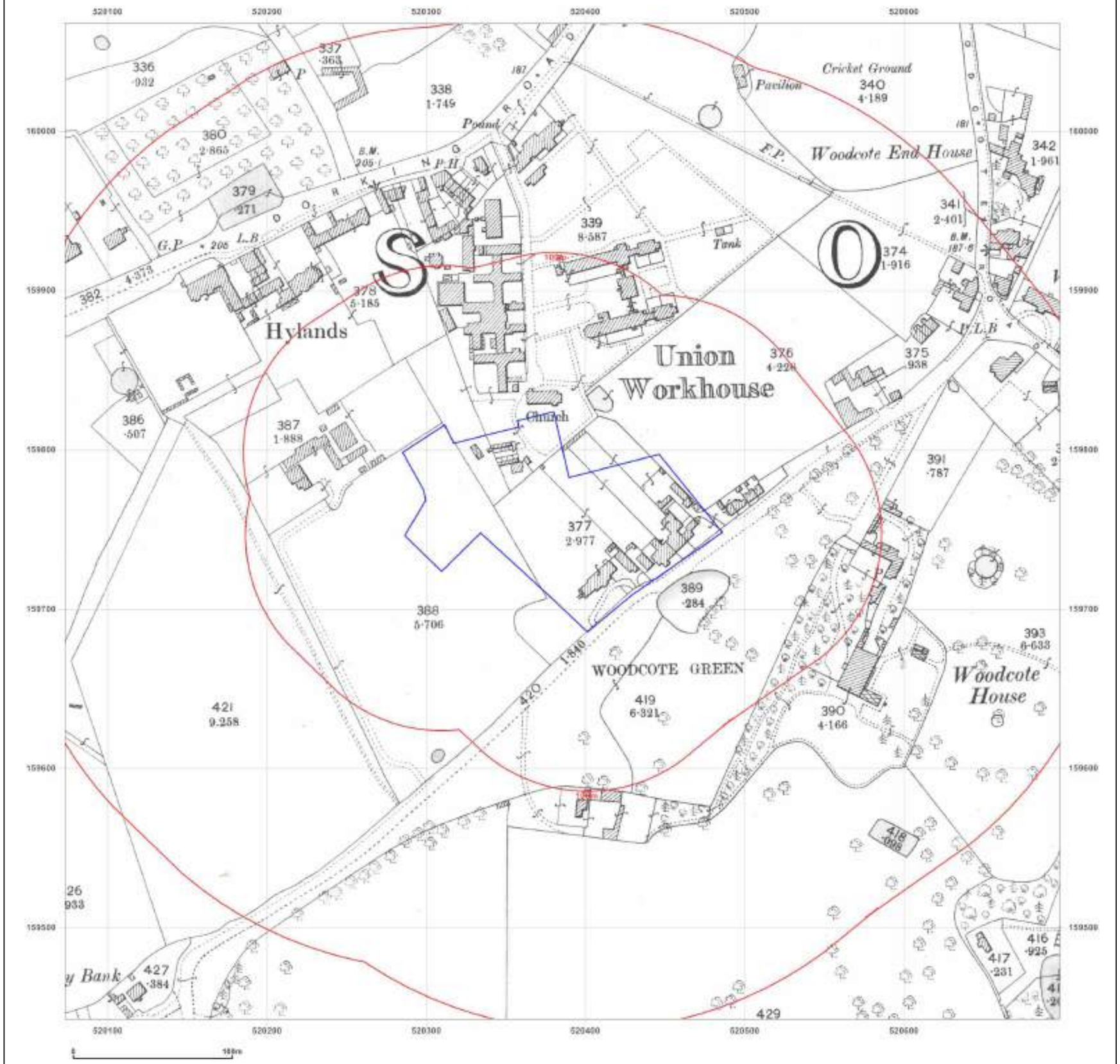

Groundsure INSIGHTS

Site Details:

ROWAN HOUSE, EPSOM GENERAL HOSPITAL, DORKING ROAD, EPSOM, KT18 7EG

Client Ref: Epsom_Hospital_
Report Ref: GS-6266220
Grid Ref: 520385, 159755

Map Name: County Series

Map date: **1896**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1898
Revised 1896
Edition N/A
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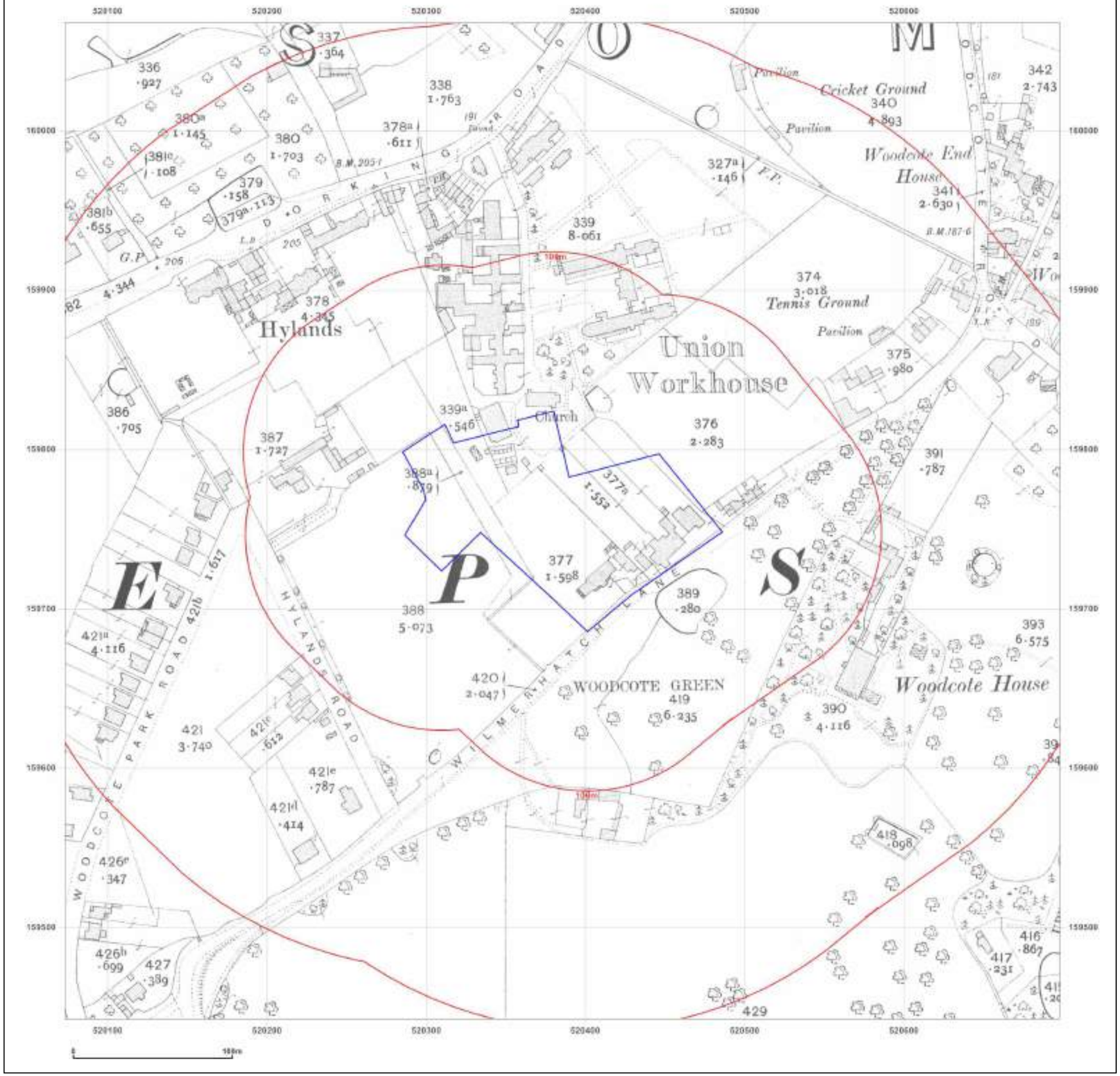

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Site Details:

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Client Ref: Epsom_Hospital_
Report Ref: GS-6266220
Grid Ref: 520385, 159755

Map Name: County Series

Map date: **1913**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1913
Revised 1913
Edition N/A
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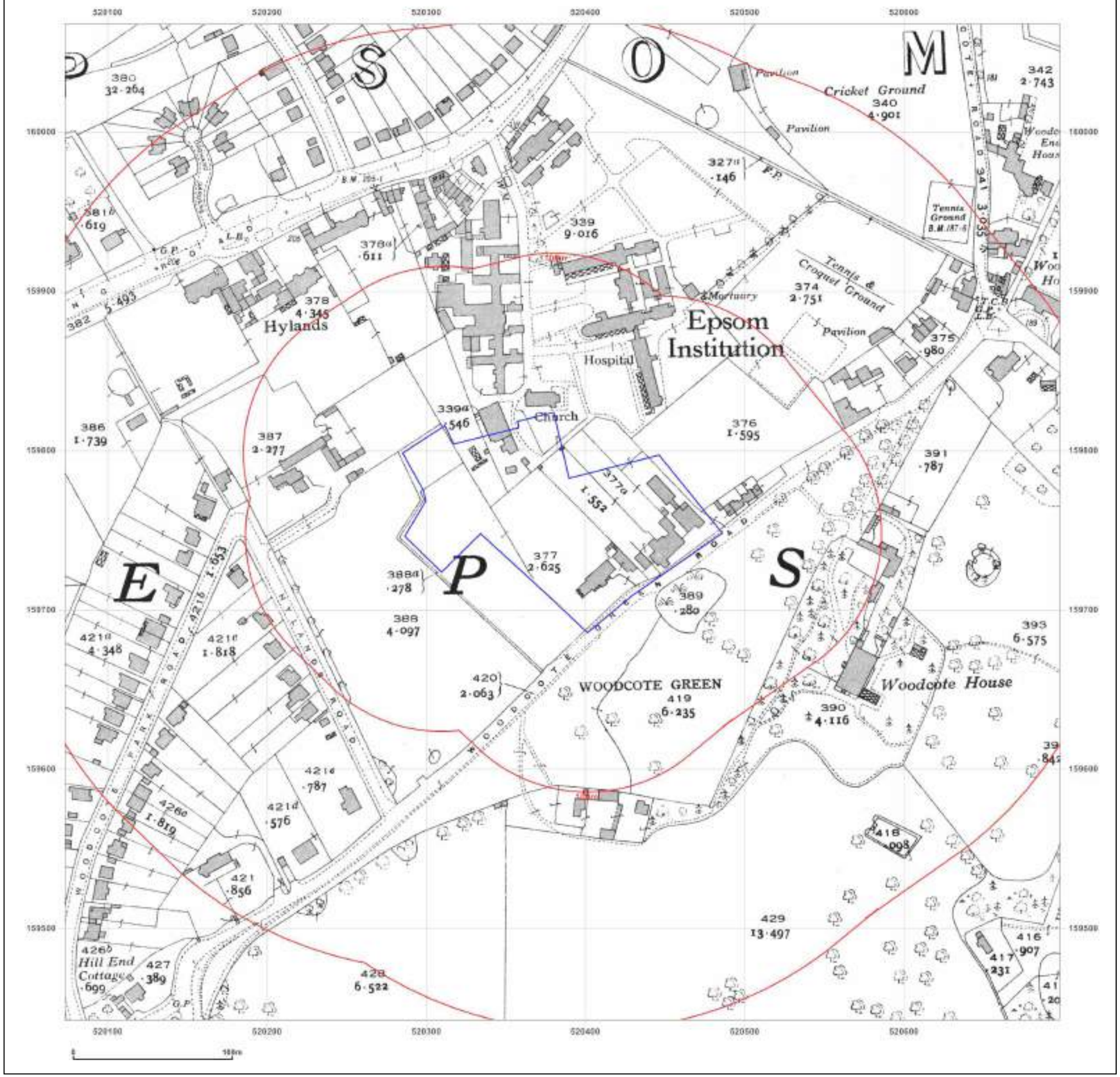

Groundsure INSIGHTS

Site Details:

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Client Ref: Epsom_Hospital_
Report Ref: GS-6266220
Grid Ref: 520385, 159755

Map Name: County Series

Map date: **1932**

Scale: 1:2,500

Printed at: 1:2,500

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Revised 1932
Edition N/A
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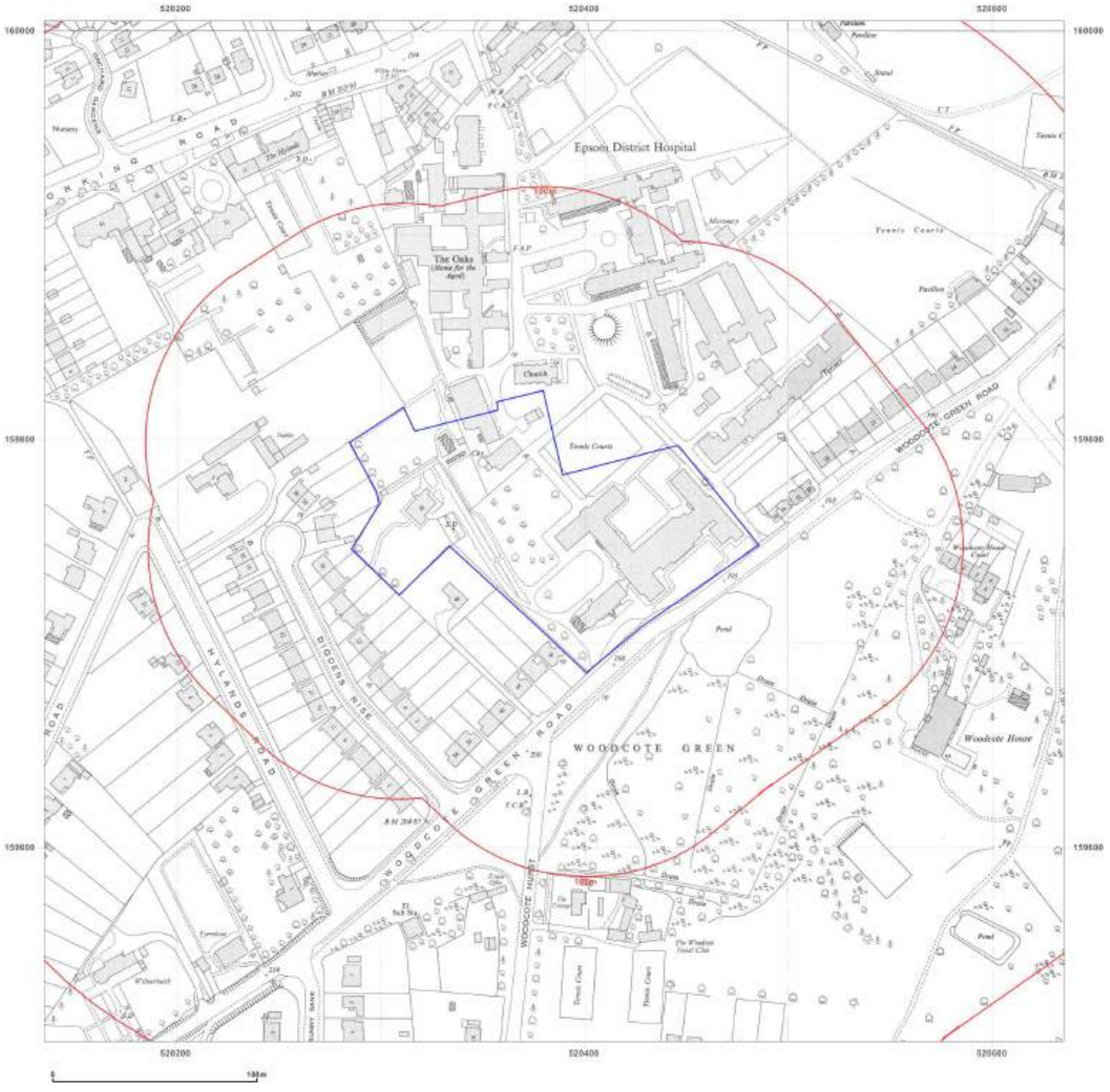

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Site Details:

ROWAN HOUSE, EPSOM GENERAL HOSPITAL, DORKING ROAD, EPSOM, KT18 7EG

Client Ref: Epsom_Hospital_
Report Ref: GS-6266220
Grid Ref: 520385, 159755

Map Name: National Grid

Map date: **1952**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed 1952
Revised 1952
Edition N/A
Copyright N/A
Levelled 1949

Surveyed 1952
Revised 1952
Edition N/A
Copyright N/A
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Surveyed 1952
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ROAD, EPSOM, KT18 7EG

Client Ref: Epsom_Hospital_
Report Ref: GS-6266220
Grid Ref: 520385, 159755

Map Name: National Grid

Map date: **1952**

Scale: 1:2,500

Printed at: 1:2,500

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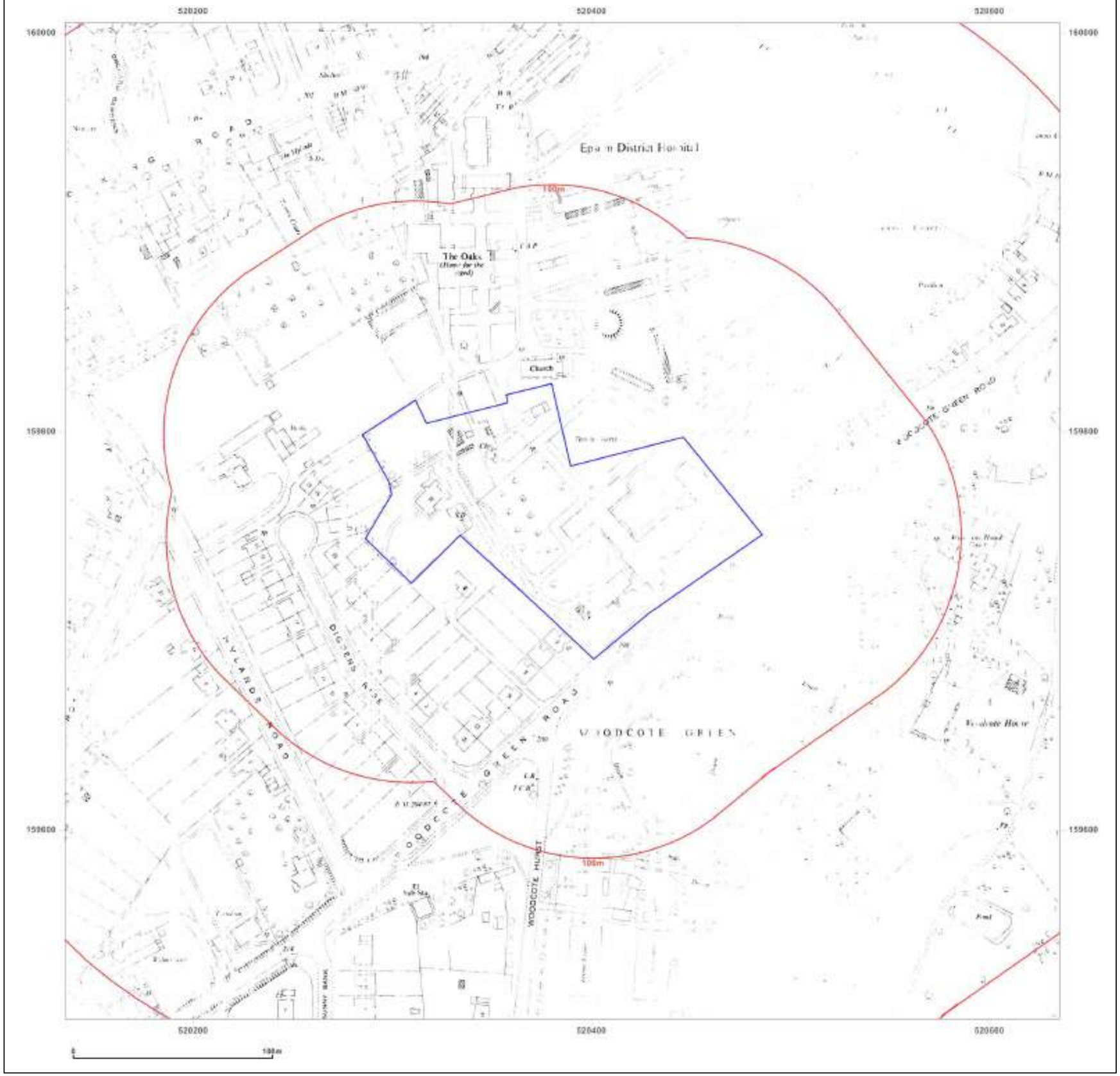

Groundsure INSIGHTS

Site Details:

ROWAN HOUSE, EPSOM GENERAL HOSPITAL, DORKING ROAD, EPSOM, KT18 7EG

Client Ref: Epsom_Hospital_
Report Ref: GS-6266220
Grid Ref: 520385, 159755

Map Name: National Grid

Map date: **1953-1954**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
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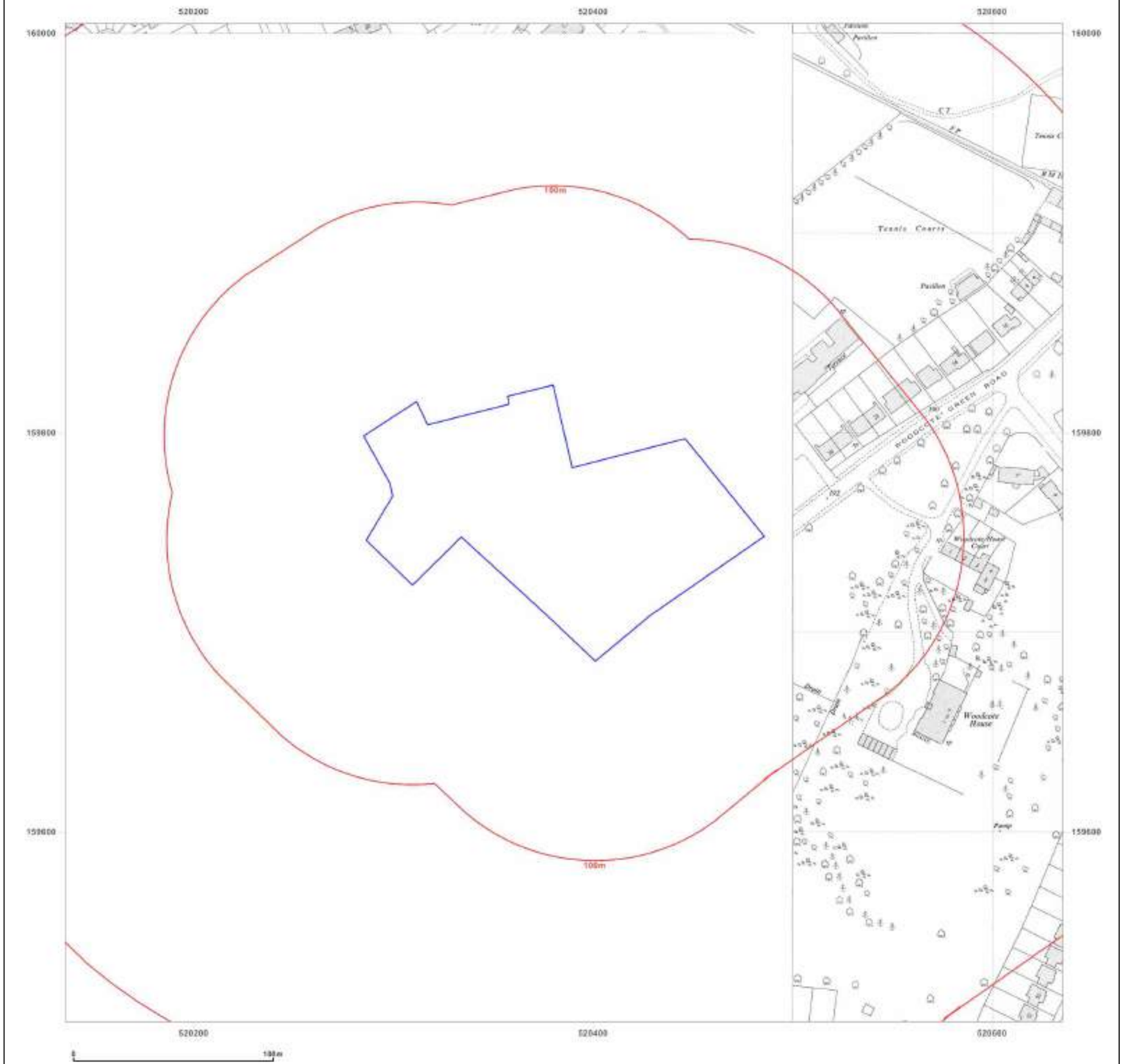

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Site Details:

ROWAN HOUSE, EPSOM GENERAL HOSPITAL, DORKING ROAD, EPSOM, KT18 7EG

Client Ref: Epsom_Hospital_
Report Ref: GS-6266220
Grid Ref: 520385, 159755

Map Name: National Grid
Map date: **1957-1962**
Scale: 1:1,250
Printed at: 1:2,000

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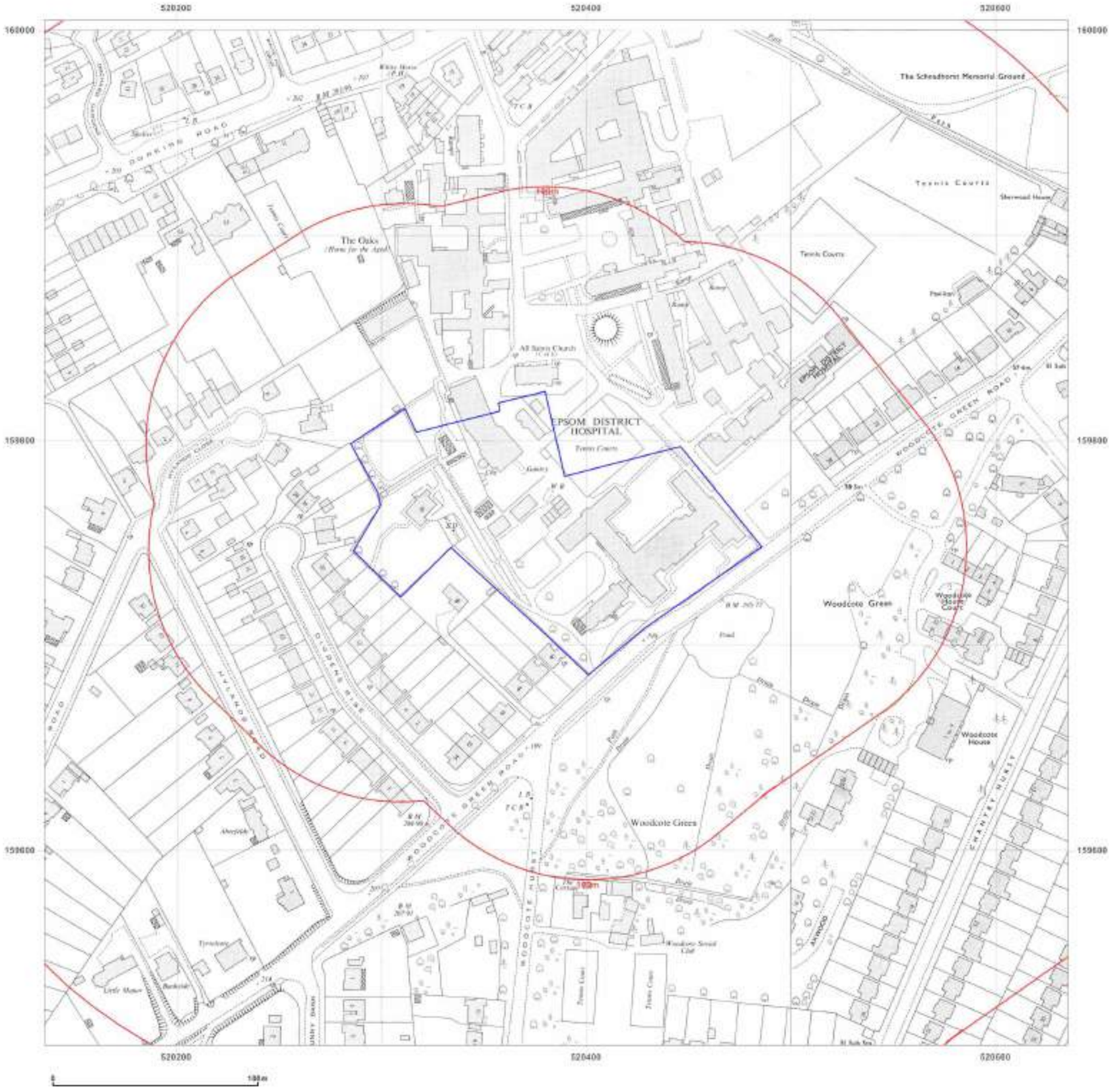

Site Details:

ROWAN HOUSE, EPSOM GENERAL HOSPITAL, DORKING ROAD, EPSOM, KT18 7EG

Client Ref: Epsom_Hospital_
Report Ref: GS-6266220
Grid Ref: 520385, 159755

Map Name: National Grid

Map date: **1965-1970**

Scale: 1:1,250

Printed at: 1:2,000

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Revised 1969
Edition N/A
Copyright 1970
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Revised 1964
Edition N/A
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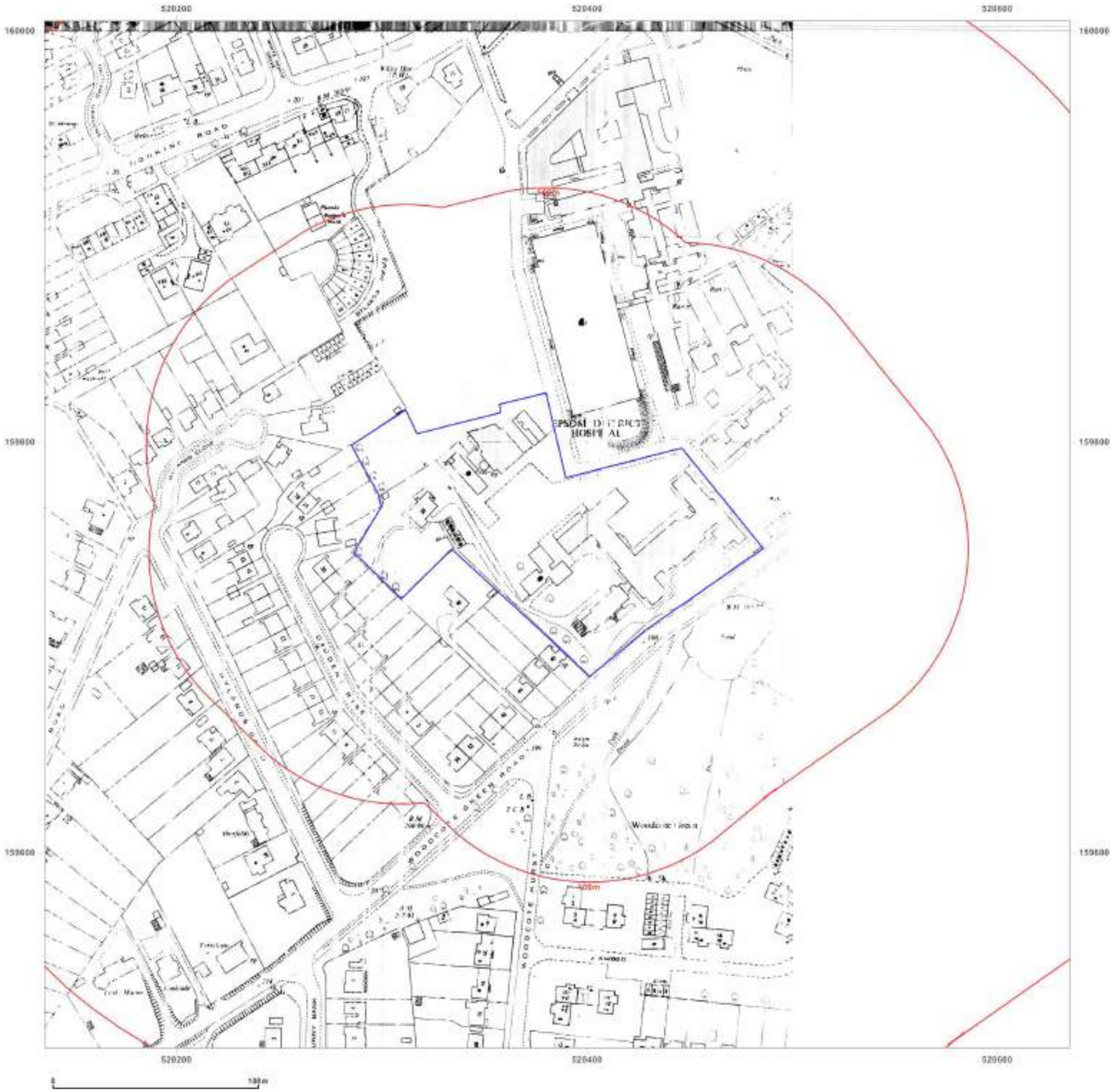

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Client Ref: Epsom_Hospital_
Report Ref: GS-6266220
Grid Ref: 520385, 159755

Map Name: National Grid

Map date: **1970-1974**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed N/A
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Edition N/A
Copyright N/A
Levelled N/A

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Client Ref: Epsom_Hospital_
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Grid Ref: 520385, 159755

Map Name: National Grid

Map date: **1979**

Scale: 1:1,250

Printed at: 1:2,000

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Revised 1979
Edition N/A
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