Intégrale
Understanding Ground Conditions

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Proposed Residential Development
Land to the Rear of 25-35 Orchard Way
Harwell
Didcot
Oxfordshire
OX11 0LH

GEOTECHNICAL AND PHASE 11 CONTAMINATION REPORT

REPORT NO. 19058, July 2019

GEOLOGICAL • GEOTECHNICAL • ENVIRONMENTAL • ENGINEERING

Intégrale is a trading name of Integrale Limited
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Client: Feltham Construction Limited

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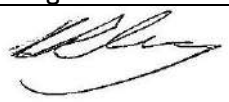
		Signature/Date
Project Co-ordinator & Report Preparation:	Isabel Lees	
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CONFIDENTIALITY STATEMENT

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EXECUTIVE SUMMARY

19058 Land to the Rear of 25 – 35 Orchard Way, Harwell, OX11 0LH – Geotechnical and Phase 11 Contamination Report

Feltham Construction Ltd propose to develop this site by constructing 16 No. detached properties over two plots with associated private gardens, car parking and detached garage bike storage.

The geology map reports the Upper Greensand Formation over the entire site. Old maps show that the area had a predominantly agricultural usage until the late 1960's when the surrounding area became residential and Orchard Way was first constructed.

Intrusive investigation has established a veneer of Topsoil, a very localised mantle (c.0.5m) of Made Ground, and a continuous stratum of variably weathered, firm becoming stiff silty Clay (with bands of medium dense clayey gravel) to depths of about 1-2m below existing ground level. From c.1-2m depth, weak to moderately strong sandstone was proven to 2.5m depth.

The variably Weathered Upper Greensand can provide an adequate bearing stratum for reinforced strip footings with design bearing pressures of 150kN/m^2 at approximately 1m depth increasing to 250kN/m^2 at c.2m depth. A 'flexible' foundation raft or short bored piles are other alternative foundation solutions. Where new structures are close to existing or proposed trees, consideration should be given to the inclusion of compressible material such as clayboard to accommodate ground heave at critical locations. Ground floor slabs may be designed as ground bearing assuming a 'weak' formation on clayey soils or 'normal' on granular soils. Design CBR values of at least 3-4% should adopted for clayey Weathered Greensand at 0.5m depth, increasing to 5+% for gravelly Weathered Greensand.

The classification tests suggest that the founding strata will be of medium to high plasticity and shrinkage potential. All foundations should be designed and constructed in line with NHBC guidelines for buildings near trees.

Elevated carbon dioxide (2.2-6.3%) was proven in both boreholes in the natural ground. In this case where there is raised carbon dioxide it is recommended to increase protection to Characteristic Situation 2. This is generally covered by including a carbon dioxide gas proof membrane as a replacement for a standard DPM and having a sub floor void beneath suspended floor slabs.

Design Sulphate Class of DS-1 and ACEC Class of AC–1d are appropriate for buried concrete.

Based on the desk study and ground investigations completed to date, the risk posed to the development and the future users from a contaminated land viewpoint would appear to be low and no further investigations are recommended.

1.0 INTRODUCTION

Feltham Construction Ltd are proposing to develop this site by constructing 16 No. detached properties over two plots with associated private gardens, car parking and detached garage bike storage. The project architects are Feltham Properties Ltd.

Integrale Limited (Intégrale) are commissioned to undertake a ground investigation and complete a Geotechnical and Phase II Contamination report. The investigation scope was determined by Feltham Construction in liaison with Intégrale.

Planning has already been granted for the area directly adjacent to the gardens of No. 29-35 Orchard Way (P17/V1998/O). The application is still awaiting a decision for the building and garden of No. 25 Orchard Way (P19/V1011/O).

This interpretative report summarises desk studies, describes the scope of fieldworks, laboratory investigations and monitoring, discusses the ground and groundwater conditions encountered, and gives advice on foundations and other geotechnical aspects.

The results of contamination analyses and generic quantitative risk assessment are reported and used to establish a conceptual model of pollutant linkages. Potential implications for the development are discussed and recommendations for design measures given.

2.0 THE SITE

2.1 Location and Description

As shown in Appendix A, the site is located on the land to the rear of 25-35 Orchard Way, Harwell, Didcot. It has a central Ordnance Survey Grid Reference of 448800E, 189133N and postcode OX11 0LH.

The site consists of two plots; Plot 1 being directly adjacent to the gardens of No. 29-35 Orchard Way and Plot 2 being the building and garden of No. 25 Orchard Way. Notes describing the site were prepared during the site visit and are included as Appendix B, together with typical photographs. The main features and pertinent aspects on the site and immediately adjacent land are summarised below, and annotated on Figure 1:

Plot 1: Square plot behind 29 – 35 Orchard Way

Current Use	Public open green space.
Site Area & Plan Shape	c.0.23 hectares. Square plan shape.
Maximum Dimensions	c.45m SW – NE x c.50m NW – SE.
Ground Slopes & Topography	c.82 - 83m AOD with a slightly higher elevation on the NW side.
Buildings & Condition	Not applicable.
Surfacings & Condition	100% soft landscaping.
Vegetation & Trees	Dense bramble scrub along the NW border. Sporadic mature trees along the NE border.
Water Courses	Not applicable.
Site Boundary Features	NE – Garden of No. 43 Orchard Way, NW – Agricultural Field, SE – Residential properties 29 - 35, SW – Garden of No. 27 Orchard Way.
Potential Contamination Issues	None identified.
Potential Geotechnical Issues	None identified.

Plot 2: Garden of No. 25 Orchard Way

Current Use	Garden, property and driveway No. 25 Orchard Way.
Site Area & Plan Shape	Rectangular garden = c.0.16 hectares. Triangular driveway area = c.0.04 hectares
Maximum Dimensions	c.65 x c.25m garden & c.30m x c.25m driveway area.
Ground Slopes & Topography	c.82 - 83m AOD according to the site survey. Relatively flat site.
Buildings & Condition	Single storey property. No signs of distress.
Surfacings & Condition	Soft landscaped garden and gravel driveway.
Vegetation & Trees	Fruit trees at the NW end of the plot. Large bush and mature tree on the SW boundary.
Water Courses	Not applicable.
Site Boundary Features	NW – Agricultural field, NE – Garden of No. 27 Orchard Way, SE – garden of No. 21 Orchard Way, SW – Field.
Potential Contamination Issues	None identified.
Potential Geotechnical Issues	None identified.

2.2 Published Geology

2.2.1 British Geological Survey (BGS) Mapping

BGS geological maps indicate the following strata beneath and adjacent to the site:

Map / Scale	Sheet 253 Abingdon (1971) at 1:63,360 scale.
Artificial Ground	On-Site – None recorded.
Superficial Deposits	On-Site – None recorded.
Solid Geology	On-Site – Upper Greensand Formation – Calcareous Sandstone and Siltstone (early Cretaceous)
Geological Features	None within 500m.

The BGS type description of the Upper Greensand Formation is as follows, '*Sand and sandstone, fine-grained, silt, glauconitic, shelly*'.

2.2.2 BGS Previous Investigation Records

Previous investigation records available on the BGS website under the Open Government Licence include trial pits and boreholes sunk to 4.5 m and situated c.600m northeast. This proved:

- GL to 0.25m – TOPSOIL
- 0.25 to 2.25m – MADE GROUND
- 2.25 to 4.5m – Dense clayey sandy SILT with inclusions of weak siltstone (UPPER GREENSAND)

Groundwater strikes were encountered at 1.4 and 1.9m depth.

2.3 Previous Investigations

No previous investigations within 500m of the site in the same anticipated geology were found.

2.4 Outline History

Historical maps obtained from a Groundsure report are included in Appendix C. These indicate the following pertinent information:

Map Date	Site Features/Land Use	Adjacent Features (distance from site)
1876	Site comprised of undeveloped agricultural fields.	Limetree House Farm situated c.240m E. Adjacent to agricultural fields in all directions.
1899	No significant changes.	Boundary of an orchard c.80m NE.
1933	No significant changes.	Orchard has expanded slightly.
1969	Two detached buildings with gardens were constructed in the SE corner.	Orchard Way was constructed, consisting of multiple semi-detached properties (immediately E). Recreation Ground directly S. Substation c.50m NE. Fields to the W.
1990-1994	No significant changes.	No significant change except an orchard has been established in the area to the W.

2.5 Geological Information

The following pertinent information on activities within 250m of the site has been extracted from the Groundsure report.

2.5.1 Ground Working and Mining

Historical Surface and Underground Working Features	None within 500m.
Current Ground Workings	None within 100m.
Mining, Extraction and Natural Cavities	110m SW – Potentially sporadic underground mining of chalk.

2.5.2 Natural Ground Subsidence

	Hazard Rating
Shrinking/Swelling Clay Ground Stability Hazard Potential	Negligible.
Landslide Ground Stability Hazard Potential	Very Low.
Ground Dissolution Stability Hazard Potential	Negligible.
Compressible Deposits Ground Stability Hazard Potential	Negligible.
Collapsible Deposits Ground Stability Hazard Potential	Very Low.
Running Sands Ground Stability Hazard Potential	Very Low.

2.6 Background Soils Chemistry

The Groundsure report includes BGS estimated background soil chemistry for 5 metals within shallow soils. This indicates that naturally occurring arsenic (As), cadmium (Cd), chromium (Cr), nickel (Ni) and lead (Pb) are not raised in this area. Interpretation suggests that at these levels, such metals would be unlikely to exceed generic assessment criteria for residential. Current National Planning Policy guidance does not consider naturally occurring metals as evidence of contamination.

2.7 Environmental Information

The following pertinent information on activities within 250m of the site has been extracted from the Groundsure report.

2.7.1 Historical Industrial Sites

Potentially Contaminative Uses	Electricity Substation	40m NE (1969-1990)
Potentially Infilled Land	None within 250m	

2.7.2 Environmental Permits, Incidents and Registers

	Details	Distance/ Direction
Historic IPC Authorised sites	-	-
Records of Part A (1) and IPPC Authorised Activities	-	-
Records of Red List Discharge Consents	-	-
Records of List 1 Dangerous Inventory Sites	-	-
Records of List 2 Dangerous Substance Inventory Sites	-	-
Records of Part A (2) & Part B Activities and Enforcements	-	-
Records of Category 3 or 4 Radioactive Substances Authorisations	-	-
Records of Licenced Discharge Consents	-	-
Water Industry Referrals (discharges to public sewer)	-	-
Planning Hazardous Substance Consents & Enforcements	-	-
COMAH & NIHHS Sites	-	-
National Incident Recording System List 1 & 2	-	-
Contaminated Sites under Part 2A EPA 1990	-	-

2.7.3 Landfill and Other Waste Sites

	Details	Distance/ Direction
Historic and Current Landfill Sites	-	-
Waste Treatment/Transfer/Disposal Sites	-	-

2.7.4 Current Land Uses

	Details	Distance/ Direction
Current Industrial Sites	Electricity Substation	44m NE
Petrol and Fuel Sites	-	-
NG High Voltage Underground Electricity Transmission cables and High-Pressure Gas Transmission Pipelines	-	-

2.8 Hydrogeology & Hydrology

2.8.1 Aquifers

Aquifer within Superficial Deposits	Not applicable.
Aquifer within Bedrock Deposits	Principal Aquifer.
Aquifer Definitions	
Principal Aquifers	**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**

2.8.2 Surface and Groundwater Abstraction Licences

	Number	Distance/ Direction
Surface Water Abstraction licences	None within 250m.	
Groundwater Abstraction licences		
Potable Water Abstraction Licences		

2.8.3 Source Protection Zones

	Number	Distance/ Direction
Source Protection Zones	None within 250m.	
Source Protection Zones within Confined Aquifer		

2.8.4 Groundwater Vulnerability and Soil Leaching Potential

Soils Permeability	Intermediate leaching potential.
Anticipated Groundwater Table Depth	Between 5-10m depth.
Anticipated Groundwater Flow Direction	SW to NE.

2.8.5 Detailed River Network and River Quality

Surface Water Courses and Flow Direction	347m E and 427m NW.
Biological River Quality	None identified.
Chemical River Quality	None identified.
Environment Agency Soils Classification	None identified.
Surface Water Features	None identified.

2.8.6 Flood Risk

Zone 2 and Zone 3 River and Coastal Zone Flooding Areas	None identified.
Flood Rating (Risk of Flooding from Rivers and the Sea)	Very Low.
Flood Defences	None identified.
Areas benefiting from Flood Defences and Flood Storage	None identified.
Groundwater Flooding Susceptibility Areas	Clearwater Flooding – Associated with unconfined aquifers.

2.9 Environmentally Sensitive Sites

The Groundsure report highlights the following sites on or within influencing distance of the site, which could have an impact within the planning process for this site.

Identified designated environmentally sensitive sites	Area of Outstanding Beauty (AONB) - North Wessex Downs (195m SW).
Nitrate Vulnerable Zones	On-Site.

2.10 Groundsure Radon Risk Information

The Groundsure report (Appendix C) indicates that the specific site does not lie within a Radon Affected Area, as less than 1% of the properties are above the action level.

Where Groundsure conclude that no radon gas protection methods are needed, the local authority may have more conservative requirements, based on the indicative maps, and this aspect should be confirmed with their Building Control department.

2.11 Unexploded Ordnance (UXO)

A preliminary screening for the site was requested and completed by 1st Line Defence. A copy of the report is included in Appendix C. Overall 1st Line Defence stated that,

'*Given the findings of this preliminary report it is recommended that no further action be taken in regards to this site*'.

Consequently, this matter is not considered further.

3.0 CONCEPTUAL EXPOSURE MODEL

3.1 General

This section draws together desk study information, outlines an initial conceptual exposure model, and provides a qualitative assessment of potential contamination via a source-pathway-receptor framework for the proposed development.

3.2 Proposed Development

Details of the proposed development are shown on Appendix D and can be summarised as:

Buildings	16 detached properties over two plots with garage/ bike storage.
Car Parking	2 No. car park spaces per property (32 No. in total).
Access Roads	Access roads to be built from Orchard Way.
Landscaping	Traditional private gardens.
Anticipated Foundations and Floor Slabs Shown on Preliminary Drawings	Currently unknown.
Building Level	Presumed at existing grade.

3.3 Potential Sources of Contamination

The desk study has been used to identify the likely remnant contaminant sources and distribution. The potential current and historical on- and off-site sources and the contaminants associated with these, derived using CLR8 Potential Contaminants for the Assessment of Land, and through experience of industrial land use, are detailed below.

Potential Contaminants Associated with On-Site Sources			
Description	Metals, semi-metals, non-metals, inorganic chemicals and others	Organic chemicals	Ground Gases & Vapours
No on-site potential contamination.			

Potential Relevant Contaminants Associated with Off-Site Sources			
Description	Metals, semi-metals, non-metals, inorganic chemicals and others	Organic chemicals	Ground Gases & Vapours
Electricity substation (44m NE)	As, B, Cd, Cr, Cu, Pb, Hg, Ni, Zn, NO3-, SO42-, S2-, asbestos, pH	Aromatic hydrocarbons, chlorinated aliphatic hydrocarbons, PCBs	-

3.4 Potential Pathways

To understand the potential risks posed by the contaminants to human receptors, the possible contaminant pathways need identified. The CLEA model (DEFRA & EA 2002) indicates potential exposure routes for assessing risks to human health for a residential setting with home-grown produce uptake as follows:

- Dermal exposure;
- Inhalation of particulates;
- Inhalation of soil vapour (indoor and outdoor);
- Inhalation of groundwater vapour (indoor and outdoor);
- Direct ingestion of soil;
- Ingestion of home-grown produce and soil attached to vegetables.

The potential pathways with respect to Controlled Waters will include:

- Downward migration through Made Ground and to underlying Principal Aquifer;
- Lateral migration through Made Ground to surface water;
- Lateral migration through groundwater to surface water;
- Lateral migration via man-made pathways (e.g. services) to surface water.

3.5 Potential Receptors

For a residential end use and the known neighbouring land uses, the potential receptors to contamination (if present on site) are:

- Immediately adjacent residents – critical receptor female child;
- Construction workers – critical receptor female adult;
- Future site users – critical receptor female child.

The likely sensitive Controlled Waters receptors are considered to be:

- Principal Aquifer (On-Site);
- Tributary of the River Thames, (347m E);
- Tributary of the River Thames, (427m NW).

Due to the topography of the site and surroundings, continuity of geological strata and drainage pattern the Principal Aquifer is considered the most likely receptor.

3.6 Conceptual Site Model with Respect to Human Health

The conceptual site model has been developed based upon the source-pathway-receptor linkages.

SOURCE		PATHWAY		RECEPTOR
Contaminated soils	→	Dermal exposure	→	On-site female child
Contaminated soils	→	Inhalation of soil dust	→	On-site female child
Contaminated soils	→	Indoor/Outdoor inhalation of soil vapour	→	On-site female child
Contaminated groundwater	→	Inhalation of groundwater vapours	→	On-site female child
Combustible/toxic ground gases	→	Indoor inhalation	→	On-site female child
Contaminated Soils	→	Direct ingestions of soil	→	On-site female child
Contaminated soils	→	Ingestion of homegrown produce and soil attached to vegetables	→	On-site female child

3.7 Conceptual Site Model with Respect to Controlled Waters

The conceptual site model has been developed based upon the source-pathway-receptor linkages.

SOURCE		PATHWAY		RECEPTOR
Contaminated soils	→	Leaching from soils or migration of liquid contaminants through the unsaturated zone.	→	Aquifer
Contaminated soils	→	Leaching from soils or migration of liquid contaminants through service runs	→	Aquifer
Perched water contamination	→	Transport in groundwater	→	Aquifer
Groundwater contamination	→	Transport in groundwater	→	Aquifer

4.0 GROUND INVESTIGATION

In view of the anticipated ground conditions, current site layout and proposed development, the following scope of investigation was completed.

4.1 Trial Pitting

4 No. trial pits were mechanically excavated using a 4T excavator on 21st May, 2019. The trial pit locations, chosen by Intégrale, are shown on Figure 1 and were referenced as TP 1 - 4. The general procedures adopted during trial pitting, together with the detailed trial pit records are included in Appendix D.

Originally Feltham Construction requested trial pitting to be completed in Plot 2. However, due to access restriction this was not possible.

4.2 Soakaway Tests

A soakaway test was attempted in TP1. The trial pit was filled from a bowser and the water level measured over time. The general procedures adopted during soakaway testing together with the soakaway records are included in Appendix E and discussed in Section 6.

4.3 Lined Sampling Boreholes

5 No. small diameter boreholes were drilled with a tracked, open-drive percussive lined sampler rig on 21st May, 2019. These borehole locations, chosen by Intégrale, are shown on Figure 1 and were referenced as WS 1 - 5. Boreholes were sunk to 2m depth. The general procedures adopted during windowless sampling, together with the detailed borehole records are included in Appendix F.

4.4 Groundwater and Soils Gas Standpipe Installations and Monitoring

Standpipes were installed in 2 No. boreholes, one in each of the plots, to 2m depth, and details are given on the borehole records. Monitoring has been undertaken on 3 No. occasions and the results are included in Appendix G, together with the general procedures adopted for installing standpipes.

4.5 Geotechnical Laboratory Testing

A schedule of complementary soils testing was prepared by Intégrale and the tests by SW Geotechnical Ltd and I2 Analytical Ltd. The results are provided in Appendix H and I and the following shows the testing strategy:

Location	Depth (m)	Stratum	Testing	Criteria for test selection
WS5	0.7	WUG	BRE Reduced Suite	Concrete classification
WS1	0.8	"	"	"
WS3	1.3	"	"	"
WS4	0.5	"	"	"
TP1	0.5	"	Natural Moisture Content and Atterberg Limit	Strata classification and characteristics
TP3	0.9	"	"	"
WS2	1.00	"	"	"
TP4	0.4	"	Natural Moisture Content	Strata characteristic
WS3	0.7	"	"	"
WS7	1.3	"	"	"

*WUG - Weathered Upper Greensand

4.6 Contamination Analyses

In view of the desk study and fieldwork findings, a schedule of soils analyses was prepared. The analyses were completed by I2 Analytical Ltd and the results are provided in Appendix I. The following shows the testing strategy:

Location	Depth (m)	Stratum	Testing	Criteria for test selection
WS1	0.3	MG	WAC 2 Stage	Waste Classification
TP2	0.1	"	WAC 2 Stage	"
TP3	0.1	"	Generic Contamination Suite, Total TPH and Asbestos Screen.	Contamination classification and characterisation
WS2	0.2	"	"	"
WS3	0.05	"	"	"
TP1	0.1	TS	"	"

*MG – Made Ground
TS - Topsoil

4.7 Referencing

Locations of the exploratory positions were set out using taped offsets from existing features.

5.0 GROUND & GROUNDWATER CONDITIONS

5.1 Summary of Strata Encountered

The strata encountered across the site are broadly similar as shown on the tentative geological cross-section in Figure 2. They can be summarised as follows:

Depth (m)	Description
GL to 0.1/0.2	TOPSOIL
0.l/0.2 to 0.15/0.45	MADE GROUND: (Comprising firm slightly sandy slightly gravelly silty Clay)
0.15/0.4 to 1.1/2.0	Firm becoming stiff slightly gravelly silty sandy CLAY with occasional bands of sandstone gravel. (WEATHERED UPPER GREENSAND FORMATION)
1.1/2.0 – 1.45/2.5	Moderately weak to moderately strong SANDSTONE (UPPER GREENSAND FORMATION)
1.45/2.5+	Refusal on SANDSTONE (UPPER GREENSAND FORMATION)

No groundwater was encountered to the depths investigated.

5.2 Strata Properties

5.2.1 Made Ground and Topsoil

Topsoil, typically 100 - 250mm thick, was proven in all the exploratory positions. Made Ground was proven in several of the exploratory positions and can be categorised as:

Made Ground Type/Location	Silty Clay
Min/Max. thickness (m)	0.1 - 0.4m proven.
Main Constituents	Brick, wood, charcoal and sandstone.
Properties	Soft to firm. SO4: 0.051 – 0.107%. pH: 7.3 – 7.6.
Visual Contamination/Odours	None.

5.2.2 Weathered Upper Greensand Formation

For the purposes of this report the uppermost horizons of the natural ground have been defined as weathered where firm becoming stiff silty clay is encountered and relatively un-weathered where weak to moderately strong sandstone is encountered. The properties can be summarised as

Stratum	Weathered Upper Greensand Formation (Clay)	Upper Greensand Formation (Sandstone)
Min / Max Thickness (m)	0.9 to 1.6m proven.	0.1 to 1.4m proven.
Soil Strength /Properties	Firm becoming stiff. SPT N = 10 – 25. LL: 44 – 69, PL: 21 – 31 & PI: 23 – 42 Medium to high volume change potential.	Weak to moderately strong. SPT N – refusal between 1.8 and 2.0m depth.
Occurrence	Proven across complete site.	Proven across complete site.

Stratum	Weathered Upper Greensand Formation (Clay)	Upper Greensand Formation (Sandstone)
Sulphate /pH	SO4 0.025 – 0.064g/l, 7.7 – 8.4pH	-
Visual Contamination/ Odours	None.	None.

There is some evidence from WS1 and WS2 in the western and central area of Plot 2 that the strata are more clayey, with sandstone not proven until 2m depth.

5.3 Groundwater

Groundwater was not proven in any of the exploratory positions during the site investigation or subsequent monitoring visits.

5.4 Ground Gas

The monitoring indicates slightly elevated carbon dioxide present in both boreholes. A maximum flow rate of 0.1 l/hr was recorded. Summary results are detailed below with full information provided in Appendix F.

Exploratory Location	WS1	WS5
Response Zone (m) / Strata	WUG	WUG
Evidence of Contamination	None.	None.
Monitoring Visits (No.)	3	3
Methane (%)	0.0-0.1	0.0-0.1
Carbon Dioxide (%)	2.3-2.6	2.2-6.3
Oxygen (%)	12.0-18.9	14.6-18.7
Gas Flow (litres/hr)	0.0-0.1	0.0-0.1
Water levels (m)	DRY	DRY
Atmospheric Pressure Range (mb)	994-1020	994-1020

*WUG -Weathered Upper Greensand

6.0 GEOTECHNICAL CONSIDERATIONS

6.1 Scheme Details & Structural Loadings

The proposed housing development will be constructed at, or close to, existing grade, locally on shallow (c.0.5m) upfilling. Intégrale understand that the development is to comprise sixteen 2-storey detached houses of load bearing masonry (and/or timber framed) construction with detached garages. Foundation line loads could be between 50 - 100kN/m run. Combined 'dead' and 'live' loading on the ground floor slabs will be less than 10kN/m^2. The development will also include new access roads, car parking, conventional gardens and perhaps limited, managed communal soft landscaping.

6.2 Site Preparation and Earthworks

Topsoil, typically 200mm thick, and any localised areas of particularly poor quality Made Ground, should be removed from beneath proposed building and hardstanding areas. Excavations to at least 1.5 - 2m depth are likely to be feasible with conventional soils excavating machinery. Pneumatic tools may be required to break out existing foundations, masonry obstructions, but more importantly sandstone bands in the bedrock.

Much of the spoil resulting from excavations in the existing Made Ground may prove be unsuitable for reuse as structural fill. At least 25 – 50% of spoil resulting from excavations in the Weathered Greensand should be suitable for reuse, except where invaded by roots and rootlets.

Whilst some excavations to 2m depth may well remain dry, others may encounter slight or moderate infiltration/ perched water seepage. Such excavations can be kept dry by intermittent pumping from a convenient sump, unless they simply soak away.

Temporary excavations in the existing Made Ground and variably weathered Greensand will probably stand unsupported in the short term at gradients of about 1 on 2 or a little steeper. Excavations below approximately 1m depth will require sheeting and shoring, particularly if personnel are to enter. Formations in the more clayey soils will be slightly susceptible to deterioration due to site traffic and weather and should be protected immediately on exposure with 150mm of granular material, or 75mm of lean mix concrete. All desiccated and root invaded (particularly) clayey soils should be excavated and made good with well compacted granular material.

6.3 Foundations and Ground Floor Slabs

6.3.1 Typical Ground Conditions

The investigation has proven a veneer of Topsoil, a very localised mantle (c.0.5m) of existing Made Ground, and a continuous stratum of variably weathered, firm becoming stiff silty Clay (with bands of medium dense clayey gravel) to depths of about 2m below existing ground level. At 1 - 2m depth is a weak becoming moderately strong sandstone, proven to 2.5m. The groundwater table appears to be below this depth and consequently the variably weathered Greensand can provide an adequate bearing stratum for strip footings.

6.3.2 Design Bearing Pressures for Strip Footings

The following design bearing pressures are given for guidance:

Depth (m) BEGL	Stratum (SPT 'N')	Design Bearing Pressure (kN/m^2)		
		1m*	2m*	3m*
c.1.0m	Firm to stiff/ medium dense WG. (N=15)	150	125	-
c.2.0m	Very weak Greensand Sandstone (N=50) (Only proven to shallow depth)	250	225	-

* WG = Weathered Greensand

All foundations must be in line with the recommendations and guidance given in NHBC Chapter 4.2 'Building near Trees'. The classification tests suggest that the shallow depth founding strata will be of medium to high plasticity and shrinkage potential, however, there is going to be a progression to sandy non plastic soils. The existing trees are generally moderate water demand and based on foundations within 1m influence the calculated foundation depth would be 2.2m. However, at this depth, the foundations would likely be in non-shrinkable sandstone. There is no reason to extend foundations below the weathered sandstone bedrock and all foundations should be taken down through the shrinkable soils and founded in the non-shrinkable soils below. The final foundations depths could be less than those calculated in line with the NHBC guidance.

The bearing pressures given above, are inevitably 'conservative' because the deeper underlying strata have not been proven. At the intensities of loading given above, total settlements should not exceed 25mm, and angular rotation along a typical 10m long (mesh reinforced) strip footing of not worse than 1 in 750. There will be variations in formation compressibility (clay v sandstone) and consequently light gauge mesh reinforcement should probably be included in all footings to even out differential settlement.

Deeper strip footings may result in significant quantities of excavation spoil and if it is inconvenient to relocate surplus material safely on-site, consideration may be given to short bored piles.

Where new structure is very close to existing (or proposed) trees and roots are anticipated, consideration should be given to inclusion of compressible material (clayboard etc) to accommodate ground heave at 'critical' locations.

6.3.3 Other Shallow Reinforced Spread Foundations

Consideration may be given to the adoption of a 'flexible' foundation raft, where there is continuity of reinforcement, poured monolithically, and where the intensity of loading on the underside varies. This type of raft is relatively inexpensive. Intégrale can give further advice on flexible rafts, on request.

6.3.4 Ground Improvement

It seems unlikely that vibro ground improvement will have any significant advantage at this site. Indeed, it is unlikely that the minimum penetration of 2m depth, could be achieved in all areas.

6.3.5 Piles

Short bored piles are an alternative foundation solution and would have some advantages for construction close to trees of high-water demand. Intégrale can give further advice on request.

6.3.6 Ground Floor Slabs

Ground floor slabs may be designed as ground bearing (assuming a 'weak' formation on clayey soils, or 'normal' on granular soils). In line with NHBC guidelines, suspended ground floor slabs (e.g. 'beam and block' type or similar) should be adopted where the slab will be underlain by 600mm or more of 'non-engineered' Made Ground.

6.3.7 Inspection

All foundation, ground slab and other substructure formations should be checked and approved by a suitably qualified and experienced engineer or geotechnical specialist, who can also give guidance on the need for mesh reinforcement to even out formation compressibility as appropriate.

6.4 Pavement Design

The equivalent CBR strength of anticipated pavement formations has either been determined using a Mexecone Penetrometer or judged based on past experience in similar materials. The following (tentative) design values are given for guidance:

Stratum	Design CBR	Typical Depth (m) BEGL
Existing Made Ground	2%	0.5m
Clayey WG	3-4%	0.5m
Gravelly WG	5+%	0.5-1m

* WG = Weathered Greensand

It would be prudent to allow a contingency for treating 'soft-spots' equivalent to 25% of the proposed hardstanding area to a depth of typically 350mm. All soft spots should be excavated and replaced with suitable well compacted granular material. Where there could be rapid variations in formation strength, consideration should be given to a sandwiched geogrid construction which will help even out those variations to within acceptable limits. Intégrale can give further guidance on request.

6.5 Earth Pressures and Retaining Walls

Foundations for retaining walls can be based on the allowable design bearing pressures given in section 5.3.2. Earth pressures may be calculated assuming the following effective shear strength parameters:

Stratum	Effective Cohesion C' (kN/m²)	Effective Angle of Friction Ø' (degrees)	Bulk Density (Mg/m³)
Clayey WG	Zero	25°	1.85
Gravelly WG	Zero	30°	1.85
Sandstone	Zero	35°	2.00

6.6 Protection of Buried Concrete

In line with BRE Special Digest 1:2005 'Concrete in Aggressive Ground', 4 no. samples weathered Upper Greensand Formation were tested for water soluble sulphate, total acid soluble sulphate, total sulphur and pH.

The desk study and ground investigation indicate the site can be categorised as being:

- Natural ground unlikely to contain pyrites
- Mobile groundwater conditions, water will flow into excavations or percolate slowly through the ground.

The results show a highest water-soluble sulphate of 102mg/l. The lowest value for pH was 7.7. The results for total acid soluble sulphate (0.025% to 0.064%) and total sulphur (0.01% to 0.019%) indicate pyrite is not present. It is therefore recommended that a Design Sulphate Class of DS - 1 and an ACEC Class of AC-1d be adopted for budgeting purposes.

6.7 Drainage Considerations

The client requested soakaway trials in one investigation location. A water bowser and pump were therefore used to fill the trial pit to 1.0m depth. The drop in water level was recorded over time, and the results are included in Appendix D. Within approximately 170 minutes, the water level had only dropped by 95mm, which suggest an extrapolated infiltration rate in the order of 2.9x10-6m/s.

Supplementary testing completed by the client has subsequently confirmed the general consensus that the infiltration in these ground conditions is very poor and that conventional soakaway drainage is not likely to be feasible.

7.0 GENERIC QUANTITATIVE CONTAMINATION ASSESSMENT

7.1 Summary of Soils Results with Respect to Human Health

The conceptual model based on the source-pathway-receptor linkages is summarised as:

The conceptual site model has been developed based upon the source-pathway-receptor linkages.

SOURCE		PATHWAY		RECEPTOR
Contaminated soils	→	Dermal exposure	→	On-site female child
Contaminated soils	→	Inhalation of soil dust	→	On-site female child
Contaminated soils	→	Indoor/Outdoor inhalation of soil vapour	→	On-site female child
Contaminated groundwater	→	Inhalation of groundwater vapours	→	On-site female child
Combustible/toxic ground gases	→	Indoor inhalation	→	On-site female child
Contaminated Soils	→	Direct ingestions of soil	→	On-site female child
Contaminated soils	→	Ingestion of homegrown produce and soil attached to vegetables	→	On-site female child

A generic risk assessment has been undertaken by comparing proven concentrations of contaminants against generic assessment (or screening) criteria (AC).

The AC adopted are the published LQM/CIEH Suitable For Use Levels (S4UL's), for a generic residential with plant uptake end-use, adopted under licence no. 3580. These provide a precautionary approach, based on the principle of minimal or tolerable risk, but relying on conservative values for soil type (sandy loam) and organic matter contents of 1, 2.5 or 6% as appropriate. Where no S4UL is published, e.g. lead, the alternative AC is the most recently published industry standard value.

If the proven contaminant concentration is less than the respective AC, it is considered there is no significant risk to human health from these substances.

7.1.1 Generic Human Health Assessment

No contaminants were present in the analysed samples in excess of the relevant assessment criteria.

7.2 Summary of Soils Results with Respect to Phytotoxicity

The soil samples where phytotoxic contaminants exceeded the former ICRCL 59/83 thresholds are:

Standard	Substance	Stratum	Depth BEGL	Area / Zone
Phytotoxic Target	Zinc	Made Ground	0.05m	WS3 only

7.3 Summary of Soils Results with Respect to WRAS

The soil samples which exceeded the Water Regulations Advisory Scheme (WRAS) guidance on water supply pipes are:

Standard	Substance	Stratum	Depth BEGL	Area / Zone
WRAS	Chromium	Made Ground	0.05m	WS3 only

This suggests that new water pipes laid through the Made Ground will need to be protective against chemical attack. Requirements should be confirmed with the water supply company.

7.4 Controlled Waters

The assessment of risks to controlled waters follows guidance provided by the Environment Agency, including their Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination (2006). The conceptual site model has been developed based on the source-pathway-receptor linkages identified during the desk study and fieldworks. Possible sources, pathways and receptors have been assessed, which identifies the potential pollutant linkages as:

SOURCE		PATHWAY		RECEPTOR
Contaminated soils	→	Leaching from soils or migration of liquid contaminants through the unsaturated zone.	→	Principal Aquifer
Contaminated soils	→	Leaching from soils or migration of liquid contaminants through service runs	→	Principal Aquifer
Perched water contamination	→	Transport in groundwater	→	Principal Aquifer
Groundwater contamination	→	Transport in groundwater	→	Principal Aquifer

The conceptual site model indicates that the Principal Aquifer (sandstone bedrock) is the most sensitive controlled waters receptor. However, with the absence of any significant contamination at this site, the risk to controlled waters is considered negligible.

7.5 Gas Mitigation

The three gas monitoring visits have proven elevated carbon dioxide (2.2-6.3%) in both boreholes. With no gas flow the site would classify as Characteristic Situation 1 in line with CIRIA 665. This is likely the natural background concentration in these glauconitic silty sandy clay soils. However, in this case where there is raised carbon dioxide it is recommended to increase the protection to Characteristic Situation 2. This is generally covered by including a carbon dioxide gas proof membrane as a replacement for a standard DPM and having a sub floor void beneath suspended floor slabs.

If required Intégrale can provide further advice or liaise with Building Control on this aspect.

7.6 Conceptual Exposure Model & Risk Assessment

The potential hazards and risks from soils, and gas contamination have been developed as a Conceptual Exposure Model, based on desk studies, proven ground conditions, analytical and monitoring results and the proposed development. Substances actually proven, or strongly suspected present, have been assessed against potential exposure pathways and available receptors.

The following hazard-pathway-receptor linkages are therefore established for this site:

- WRAS Contaminant Threshold Concentrations are exceeded in the Topsoil Made Ground of WS3 (South eastern area of Plot 2), could pose a risk to water supply pipework;
- Phytotoxicity Concentrations are exceeded in the Topsoil Made Ground of WS3 (South eastern area of Plot 2), might pose an effect on plant growth;
- Slightly elevated carbon dioxide in the natural ground could theoretically pose a risk within confined spaces.

7.7 Recommendations

7.7.1 For Protection of Building Materials & Services

To protect new building materials the following precautions will be necessary:

a) Specification of appropriate concrete protection for the sulphate/pH environment, as detailed in Section 5.
b) Use of protective pipework for all water supplies.

7.7.2 For Protection of New Vegetation

Contamination which would be considered phytotoxic has not been encountered and it is likely that existing topsoil can be reused on site. We would always recommend a minimum 150mm clean topsoil cover. However, guidance from a landscape architect should be sought to confirm appropriate planting depths and thicknesses of topsoil.

Any imported topsoil should be from a certified source.

7.7.3 Reuse and Disposal of Surplus Spoil

The WAC testing indicates that the Made Ground from both Plot 1 and Plot 2 can be sent to an **inert** waste landfill site.

7.7.4 Recommended Further Assessment

A watching brief should be kept at all times while groundworks are occurring. Should any signs of unforeseen contamination be found during groundworks, Intégrale should be contacted immediately to determine the best course of action.

Based on the desk study and ground investigation completed to date, the risk posed to the development and the future user from a contaminated land viewpoint would appear to be low and no further investigations are recommended.

Copies of this report should be provided to the local authority and Environment Agency to confirm their agreement with the findings and recommendations.

N

W E

S

Key:

- Window Sample borehole with installation
- Window Sample borehole
- Trial pit
- Trial pit with soakaway testing

Scale = 1:500 (approx.) @ A3

Figure 1
Site Plan
Orchard Way,
Harwell,
OX11 0LH

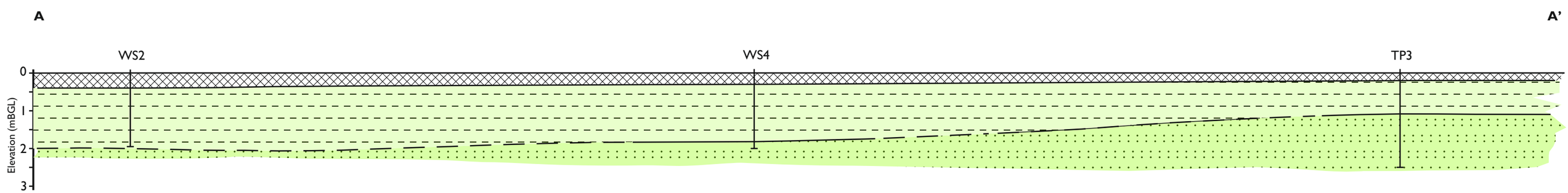
Job No: 19058
July 2019

Intégrale
Understanding Ground Conditions

Section A - A'

Southwest

Northeast



Key:

Made Ground/Topsoil

Weathered Upper Greensand Formation
(Firm becoming stiff Clay with occasional gravel bands)

Upper Greensand Formation
(Weak to moderately strong Sandstone)

Scale = 1:100 Vertical / 1:250 Horizontal

Figure 2
Tentative Geological Cross-Section
Orchard Way,
Harwell,
OX11 0LH

Job No: 19058
July 2019

Intégrale
Understanding Ground Conditions

Appendix A

Site Location

Integrale Limited, Suite 7, Westway Farm Business Park, Wick Road, Bishop Sutton, Somerset, BS39 5XP United Kingdom
Tel: 01275 333 036 www.integrale.uk.com

Registered Office: The Granary, Chewton Fields, Ston Easton, Somerset, BA3 4BX United Kingdom VAT Reg. No. 609 7402 37

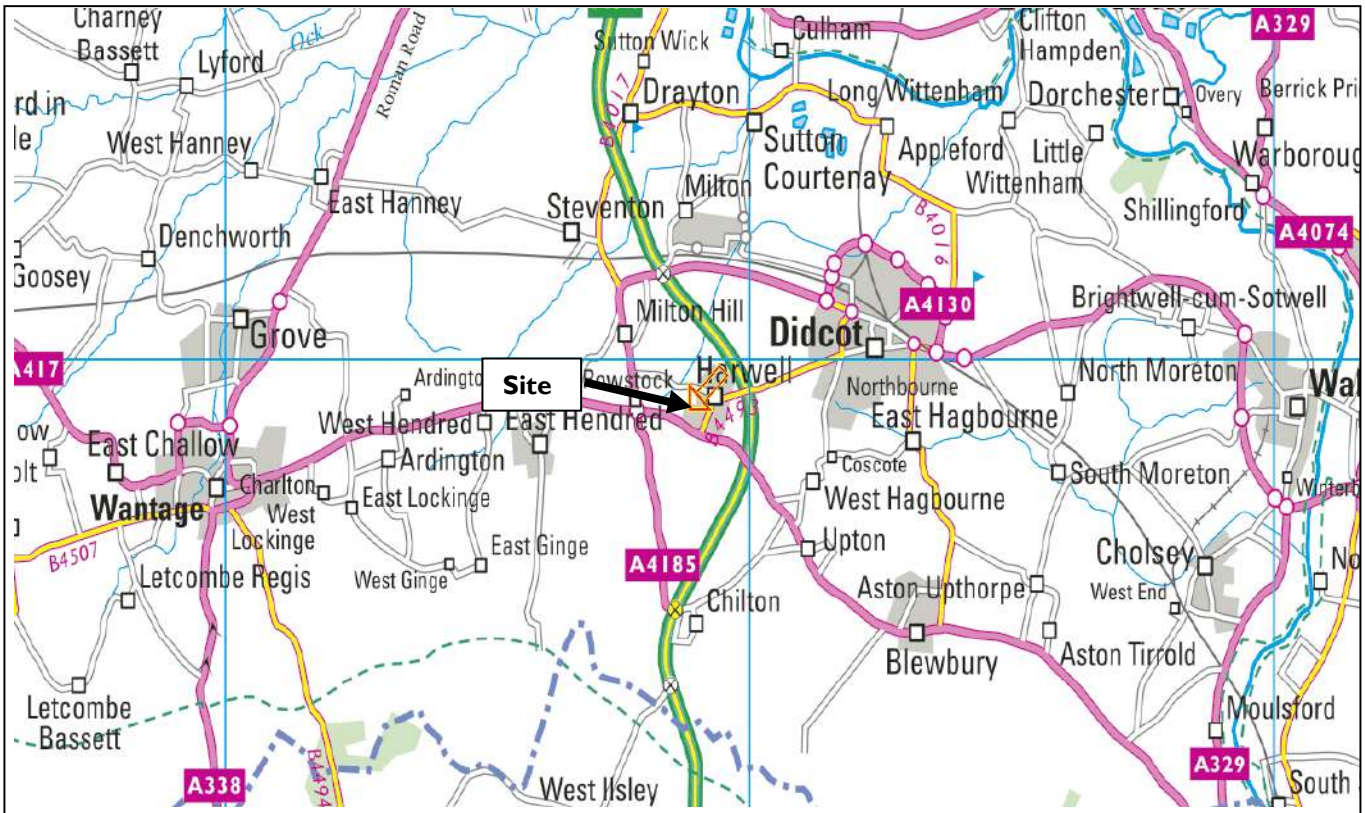
Intégrale
Understanding Ground Conditions

Suite 7, Westway Farm Business Park
Wick Road, Bishop Sutton, Somerset,
BS39 5XP, United Kingdom

Tel: 01275 333036
www.integrale.uk.com

Project: **Land to the Rear of 25-35 Orchard Way, Harwell, Didcot, Oxfordshire, OX11 0LH** **Job No: 19058**

Site Location Plan



North

Appendix B

Site Description / Photographs

Integrale Limited, Suite 7, Westway Farm Business Park, Wick Road, Bishop Sutton, Somerset, BS39 5XP United Kingdom
Tel: 01275 333 036 www.integrale.uk.com

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Intégrale
Understanding Ground Conditions

Suite 7, Westway Farm Business Park
Wick Road, Bishop Sutton, Somerset,
BS39 5XP, United Kingdom

Tel: 01275 333036
www.integrale.uk.com

REFERENCES	
Project No.	19058
Site Address	Land to the Rear of 25-35 Orchard Way, Harwell, Didcot, OX11 0LH.
Grid Reference	448800E, 189133N.
Date of Visit	21st May, 2019
Names of site owners/ developers/ engineers met with on site	Guy Thomas (Feltham Construction)
Prepared by	IL
SITE – GENERAL	
Plan of site	See Figure 1.
Site size (area) : % building, % hardstanding, % soft landscaping, % open space, etc.	Plot 1 – 100% soft landscaping Plot 2 – 80% soft landscaping, 15% building and 5% hardstanding.
Current use (occupants and operations)	Plot 1 – Overgrown field with footpath. Plot 2 – Residential property and garden.
Site Area	Plot 1 – c.0.23 hectares. Plot 2 – Rectangular garden = c.0.16 hectares. Triangular driveway area = c.0.04 hectares
Maximum Dimensions	Plot 1 - c.45m SW – NE x c.50m NW – SE. Plot 2 - c.65 x c.25m garden & c.30m x c.25m driveway area.
Boundaries – e.g. wooden fence/ retaining wall	Plot 1: NE – Garden of No. 43 Orchard Way, NW – Agricultural Field, SE – Residential properties 29 - 35, SW – Garden of No. 27 Orchard Way. Plot 2: NW – Agricultural field, NE – Garden of No. 27 Orchard Way, SE – garden of No. 21 Orchard Way, SW – Field.
Any access limitations for JCBs, drilling rigs etc; minimum distances, steps, steep banks, inaccessible areas, need for breaker for SI.	JCB will not be able to fit in to Plot 2 as the excavator is too wide for the garden gate entrance. Concrete post may need to be removed in Plot 1 to allow the window sampling rig to access Plot 1.
Any specific working hours for SI; keys required for access	No specific workings hours. Occupier of No. 25 needs to open garden gate for access.
Any specific Health and Safety hazards/ considerations	Plot 1 is accessible to the public therefore warning tape will be required around the soakaway.
Water supply on site? Fire hydrant nearby? Power supply on site?	Water supply in Plot 2.

SITE – BUILDINGS	
Age of building(s)	1960's
Building appearance: no. of storeys, basement, roofing type, chimneys / stacks?, car park, service areas;	1 storey bungalow in Plot 2 with gravel driveway.
State of buildings, i.e. cracks; structural distress etc.	No observable structural distress.
Tanks: location (internal / external : above or below ground), age / condition, size / capacity, type, bunding (condition), refuelling point, evidence of stains / spills	None observed.

Heating : electric/gas/oil	Unknown.
Chemical storage : drums, other chemical stores	None identified.
Gas control measures (e.g. vents, cowls, monitoring / alarms)	Unknown.
Other evidence of industrial activity	None observed.
Asbestos / deleterious materials	None observed.
Electrical equipment / Transformers – check for PCBs? Backup power supplies (generators)	None identified.

SITE – EXTERNAL	
Hard surfacings : type (asphalt/concrete etc.), staining, weathering, subsidence, repairs. Specific reinstatement required.	None in the site investigation area.
Invasive species noted (e.g. Japanese Knotweed). Note: absence indicated here by non-specialist does not infer that JKn is not present.	None observed.
Can investigation be in landscaped areas. Specific reinstatement required.	Yes, both in Plot 1 and 2. No specific reinstatement requirements.
Site topography – flat / sloping, Level compared to surroundings & mAOD.	Plot 1: c.82 - 83m AOD with a slightly higher elevation on the NW side according the topographic survey. Plot 2 - c.82 - 83m AOD. Relatively flat site.
Evidence of filling or raising, earthworks, mounds/ hummocks, soil creep and sloping ground etc.	None observed.
Soil drainage – marshy/ marsh vegetation/ dry/ surfaces cracked/ surface rutting etc.	None observed.
Trees – effects on buildings, condition, species and height; location; maturity; leaning/ upright; rotated trees?	Plot 1 – Sporadic mature trees along the NE border. Plot 2 – High abundance of fruit trees at the NW end. Large mature tree on the SE boundary of the site. No evidence of these affecting the building.
Rock/ soil exposures – height/ extent description etc.	None observed.
Drainage : interceptors, disposal of storm water / waste water, mains water supply.	In the road.
Other evidence of Services, e.g. overhead cables, Gas 'yellow headstone'.	Drains on the house.
Vehicle maintenance : washdown areas, workshops, refuelling points.	Not applicable.
Waste : skips / compounds, any hazardous waste? Burning grounds or incinerators.	None observed.
Sub-stations : age, condition, transformers, operator, servicing?	44m NE from Plot 1.
Ecological features of note – Burrows, bats, nest sites, designated preservation areas.	None observed.

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Any seepages on or adjacent to site.	None observed.
Watercourses, water levels, direction and rate of flow.	None observed.

SURROUNDING LAND USES	
General site context – industrial, commercial, urban, agricultural etc.	Generally residential usage to E and agricultural to W.
Land use – north (give distances)	NW – Agricultural, SW – Agricultural, SE – Residential, NE – Residential.
Nearby (<500m) sources of pollution – landfills, filling stations, industrial activity.	Vehicle repair shop – 300m E.
Nearby river / surface water features – culverted, banks, flood plain. If visible, condition of watercourse.	None observed from site.
Local ground profiles and signs of instability.	None observed.
Evidence of structural distress on nearby buildings.	No significant distress observed.
Evidence of mining history (colliery spoil heap, miners cottage).	None observed.
Nearby rock/ soil outcrops.	None observed.
Vegetation – distinctive change in vegetation (e.g. hydrophyllic veg).	No distinctive changes observed.
Adjacent geotechnical features of note – cuttings, quarries, embankments, slopes (particularly if failed), major excavations, deep basements, sources of vibrations (railway or heavy machinery).	None observed.

Plate 1 – TP1/SA1.

Plate 2 – TP1.

Plate 3 – TP1.

Plate 4 – WS1.

Plate 5 – WS1.

Plate 6 – WS2.

Plate 7 – WS2: 1 - 2m.

Plate 8 – WS3: 1 – 2m.

Plate 9 – WS3: 2 -3m.

Plate 10 – TP2.

Plate 11 – TP2.

Plate 12 – TP3.

Plate 13 – TP3.

Plate 14 – TP3.

Plate 15 – TP4.

Plate 16 – TP4.

Plate 17 – TP4.

Plate 18 – WS4: GL – 1m.

Plate 19 – WS4: 1 – 2m.

Plate 20 - WS5: GL – 1m.

Plate 21 – WS5: 1 – 2m.

Plate 22 – Entrance to Plot 1.

Plate 23 – View looking NW in Plot 1.

Plate 24 – View looking SW in Plot 1.

	
Plate 25 – View looking SE towards No. 25 Orchard Way in Plot 2.	Plate 26 – View looking NW in Plot 2.

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Appendix C

Desk Study Information

Integrale Limited, Suite 7, Westway Farm Business Park, Wick Road, Bishop Sutton, Somerset, BS39 5XP United Kingdom
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CENTREMAPS

Open Space, Upper Interfields,
Worcester, WR14 1UT

Groundsure Reference:	CMAPS-CM-798897-13238-100519EDR
Your Reference:	13238
Report Date	10 May 2019
Report Delivery Method:	Email - pdf

Enviro Insight

Address: Orchard Way, Harwell, OX11 0LQ

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 01886 832972 quoting the above CENTREMAPS reference number.

Yours faithfully,

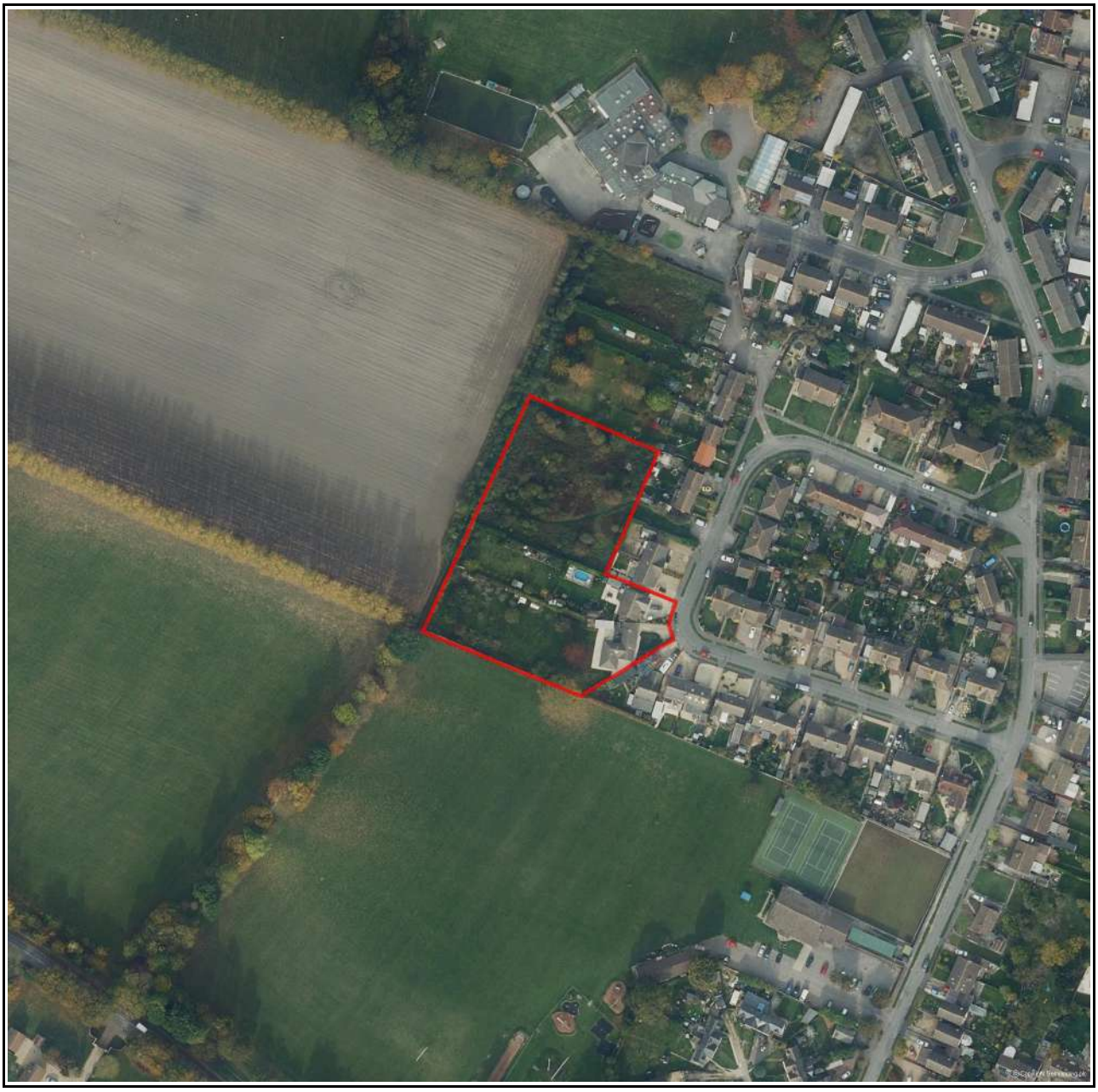
CENTREMAPS

Enc.
Groundsure Enviroinsight

Enviro Insight

Address:	**Orchard Way, Harwell, OX11 0LQ**
Date:	**10 May 2019**
Reference:	**CMAPS-CM-798897-13238-100519EDR**
Client:	**CENTREMAPS**

NW N NE



W E

SW S SE

Aerial Photograph Capture date:	24-Oct-2018
Grid Reference:	448798,189130
Site Size:	0.6642ha

Report Reference: CMAPS-CM-798897-13238-100519EDR
Client Reference: 13238

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	0	0	0	3
1.2 Additional Information – Historical Tank Database	0	0	0	3
1.3 Additional Information – Historical Energy Features Database	0	2	9	11
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	3
1.6 Historical military sites	0	0	0	0
1.7 Potentially Infilled Land	0	0	0	4

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	0
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	0
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	0
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	0
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	0

Section 4: Current Land Use	On-site	0-50m	51-250	251-500
4.1 Current Industrial Sites Data	0	1	4	Not searched
4.2 Records of Petrol and Fuel Sites	0	0	0	0
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	None 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	0
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	5
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.6 Source Protection Zones (within 500m of the study site)	0	0	0	0	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	0	1	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	0	0	34	Not searched	Not searched
6.11 Surface water features within 250m of the study site	No	No	No	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	Limited potential
7.8 BGS confidence rating for the Groundwater Flooding susceptibility areas	Low

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	0	0
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
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	0	0	1
8.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	0
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	1	0	0	1
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	2	0	0	0	3	8
8.14 Records of Green Belt land	0	0	0	0	0	0

Section 9: Natural Hazards

9.1 Maximum risk of natural ground subsidence	Very Low
9.1.1 Maximum Shrink-Swell hazard rating identified on the study site	Negligible
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	None 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.

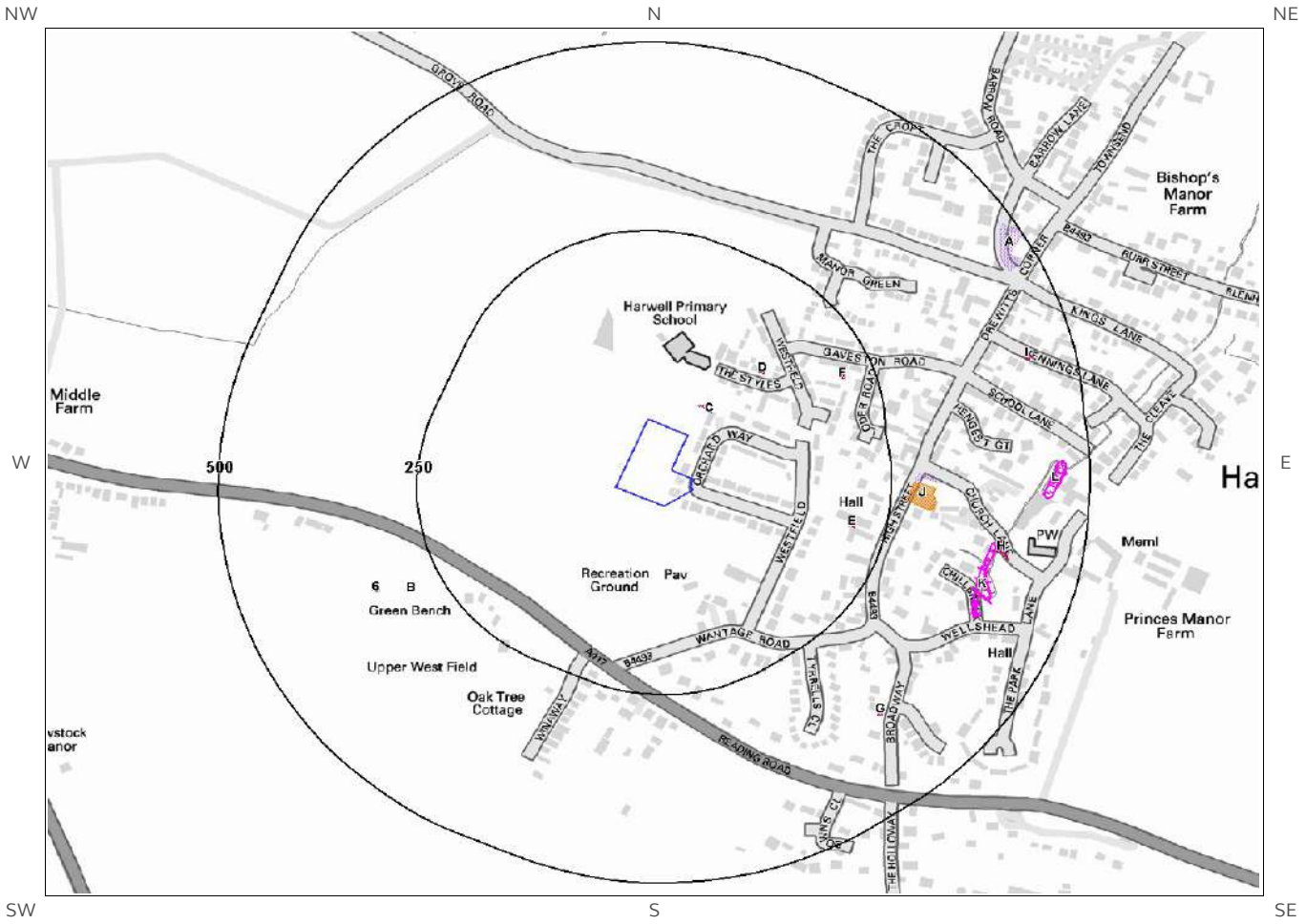
Note: Maps

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: 3

ID	Distance [m]	Direction	Use	Date
1	279	E	Smithy	1910
2A	458	NE	Brewery	1910
3A	458	NE	Brewery	1898

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: 3

ID	Distance (m)	Direction	Use	Date
4B	291	SW	Unspecified Tanks	1969
5B	292	SW	Tanks	1994
6	327	SW	Unspecified Tanks	1969

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: 22

ID	Distance (m)	Direction	Use	Date
7C	40	NE	Electricity Substation	1969
8C	41	NE	Electricity Substation	1990
9D	123	NE	Electricity Substation	1990
10D	123	NE	Electricity Substation	1969
11E	203	E	Electricity Substation	1989
12E	203	E	Electricity Substation	1990
13E	203	E	Electricity Substation	1969

14E	203	E	Electricity Substation	1990
15F	206	E	Electricity Substation	1989
16F	207	E	Electricity Substation	1969
17F	207	E	Electricity Substation	1994
18G	375	SE	Electricity Substation	1989
19G	377	SE	Electricity Substation	1990
20G	377	SE	Electricity Substation	1969
21H	390	E	Electricity Substation	1989
22H	392	E	Electricity Substation	1990
23H	393	E	Electricity Substation	1969
24H	393	E	Electricity Substation	
25I	436	E	Electricity Substation	
26I	438	E	Electricity Substation	
27I	438	E	Electricity Substation	
28I	438	E	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: 3

ID	Distance (m)	Direction	Use	Date
29J	270	E	Garage	1989
30J	270	E	Garage	1969
31J	271	E	Garage	

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.

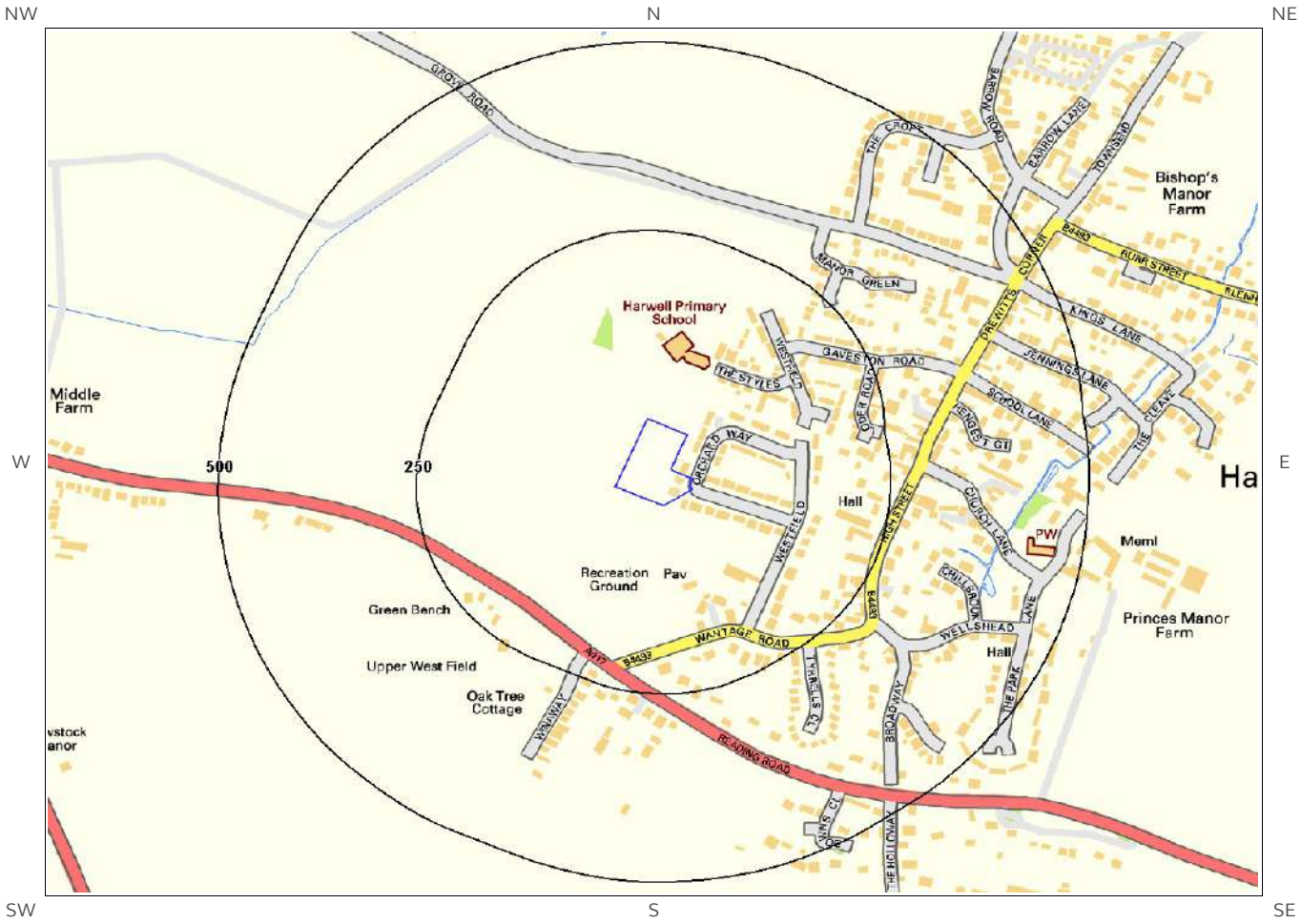
1.7 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 4

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

ID	Distance(m)	Direction	Use	Date
32K	378	E	Pond	1956
33K	378	E	Pond	1960
34L	442	E	Ponds	1980
35L	447	E	Pond	1980

2. Environmental Permits, Incidents and Registers Map



- Site Outline
- Search Buffers (m) (250, 500)
- 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: 0

Database searched and no data found.

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:

0

Database searched and no data found.

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.

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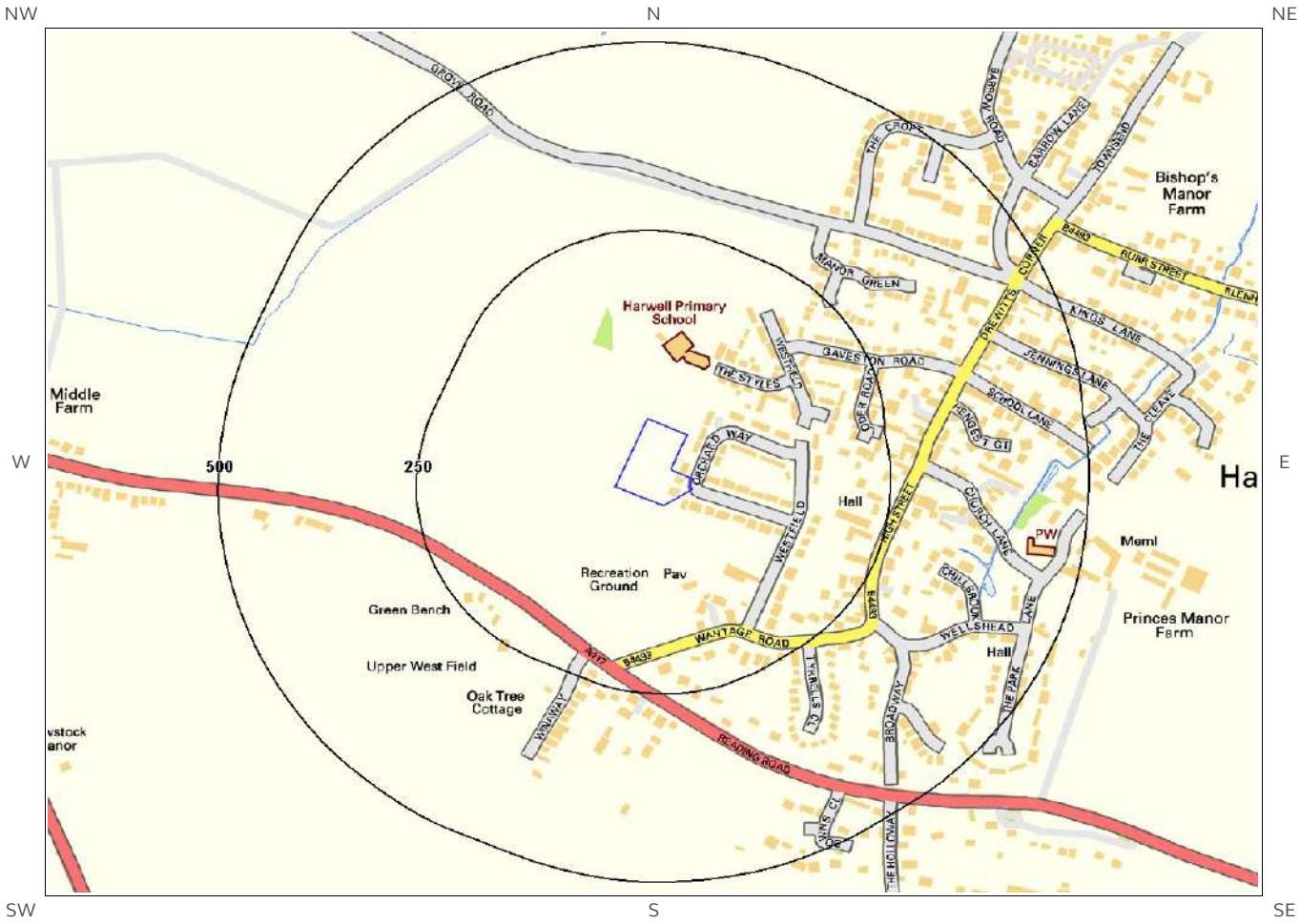
3. Landfill and Other Waste Sites Map



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:

0

Database searched and no data found.

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:

0

Database searched and no data found.

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.

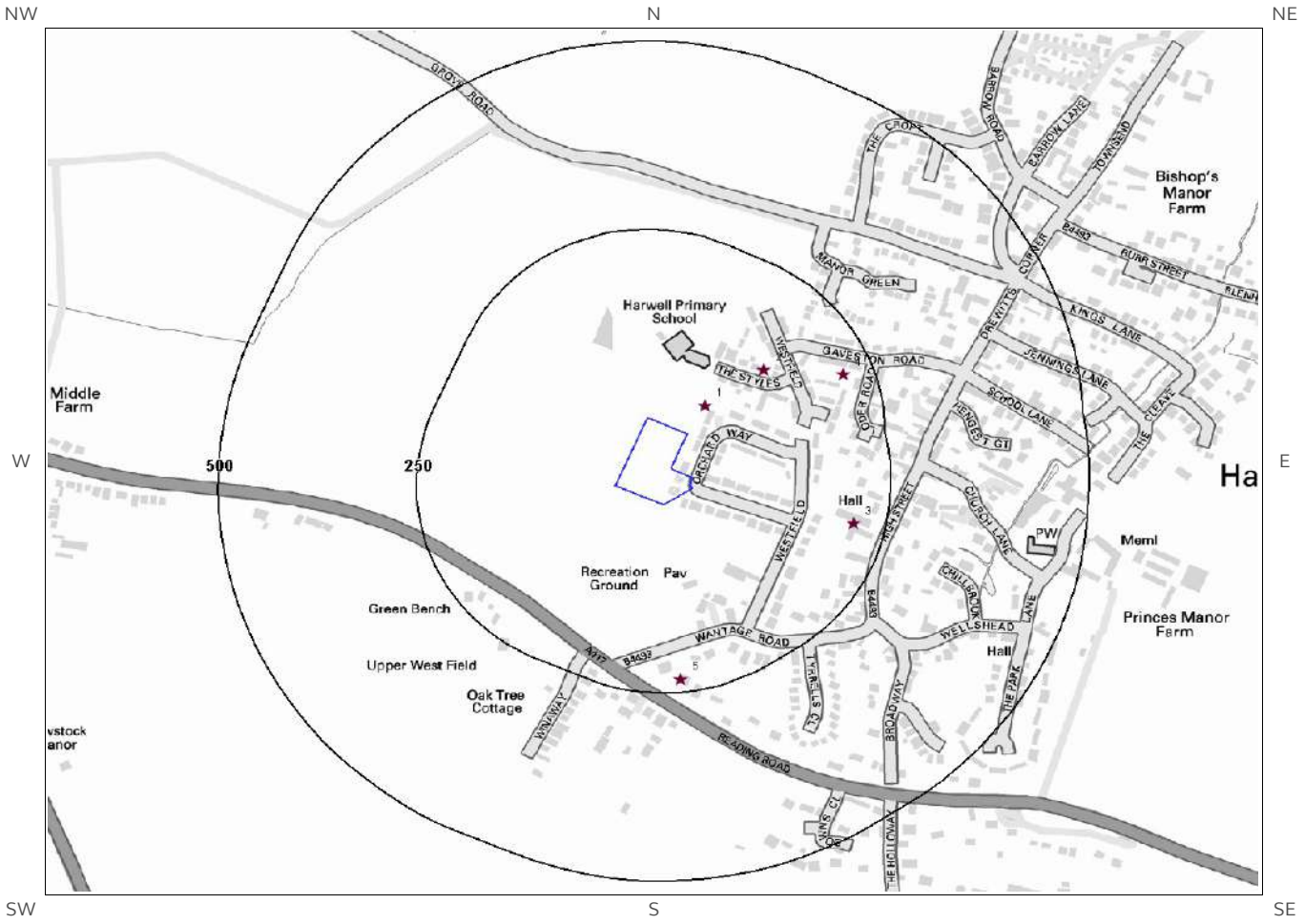
3.2.2 Records of Environment Agency/Natural Resources Wales licensed waste sites within 1500m of the study site:

0

Database searched and no data found.

---

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: 5

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

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1	44	NE	Electricity Sub Station	448862 189205	Oxfordshire, OX11	Electrical Features	Infrastructure and Facilities
2	128	NE	Electricity Sub Station	448936 189252	Oxfordshire, OX11	Electrical Features	Infrastructure and Facilities
3	209	E	Electricity Sub Station	449050 189048	Oxfordshire, OX11	Electrical Features	Infrastructure and Facilities
4	212	E	Electricity Sub Station	449037 189246	Oxfordshire, OX11	Electrical Features	Infrastructure and Facilities
5	232	S	Industrial Abrasives & Tool Co Ltd	448831 188841	Amberwood, Wantage Road, Harwell, Didcot, Oxfordshire, OX11 0LL	Abrasive Products and Grinding Equipment	Industrial Products

4.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: 0

Database searched and no data found.

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.

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

Database searched and no data found.

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

5.3 Bedrock and Solid Geology

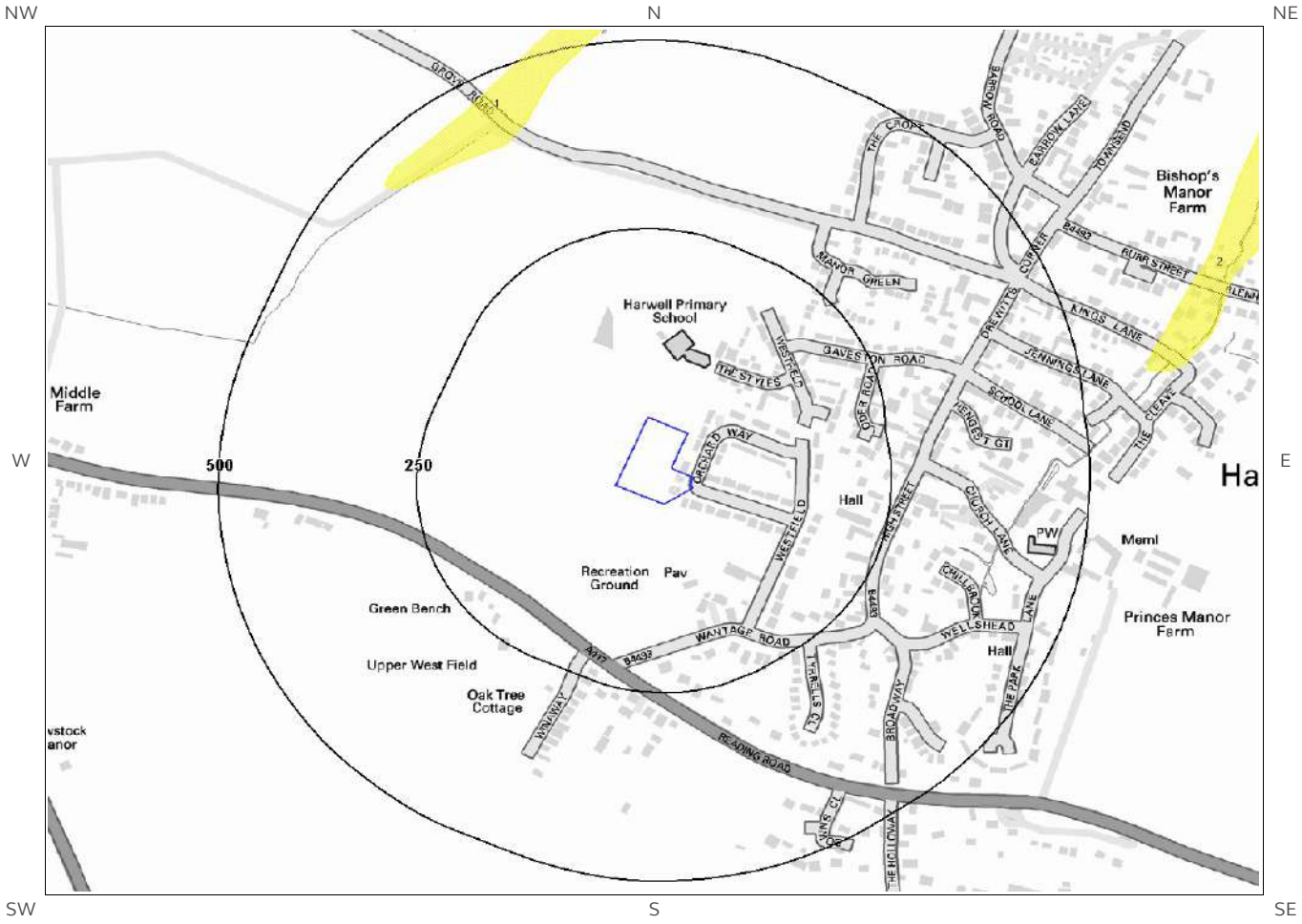
The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
UGS-CSSL	UPPER GREENSAND FORMATION	CALCAREOUS SANDSTONE AND SILTSTONE

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

6 Hydrogeology and Hydrology

6a. Aquifer Within Superficial Geology



Site Outline

250
500
Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

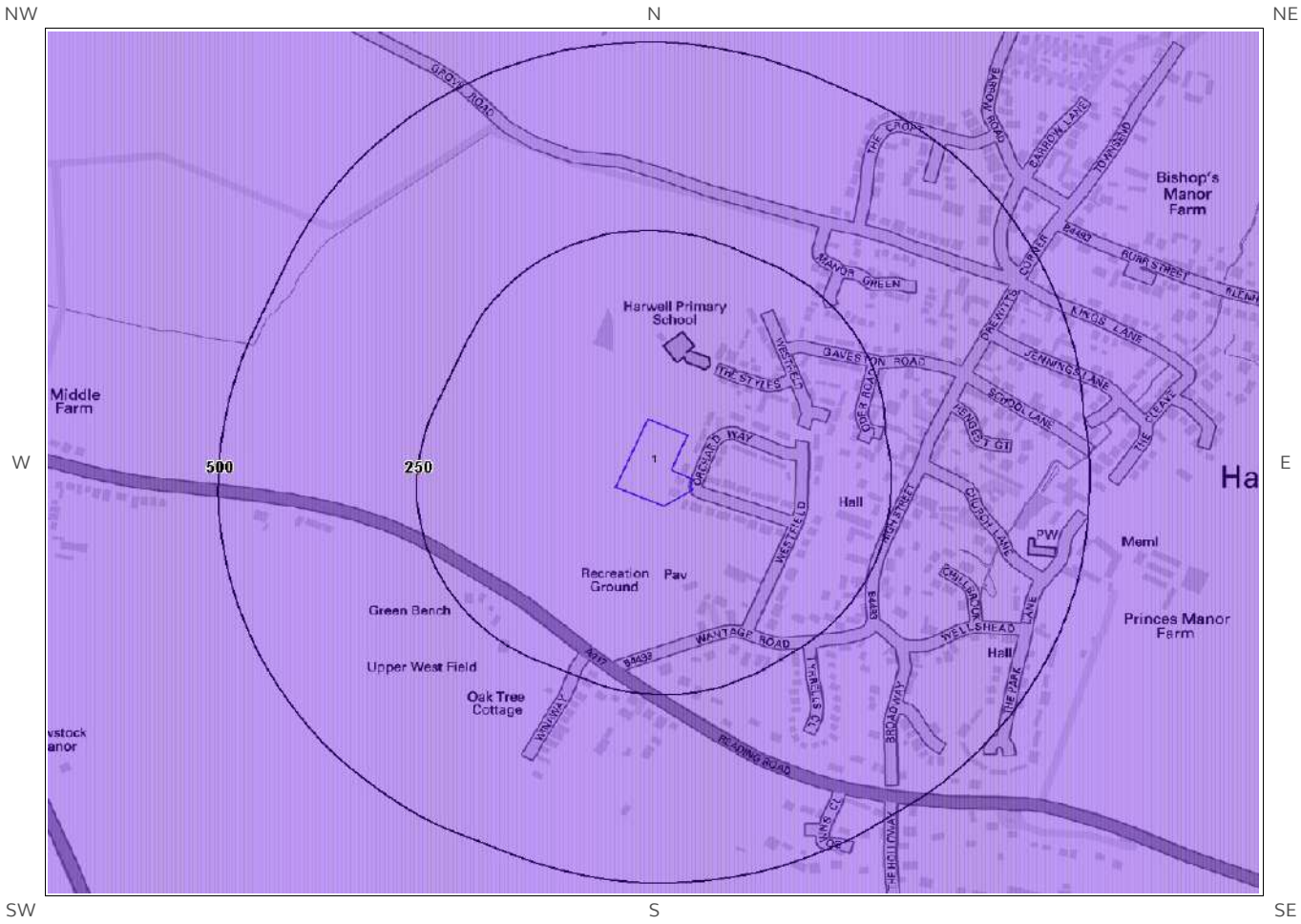
Secondary (B) Aquifer - Lower Permeability Layers

Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

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

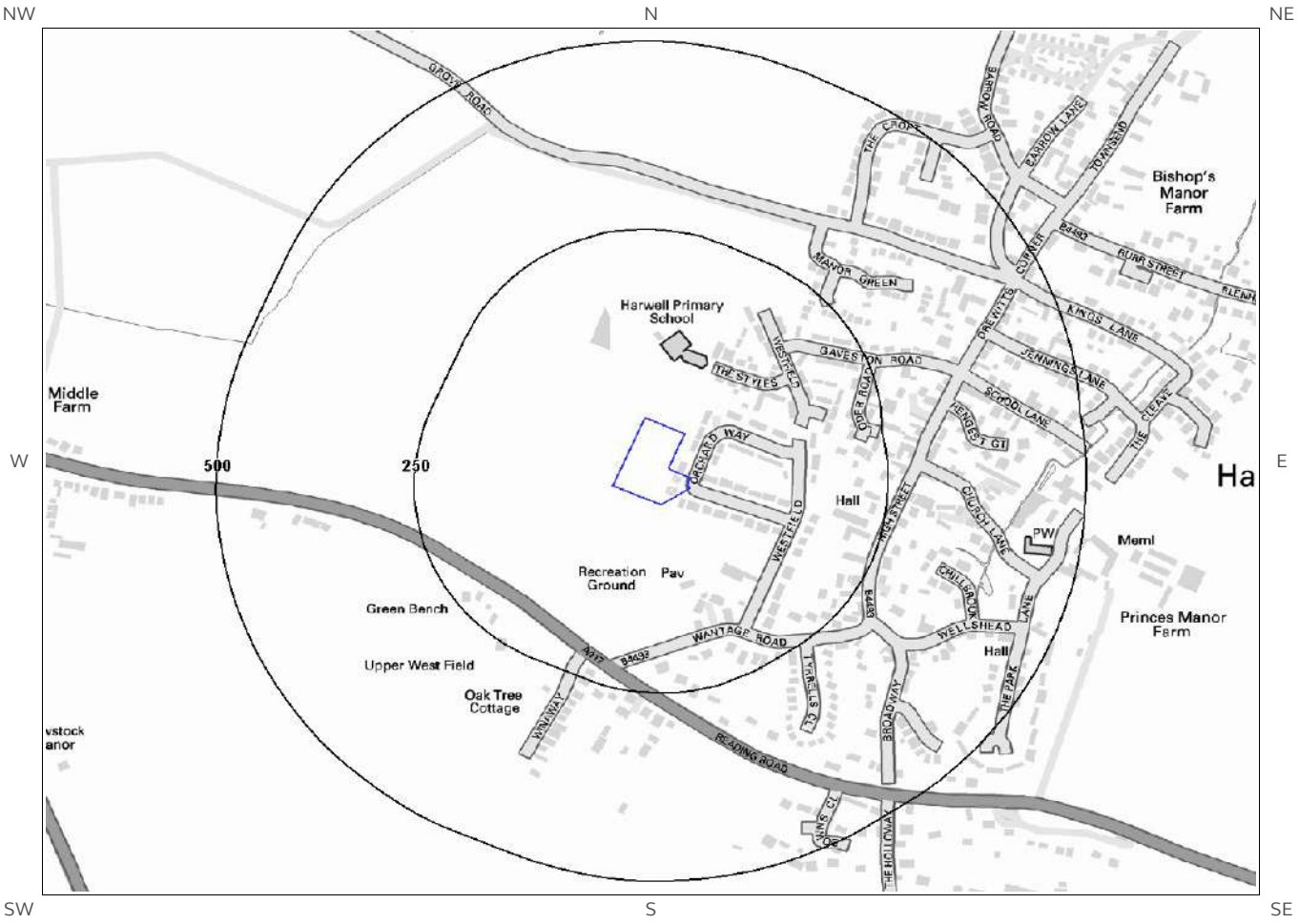
Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

Surface Water Abstraction Licence

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



Site Outline

250 — 500 — Search Buffers (m)

Source Protection Zone 1 - Inner Catchment

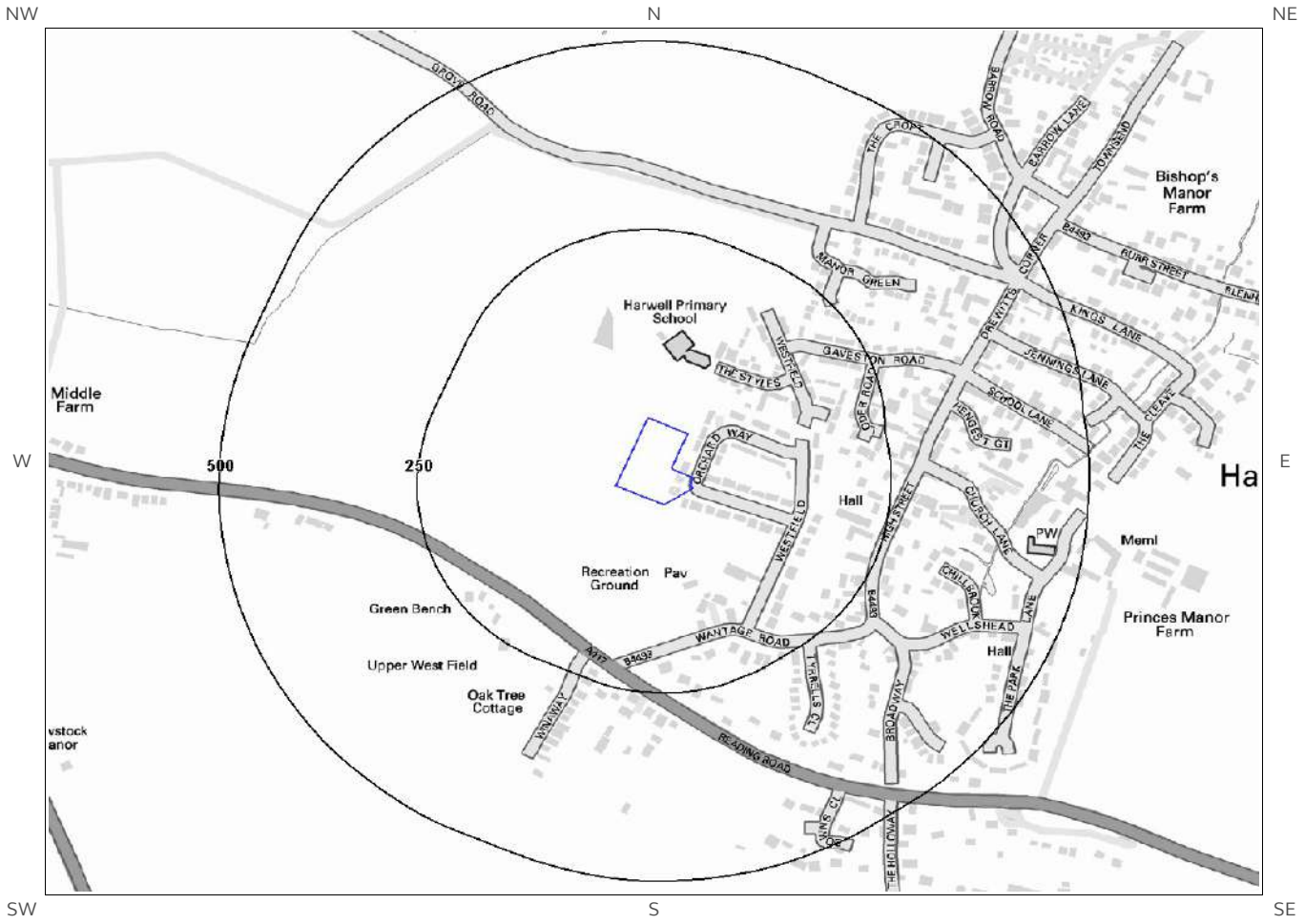
Source Protection Zone 2 - Outer Catchment

Source Protection Zone 3 - Total Catchment

Source Protection Zone 4 - Zone of Special Interest

Potable Water Abstraction Licence

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

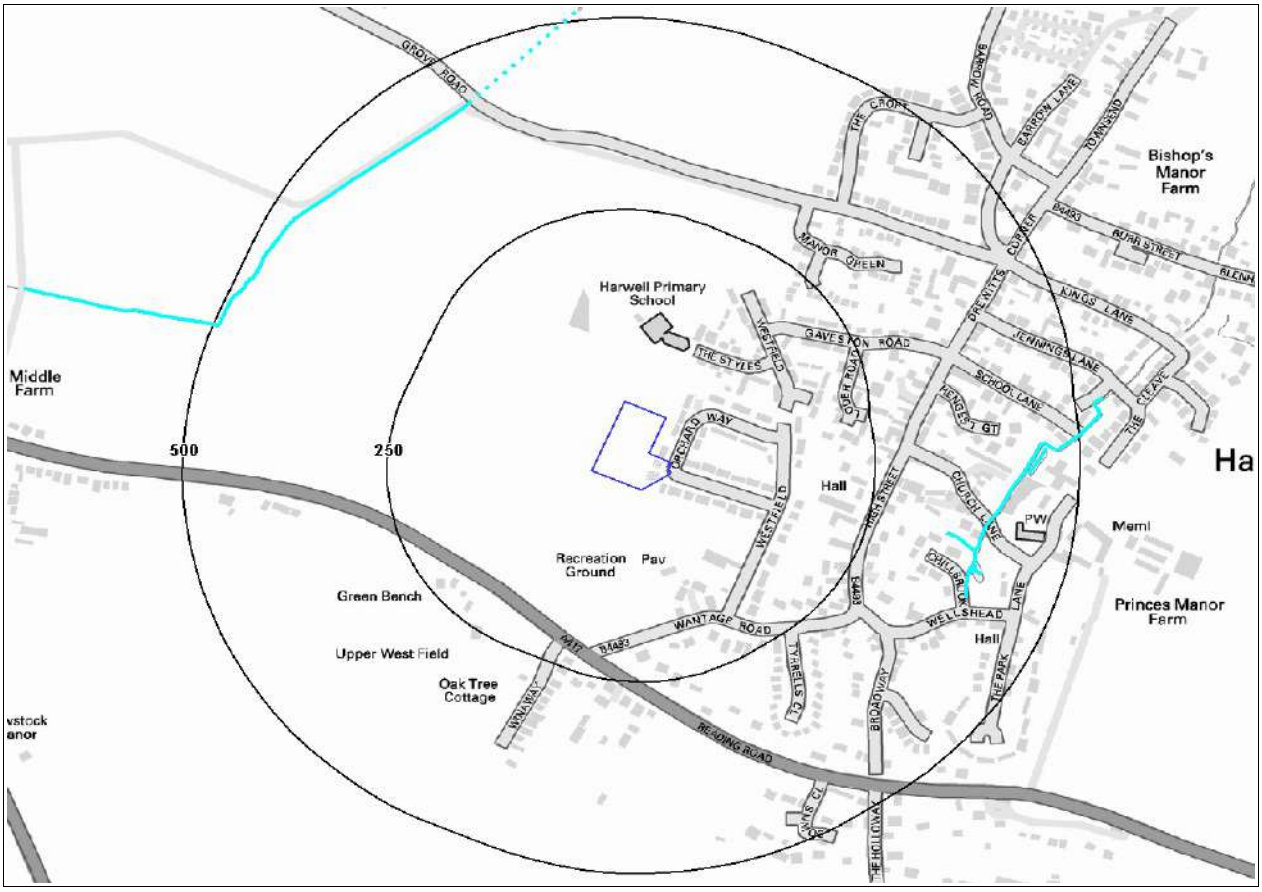
Potable Water Abstraction Licence

6e. Hydrology – Watercourse Network and River Quality

NW N NE

W E

SW S SE



Watercourse type

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

Site Outline

250 / 500 Search Buffers (m)

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	404	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
1	0	On Site	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 None identified

Database searched and no data found.

6.4 Surface Water Abstraction Licences

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

The following Surface Water 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	1016	N	448700 190200	Status: Historical Licence No: 28/39/18/0003 Details: Non-Evaporative Cooling Direct Source: THAMES SURFACE WATER - NON TIDAL Point: WOODLANDS, MILTON HILL Data Type: Point Name: C & A J HARTWRIGHT	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: - Original Start Date: 10/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 03/06/1988 Version End Date:
Not shown	1016	N	448700 190200	Status: Historical Licence No: 28/39/18/0003 Details: Non-Evaporative Cooling Direct Source: THAMES SURFACE WATER - NON TIDAL Point: WOODLANDS, MILTON HILL - WATERCOURSE Data Type: Point Name: C & A J HARTWRIGHT	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: - Original Start Date: 10/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 03/06/1988 Version End Date:
Not shown	1028	N	448200 190100	Status: Active Licence No: 28/39/18/0073 Details: Spray Irrigation - Storage Direct Source: THAMES SURFACE WATER - NON TIDAL Point: MILTON HILL, ABINGDON, - MOOR DITCH, POINT 'A' Data Type: Line Name: C & A J HARTWRIGHT	Annual Volume (m^3): 20457 Max Daily Volume (m^3): 654.62 Application No: - Original Start Date: 04/01/1977 Expiry Date: - Issue No: 100 Version Start Date: 03/06/1988 Version End Date:
Not shown	1030	N	448600 190200	Status: Historical Licence No: 28/39/18/0073 Details: Spray Irrigation - Storage Direct Source: THAMES SURFACE WATER - NON TIDAL Point: MILTON HILL, ABINGDON, - MOOR DITCH, POINT 'B' Data Type: Point Name: C & A J HARTWRIGHT	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: - Original Start Date: 04/01/1977 Expiry Date: - Issue No: 100 Version Start Date: 03/06/1988 Version End Date:
Not shown	1086	NW	448200 190100	Status: Historical Licence No: 28/39/18/0073 Details: Spray Irrigation - Storage Direct Source: THAMES SURFACE WATER - NON TIDAL Point: MILTON HILL, ABINGDON, - MOOR DITCH, POINT 'A' Data Type: Point Name: C & A J HARTWRIGHT	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: - Original Start Date: 04/01/1977 Expiry Date: - Issue No: 100 Version Start Date: 03/06/1988 Version End Date:

6.5 Potable Water Abstraction Licences

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

Database searched and no data found.

6.6 Source Protection Zones

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

Database searched and no data found.

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	Major Aquifer/Intermediate Leaching Potential	I1	Soils which can possibly transmit a wide range of pollutants.
355	SW	Major Aquifer/High Leaching Potential	H3	Coarse textured or moderately shallow soils which readily transmit non-adsorbed pollutants and liquid discharges but have some ability to attenuate adsorbed pollutants because of their clay or organic matter content.

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.

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	347 E	-	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): 1.8
1	347 E	-	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): 1.8
2	386 E	-	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): 4.6
3	386 E	-	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): 1.8
4	386 E	-	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): 1.0
2	386 E	-	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): 4.6
3	386 E	-	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): 1.8
4	386 E	-	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

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
				conditions) Average Width in Watercourse Section (m): 1.0
5	387 E	-	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): 3.0
6	387 E	-	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): 2.5
5	387 E	-	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): 3.0
6	387 E	-	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): 2.5
7	391 E	-	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): 9.7
7	391 E	-	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): 9.7
8	392 E	-	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): 10.8
8	392 E	-	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): 10.8
9	393 E	-	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	393 E	-	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
10	397 E	-	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): 1.6
Not shown	397 E	-	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): 1.6

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
11	427 NW	-	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
11	427 NW	-	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	430 NW	-	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	430 NW	-	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
13	431 NW	-	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 NW	-	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	432 NW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: Not provided Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	432 NW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: Not provided Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
15	438 E	-	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): 3.8
Not shown	438 E	-	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): 3.8
16	465 NW	-	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	465 NW	-	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
17	466	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship to Ground Level: On ground surface

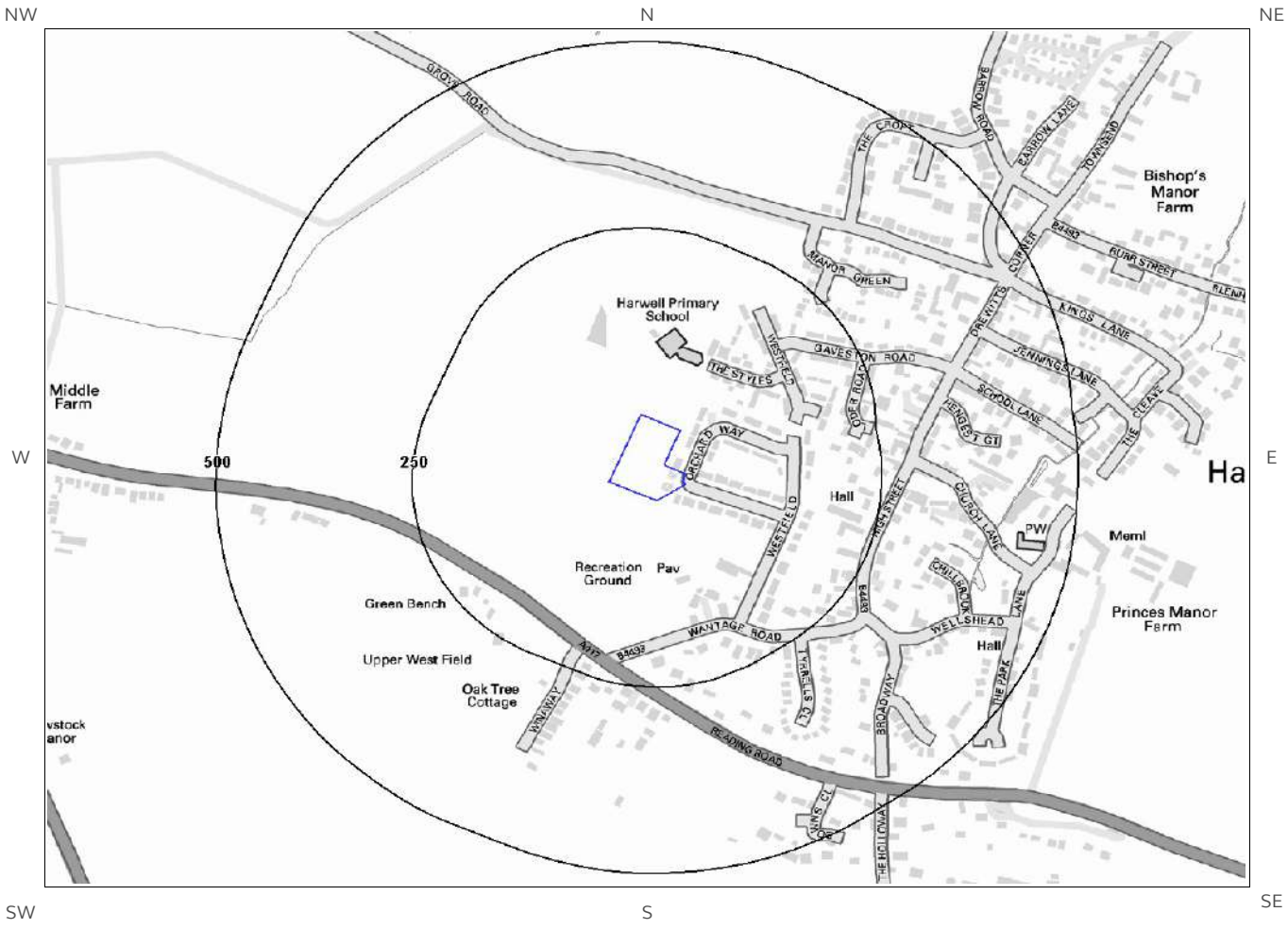
ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
	NW			Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
17	466 NW	-	Inland river not influenced by normal tidal action.	Catchment Area: Thames Relationship 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 — None identified

Database searched and no data found.

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

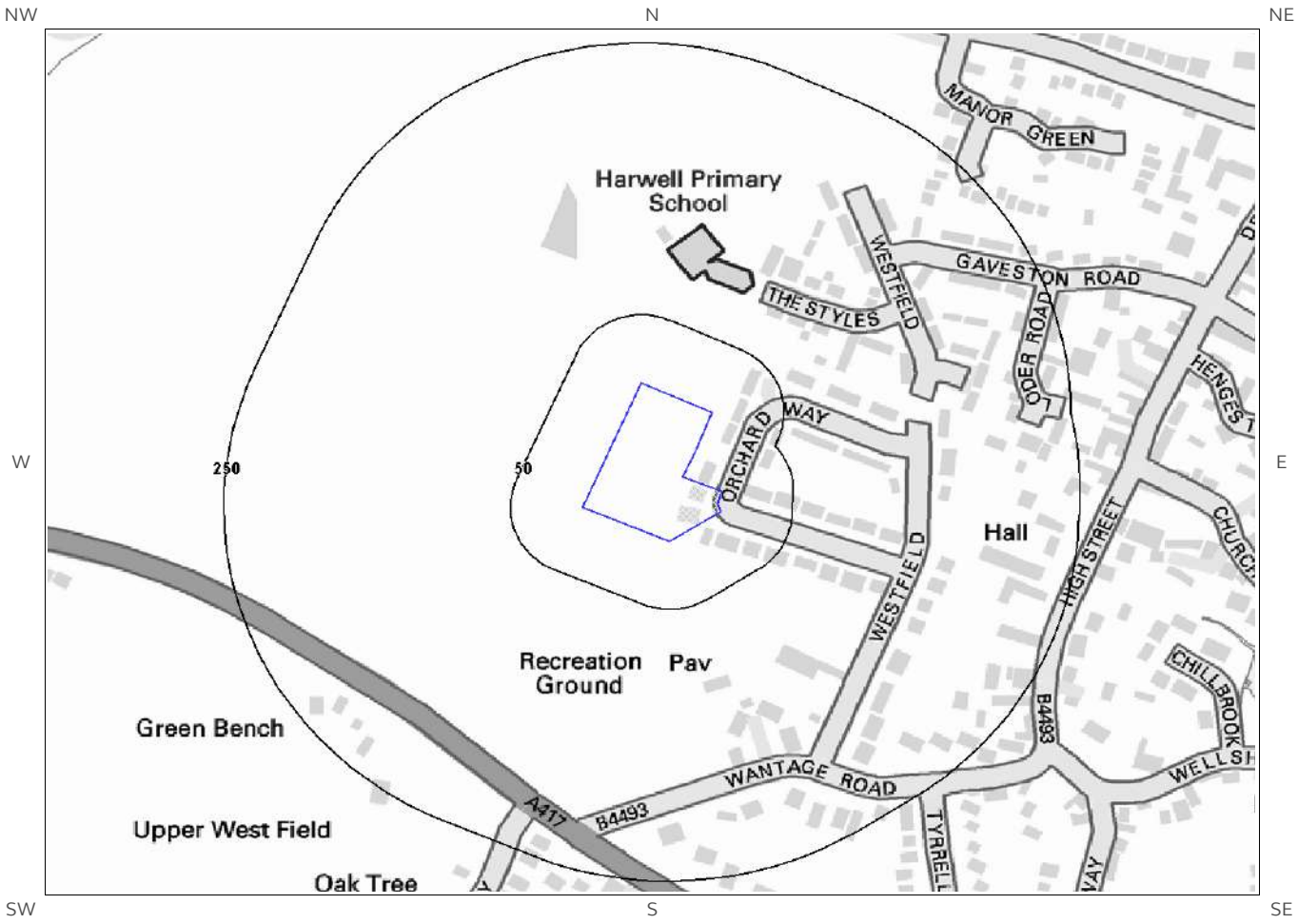
Zone 3 Floodplain

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	Clearwater 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

Limited potential

Where limited potential for groundwater flooding to occur is indicated, this means that although given the geological conditions there may be a groundwater flooding hazard, unless other relevant information, e.g. records of previous flooding, suggests groundwater flooding has occurred before in this area, you need take no further action in relation to groundwater flooding hazard.

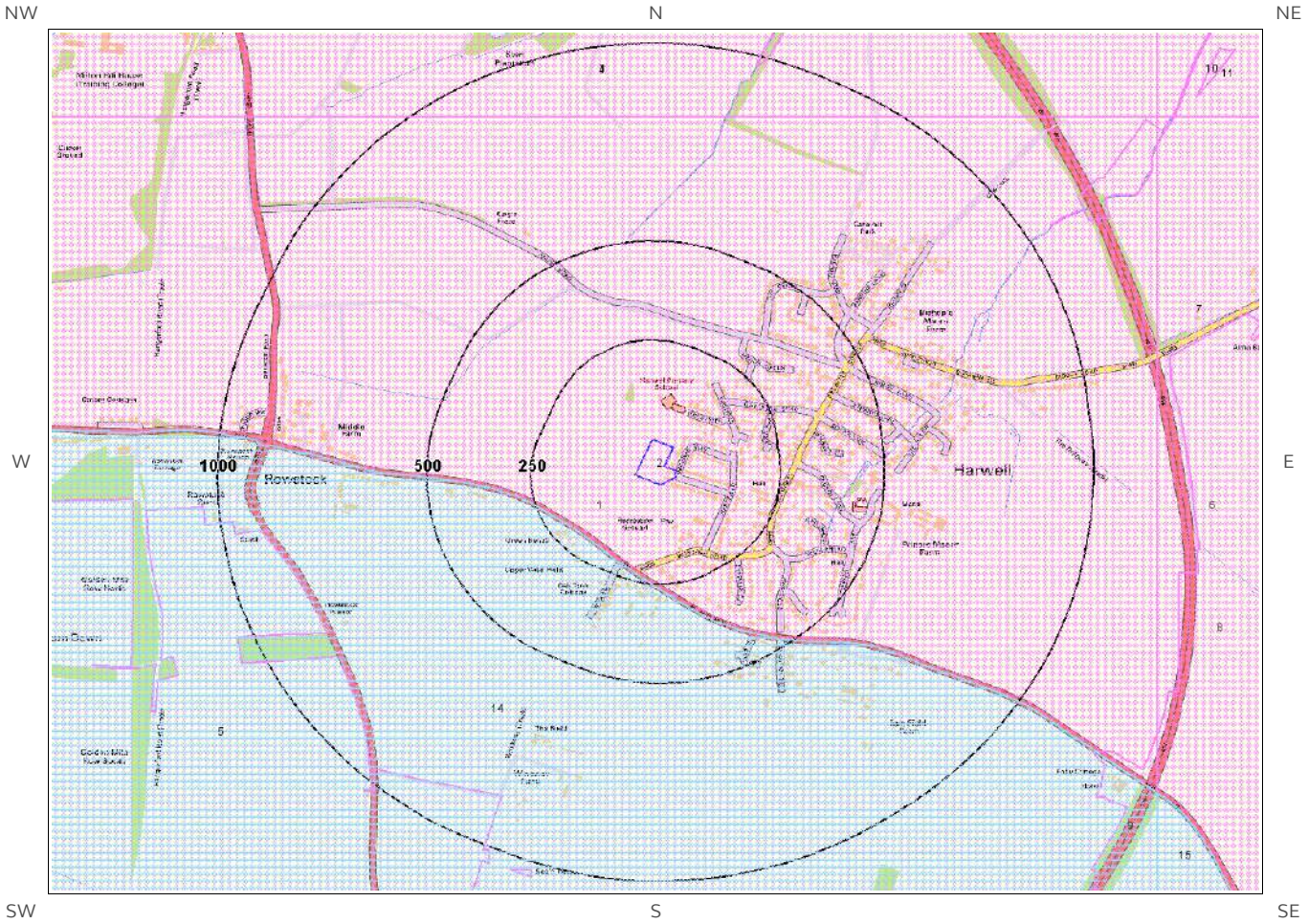
7.8 Groundwater Flooding Confidence Areas

British Geological Survey confidence rating in this result	Low

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:

0

Database searched and no data found.

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

0

Database searched and no data found.

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:

1

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
Not shown	1945	SW	LYDE BANK PLANTATION	Ancient and Semi-Natural Woodland

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

0

Database searched and no data found.

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:

2

The following Area of Outstanding Natural Beauty (AONB) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	AONB/NSA Name	Data Source
14	195	SW	North Wessex Downs	Natural England
15	1404	SE	North Wessex Downs	Natural England

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:

13

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
1	0	On Site	Existing	DEFRA
2	0	On Site	Existing	DEFRA
3	812	N	Existing	DEFRA
4	812	N	Existing	DEFRA
5	836	SW	Existing	DEFRA
6	1153	E	Existing	DEFRA
7	1153	E	Existing	DEFRA
8	1206	E	Existing	DEFRA
9	1220	SE	Existing	DEFRA
10	1428	NE	Existing	DEFRA
11	1428	NE	Existing	DEFRA
Not shown	1760	NW	Existing	DEFRA
Not shown	1993	NE	Existing	DEFRA

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

0

Database searched and no data found.

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 — Negligible

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

Hazard
Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.

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	None identified

Database searched and no data found.

10.3 Brine Affected Areas

Brine affected areas within 75m of the study site	None identified

Guidance: No Guidance Required.

Contact Details

CENTREMAPS
Telephone: 01886 832972
Groundsure@centremaps.co.uk
Open Space, Upper Interfields, Malvern, Worcester, WR14 1UT

British Geological Survey Enquiries
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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**
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Public Health England
Public information access office
Public Health England, Wellington House
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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: Vale of White Horse District Council
Phone: 01235 422 422
Web: http://www.whitehorsedc.gov.uk/
Address: 135, Eastern Avenue, Abingdon, Oxfordshire, OX14 4SB

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

CENTREMAPS

Open Space, Upper Interfields,
Worcester, WR14 1UT

Report Reference: CMAPS-CM-798897-13238-100519GEO

Your Reference: 13238

Report Date 10 May 2019

Report Delivery Method: Email - pdf

Geo Insight

Address: Orchard Way, Harwell, OX11 0LQ

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 01886 832972 quoting the above CENTREMAPS reference number.

Yours faithfully,

CENTREMAPS

Enc.
Groundsure Geo Insight

Geo Insight

Address:	**Orchard Way, Harwell, OX11 0LQ**
Date:	**10 May 2019**
Reference:	**CMAPS-CM-798897-13238-100519GEO**
Client:	**CENTREMAPS**

NW N NE

W E

SW S SE

Aerial Photograph Capture date:	24-Oct-2018
Grid Reference:	448798,189130
Site Size:	0.6642ha

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?*	No
	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	0	0	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	0

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*	0	0	1	0	0
5.5 Non–Coal Mining Cavities	0	0	0	0	0
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 Tin Mining	0	0	0	0	0
5.9 Clay Mining	0	0	0	0	0

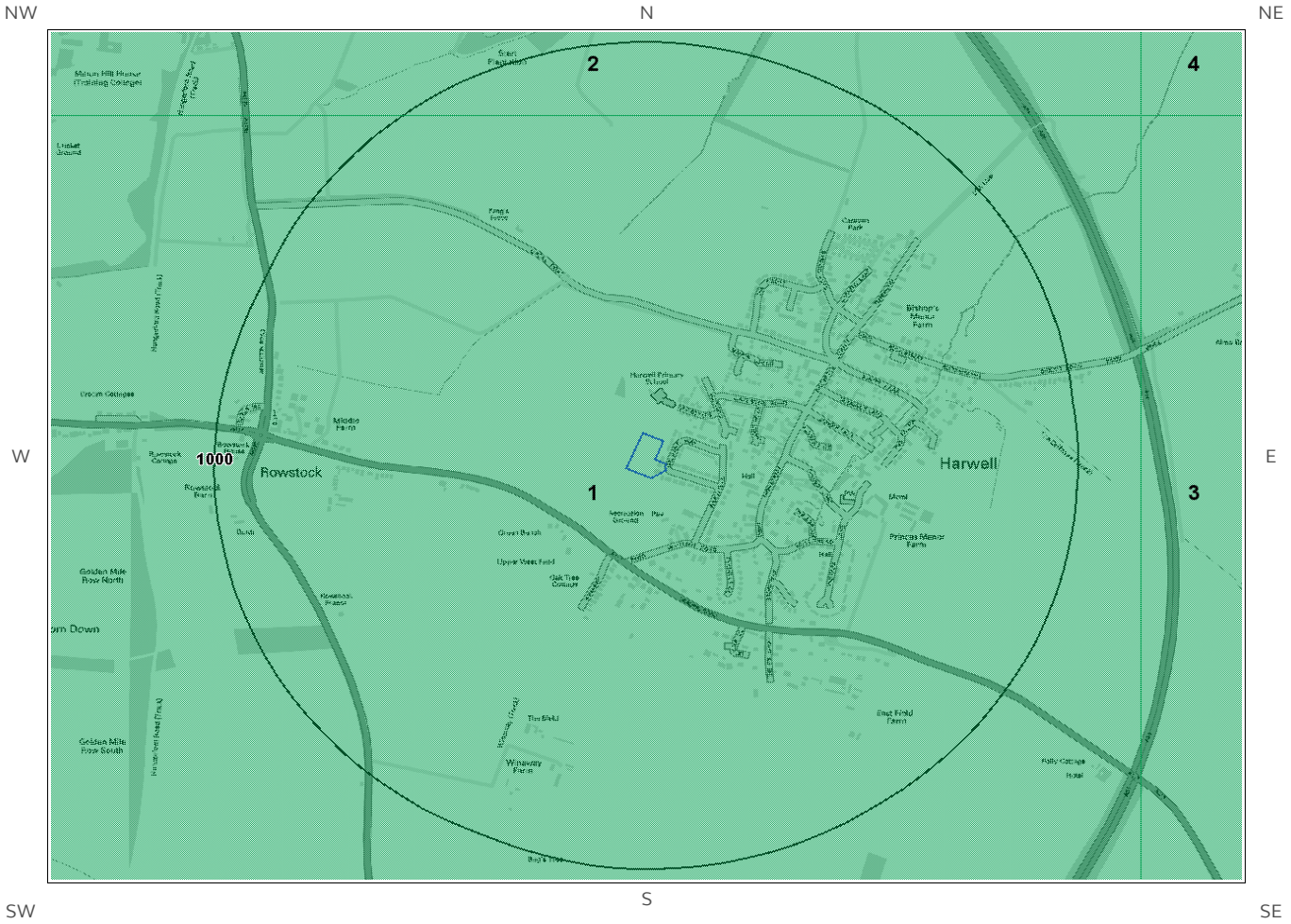
Section 6: Natural Ground Subsidence	On-site
6.1 Shrink-Swell Clay	Negligible
6.2 Landslides	Very Low
6.3 Ground Dissolution of Soluble Rocks	Negligible
6.4 Compressible Deposits	Negligible
6.5 Collapsible Deposits	Very Low
6.5 Running Sand	Very Low

Section 7: Borehole Records	On-site	0-50m	51-250
7 BGS Recorded Boreholes	0	0	5

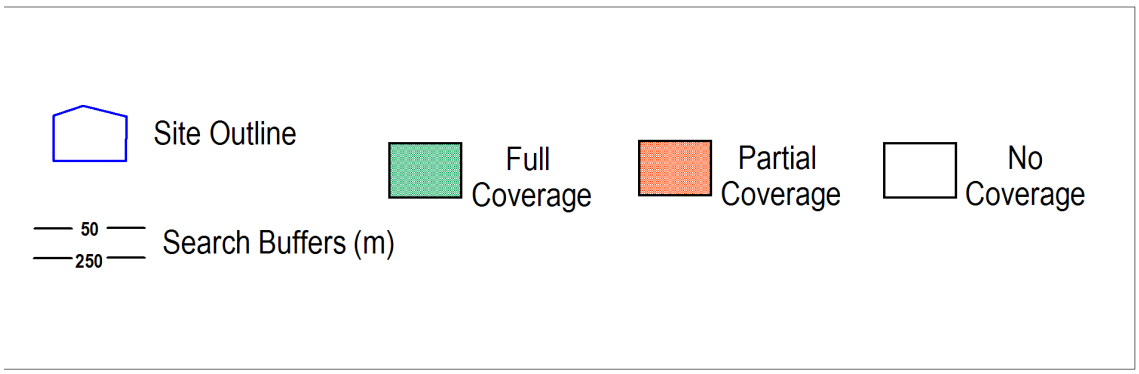
Section 8: Estimated Background Soil Chemistry	On-site	0-50m	51-250
8 Records of Background Soil Chemistry	1	0	0

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	Some deposits are mapped	Full	Full	No coverage
2	812.0	Some deposits are mapped	Full	Full	Some deposits are mapped
3	1153.0	Some deposits are mapped	Full	Full	No coverage
4	1428.0	Some deposits are mapped	Full	Full	No coverage

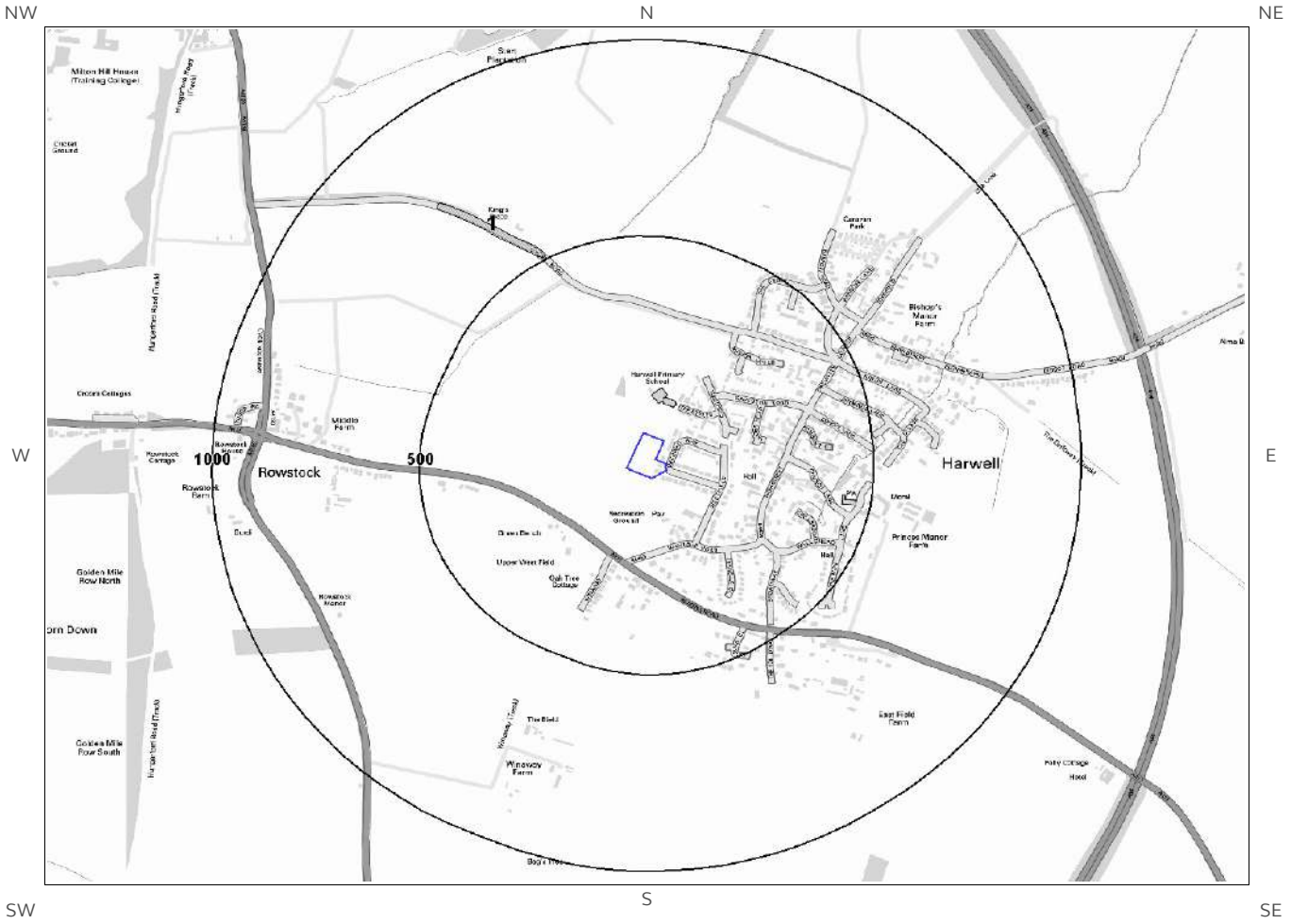
Guidance: The 1:10,000 scale geological interpretation is the most detailed generally available from BGS and is the scale at which most geological surveying is carried out in the field. The database is presented as four types of geology (artificial, mass movement, superficial and bedrock), although not 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? No

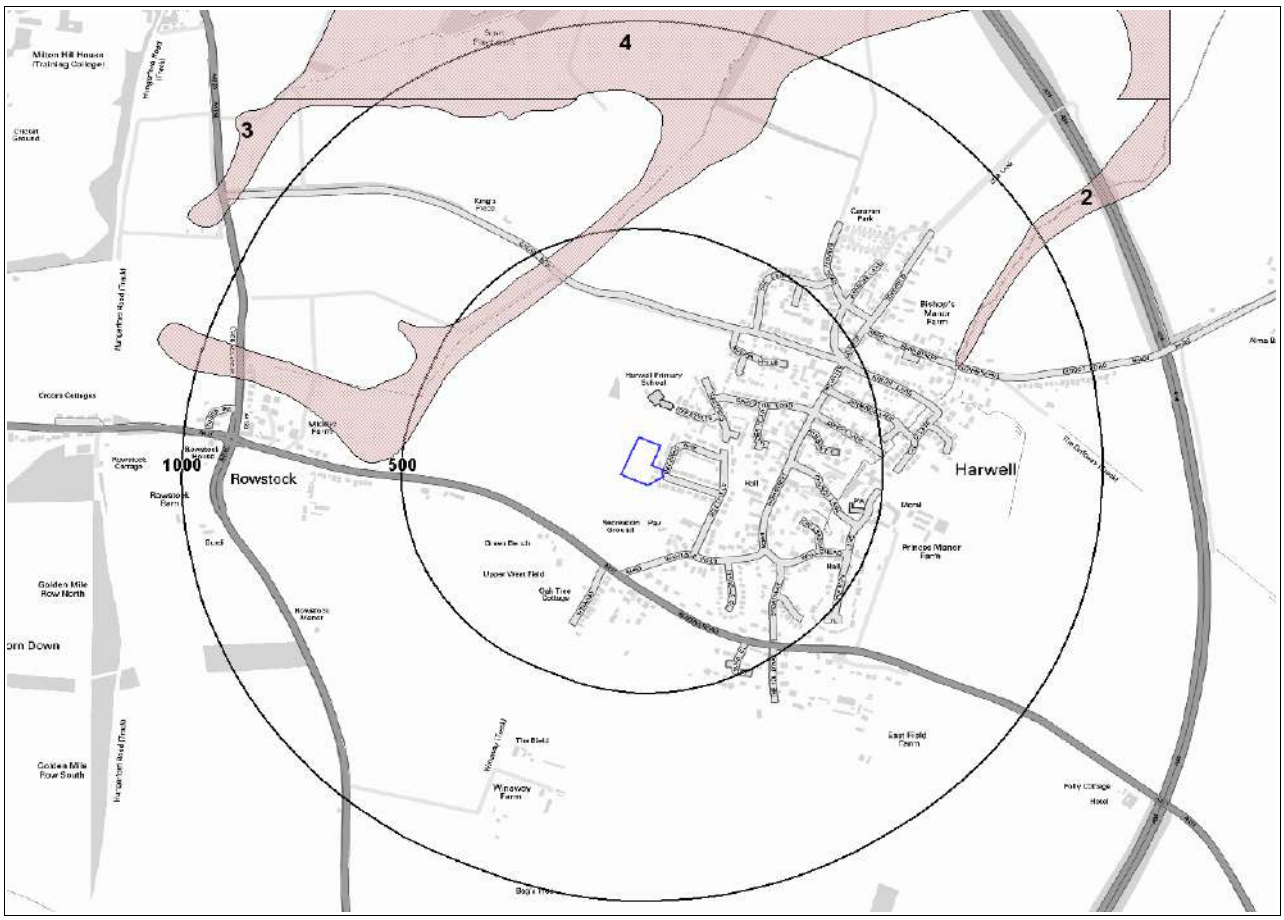
Database searched and no data found.

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

NW N NE

W E

SW S SE



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	400.0	NW	HEAD-XCZSV	Head - Clay, Silt, Sand And Gravel	Clay, Silt, Sand And Gravel

1.2.2 Landslip

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

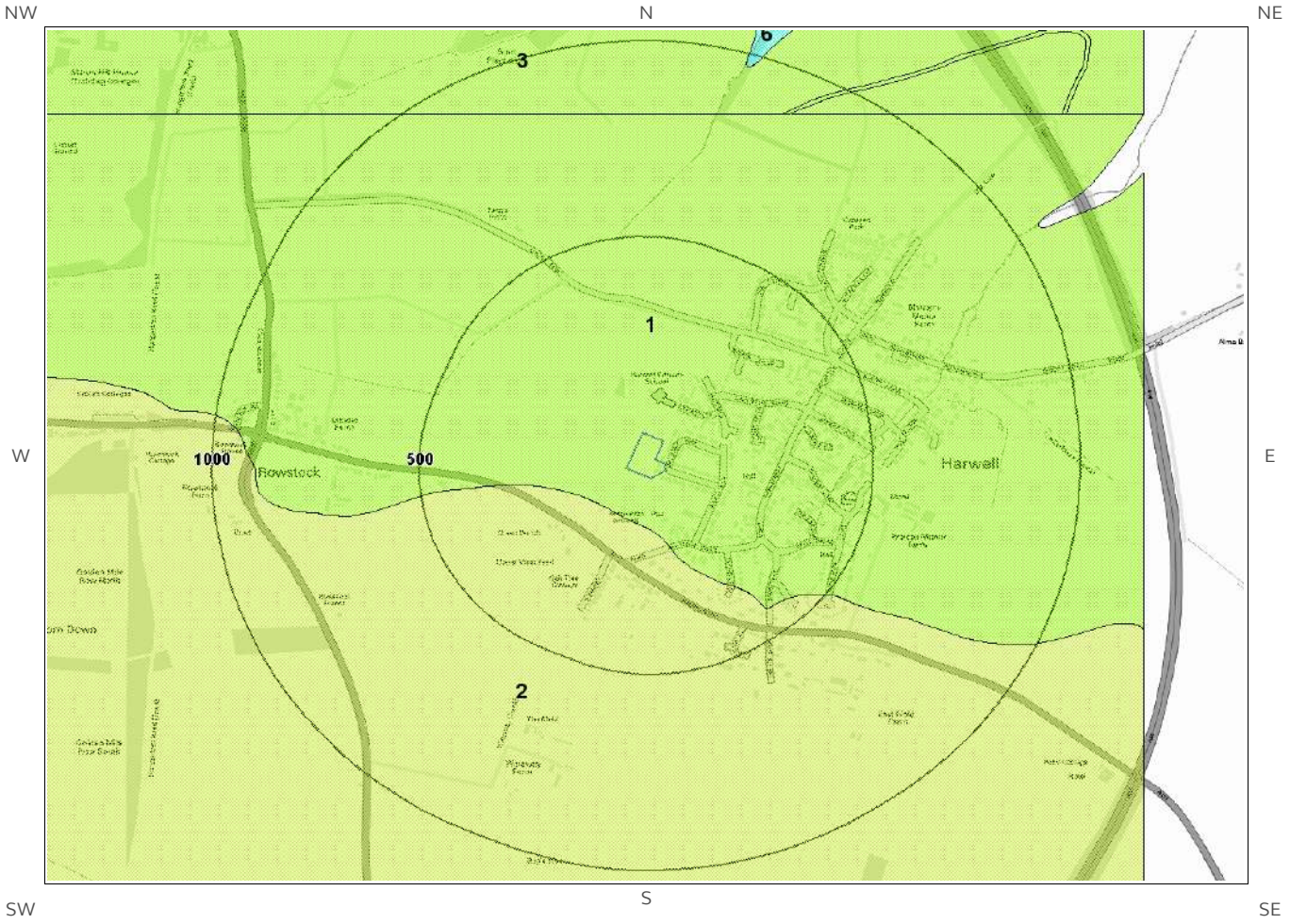
No

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	0.0	On Site	UGS-SISD	Upper Greensand Formation - Siltstone And Sandstone	Cenomanian Age - Albian Age
2	110.0	SW	WMCH-CHLK	West Melbury Marly Chalk Formation - Chalk	Cenomanian 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

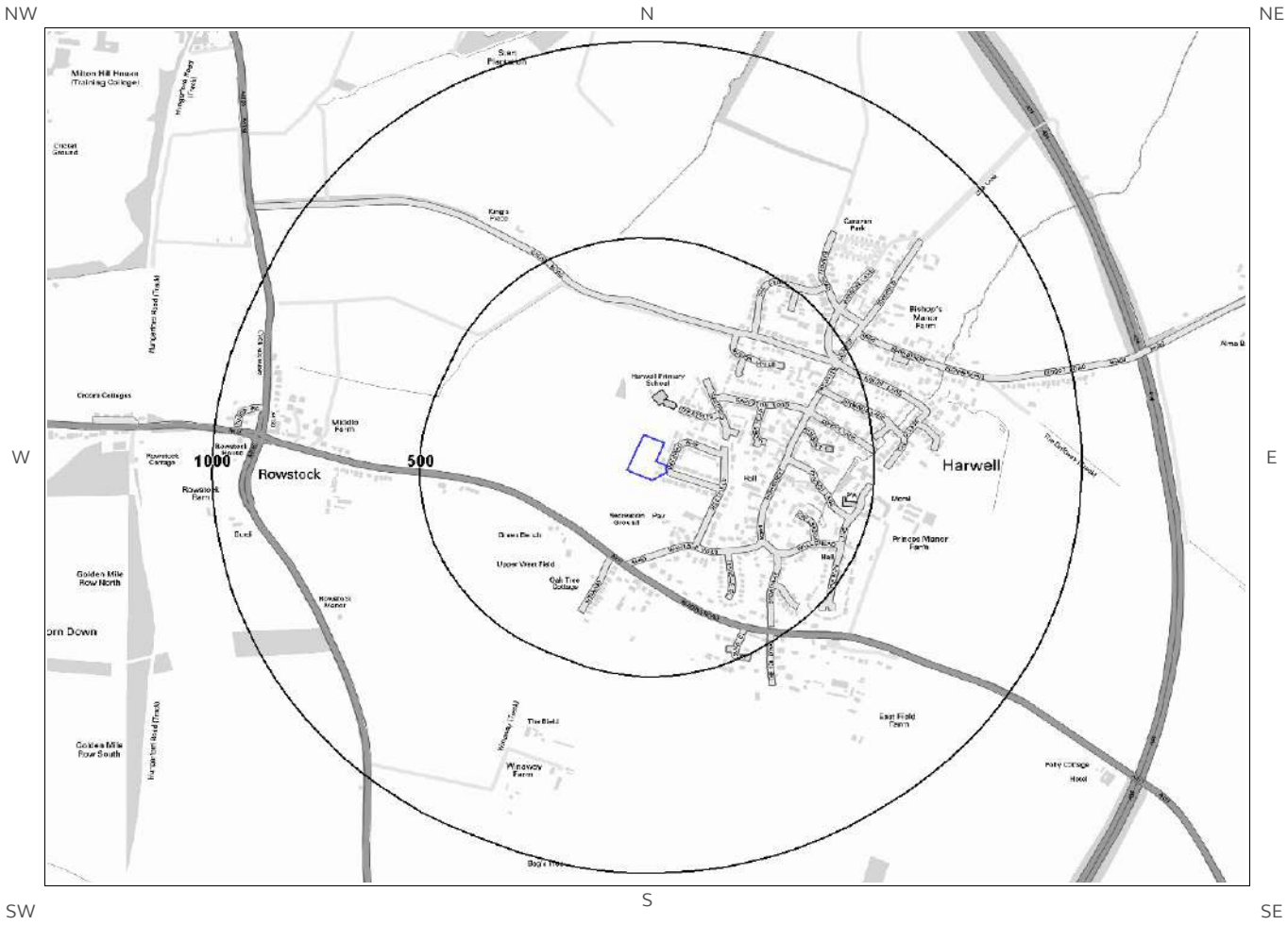
Database searched and no data found at this scale.

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)

Worked Ground (undivided)

Infilled Ground

Disturbed Ground (undivided)

Landscaped Ground (undivided)

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: 253

2.1.1 Artificial/ Made Ground

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

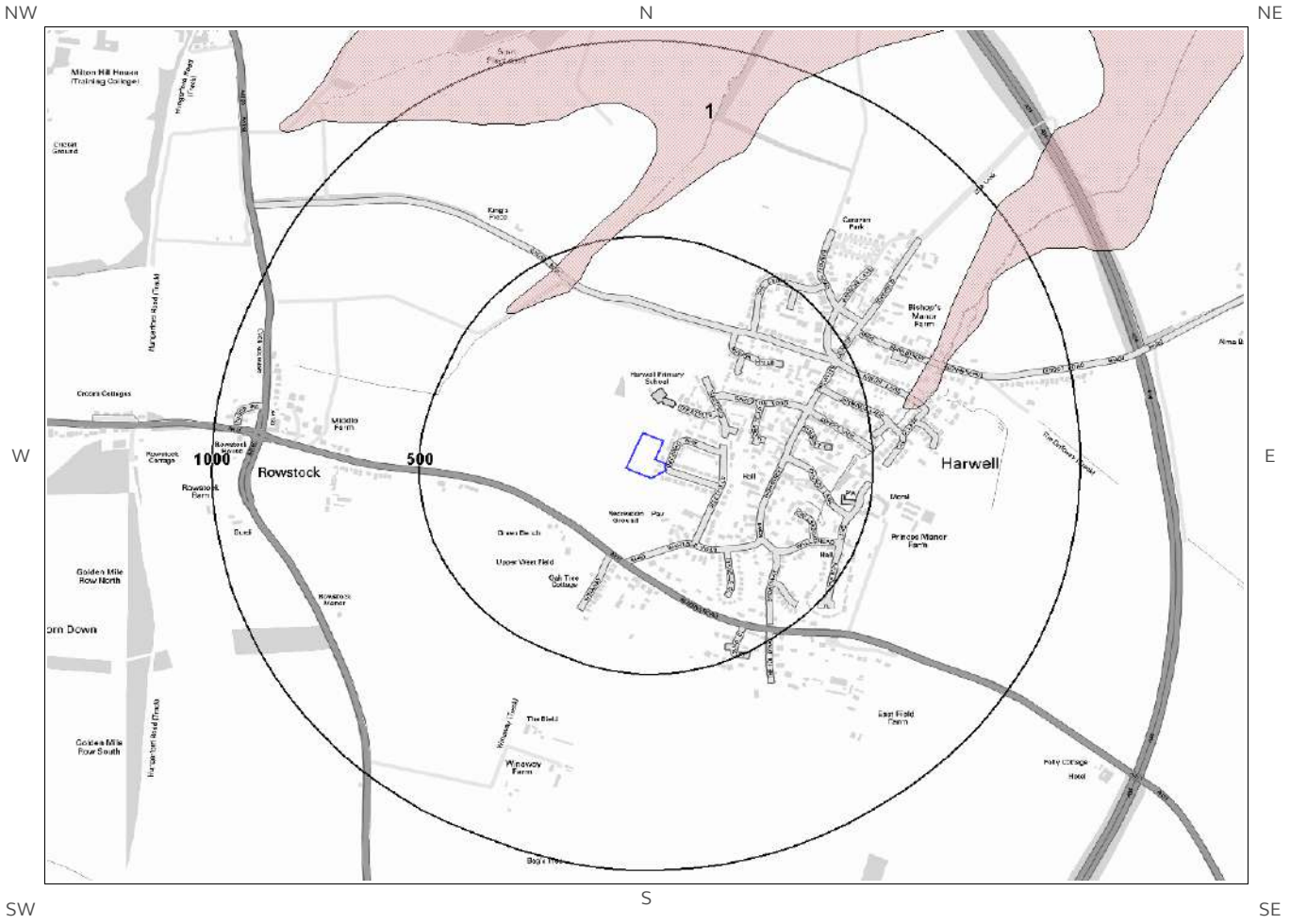
Database searched and no data found.

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	404.0	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	Mixed	High	Very Low

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.

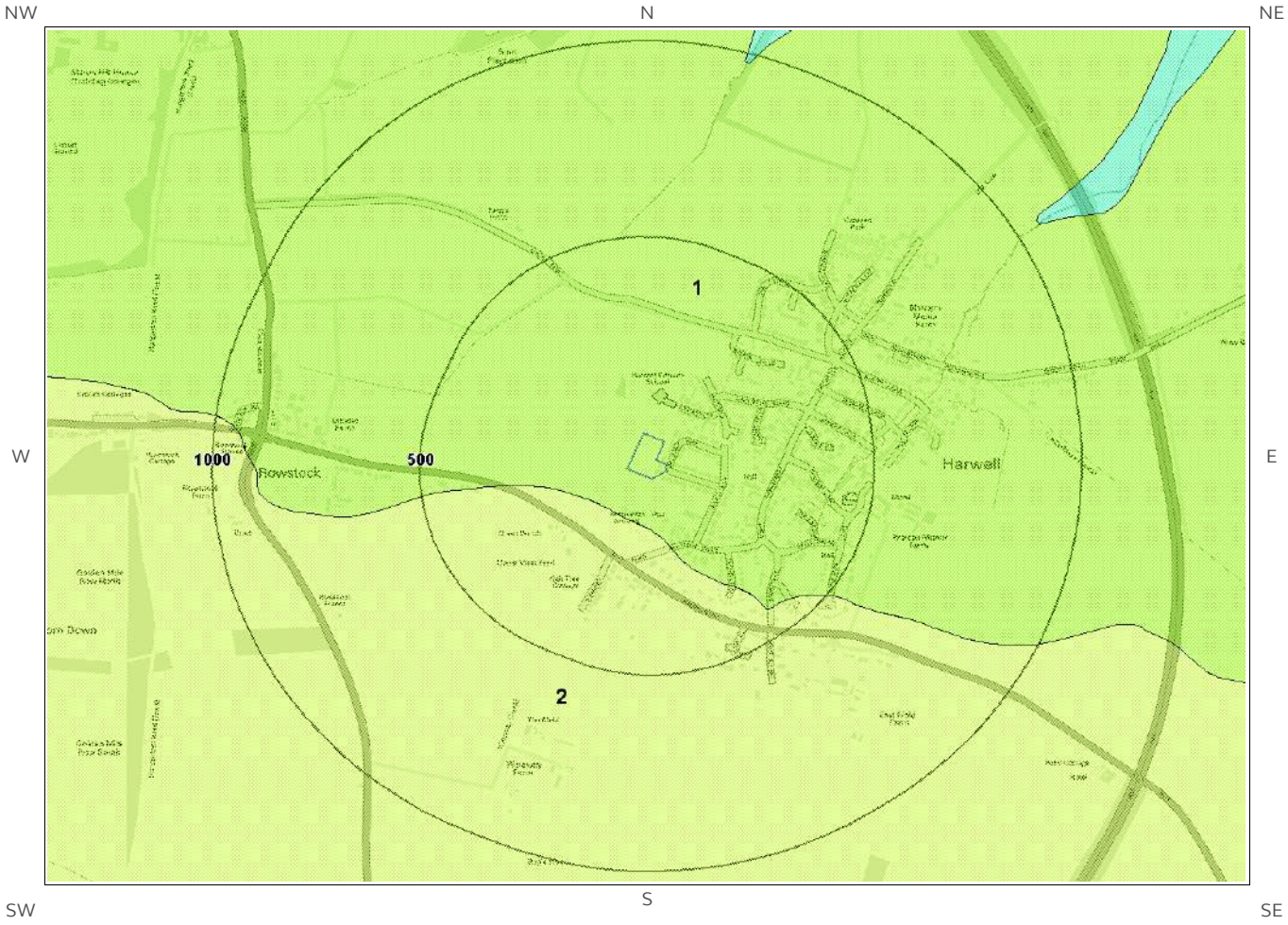
This Geology shows the main components as discrete layers, there are: Artificial/ Made Ground, Superficial/ Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

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: 253

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	UGS-CSSL	UPPER GREENSAND FORMATION - CALCAREOUS SANDSTONE AND SILTSTONE	ALBIAN
2	110.0	SW	WMCH-CHLK	WEST MELBURY MARLY CHALK FORMATION - CHALK	CENOMANIAN

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	High	Moderate

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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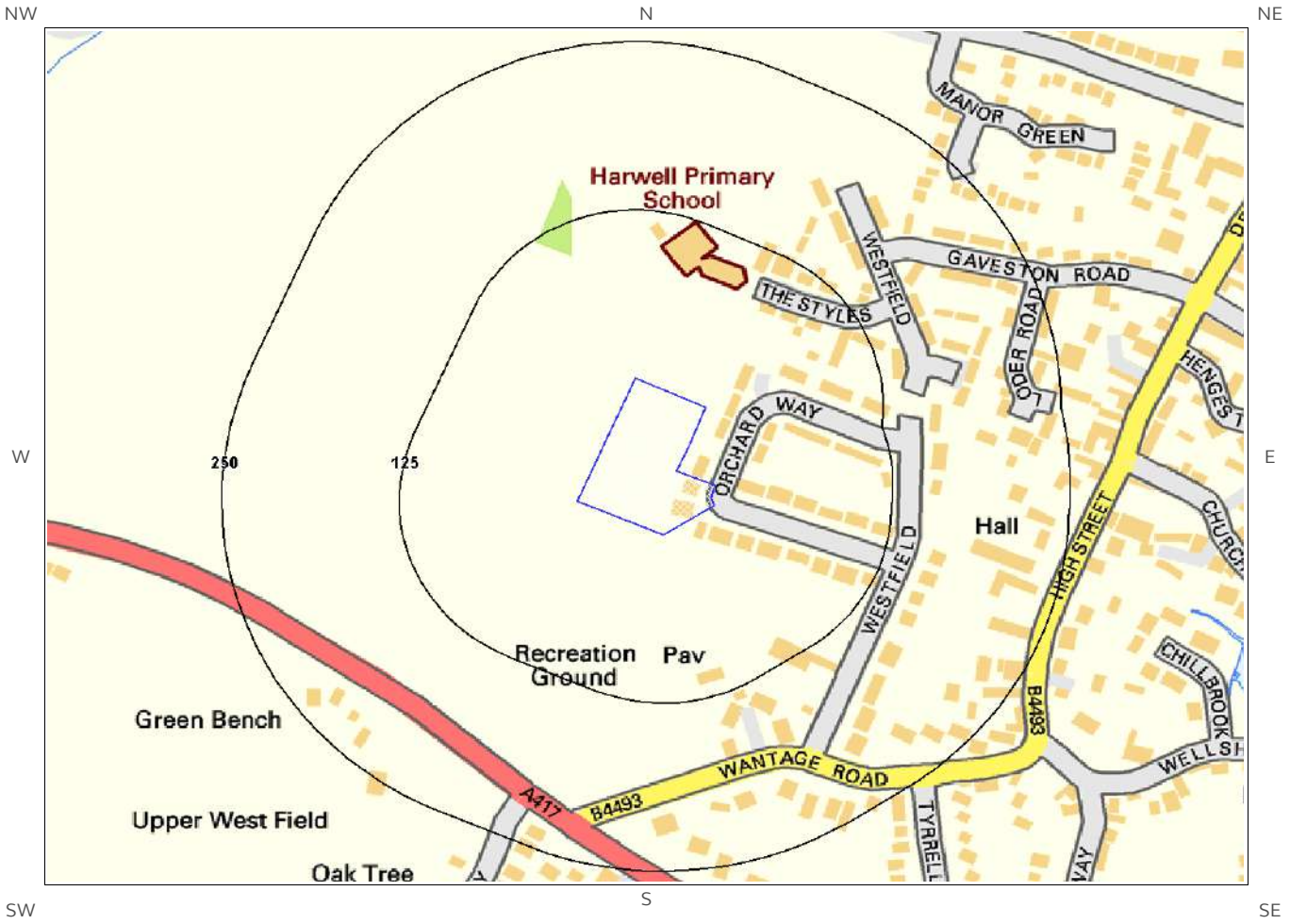
4 Ground Workings map



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? No

Database searched and no data found.

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

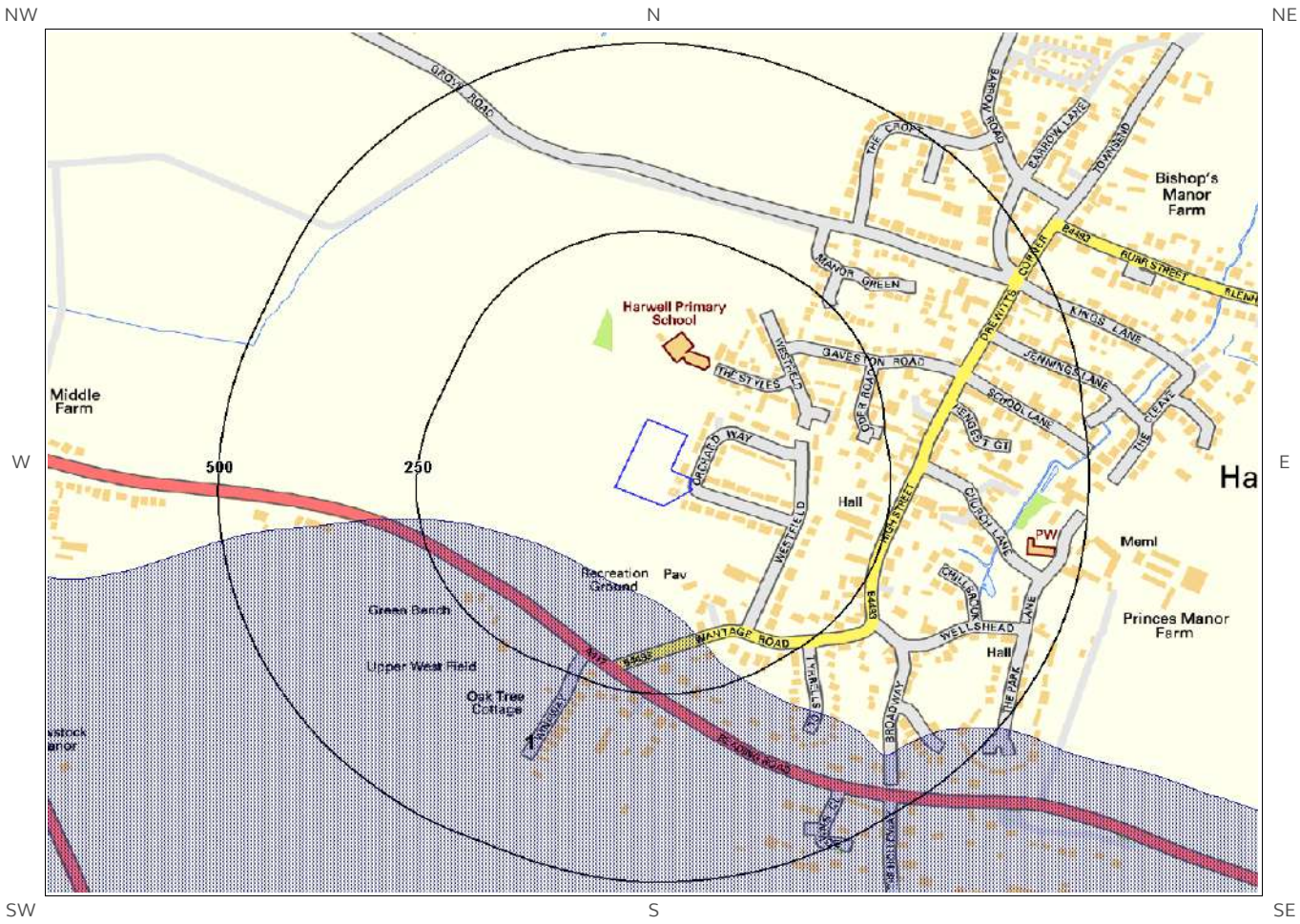
This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary? No

Database searched and no data found.

---

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	110.0	SW	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? No

Database searched and no data found.

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 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level..

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

Database searched and no data found.

5.10 Clay Mining

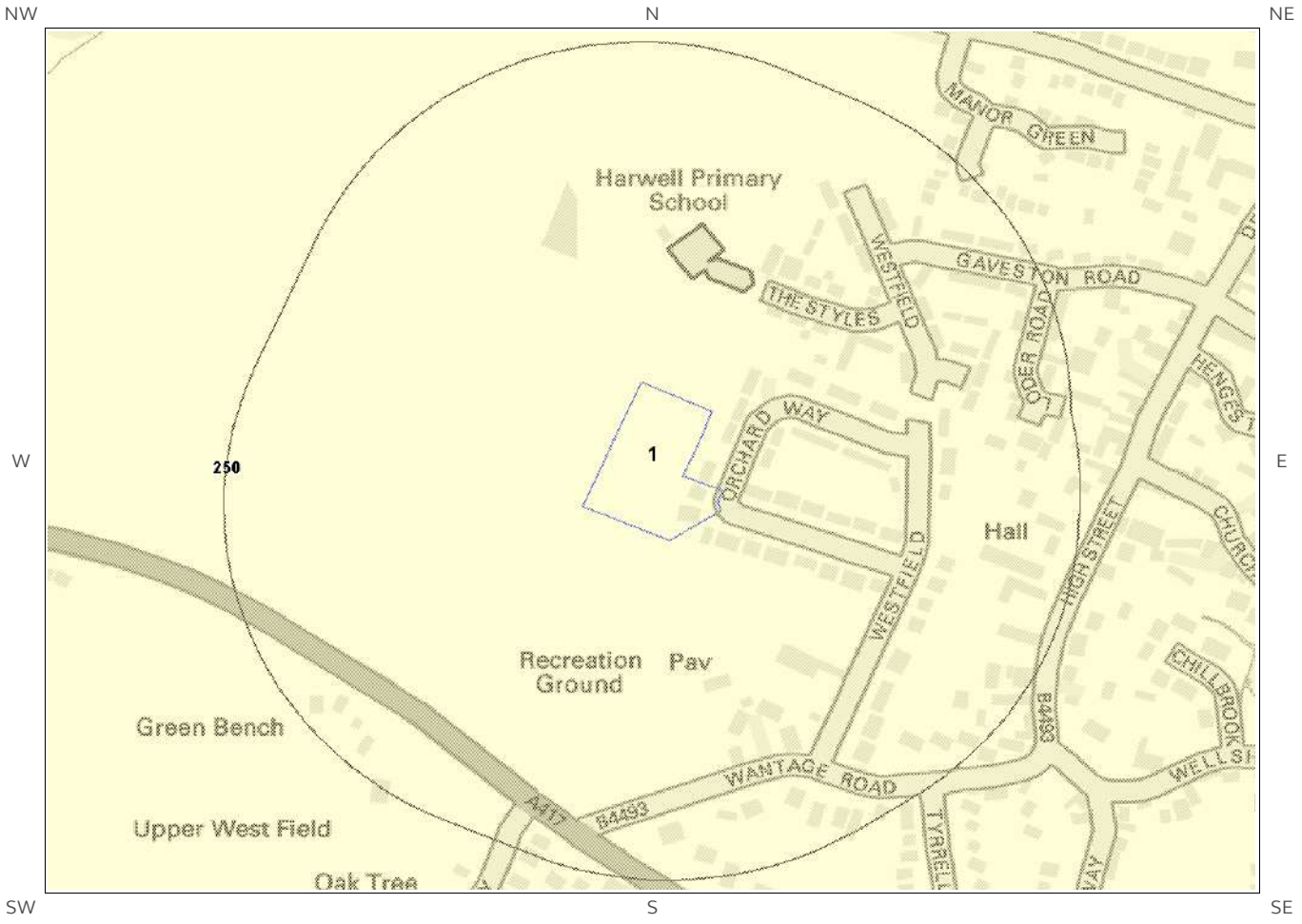
This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.

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

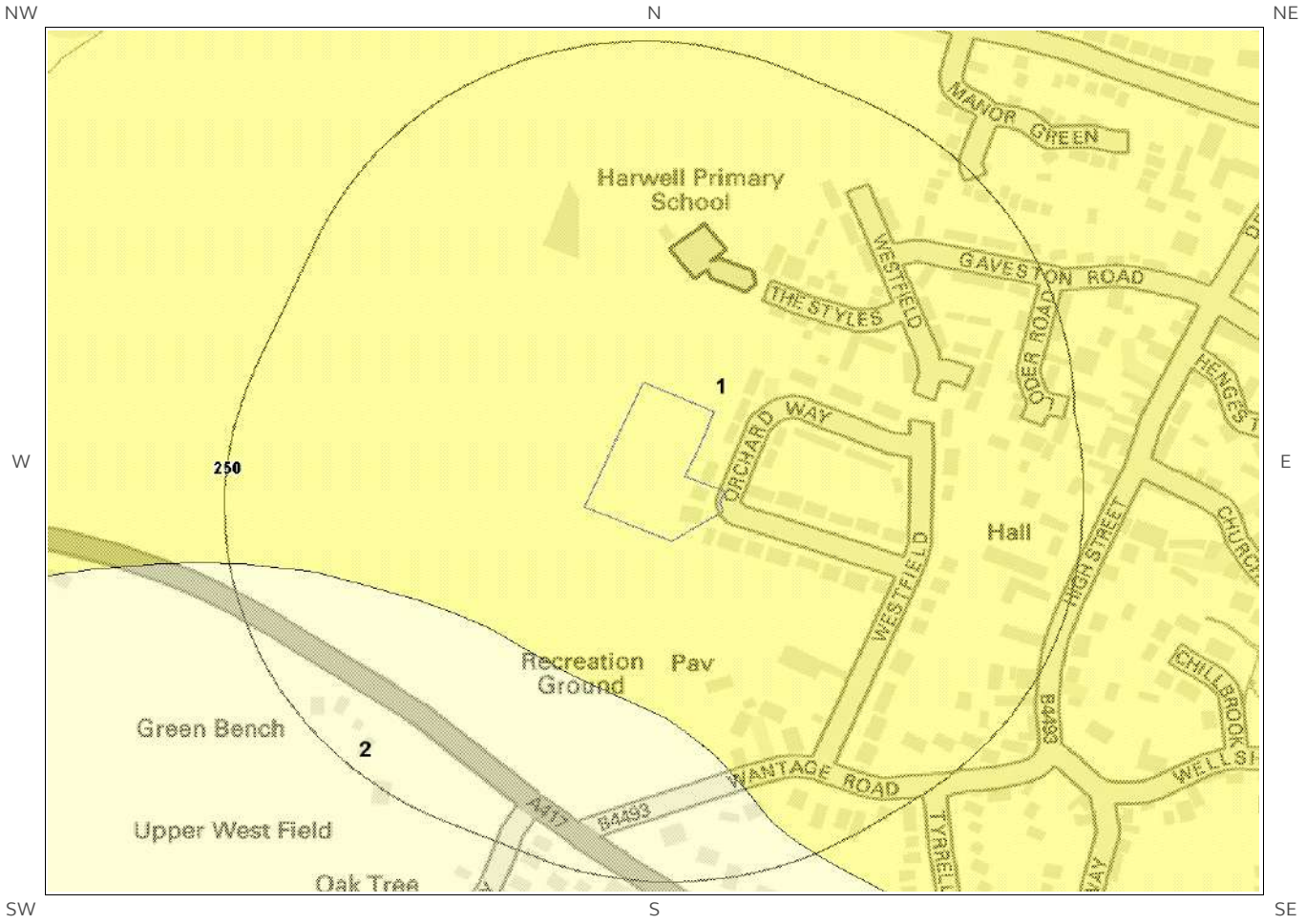
Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

6.2 Landslides map



Landslides Legend

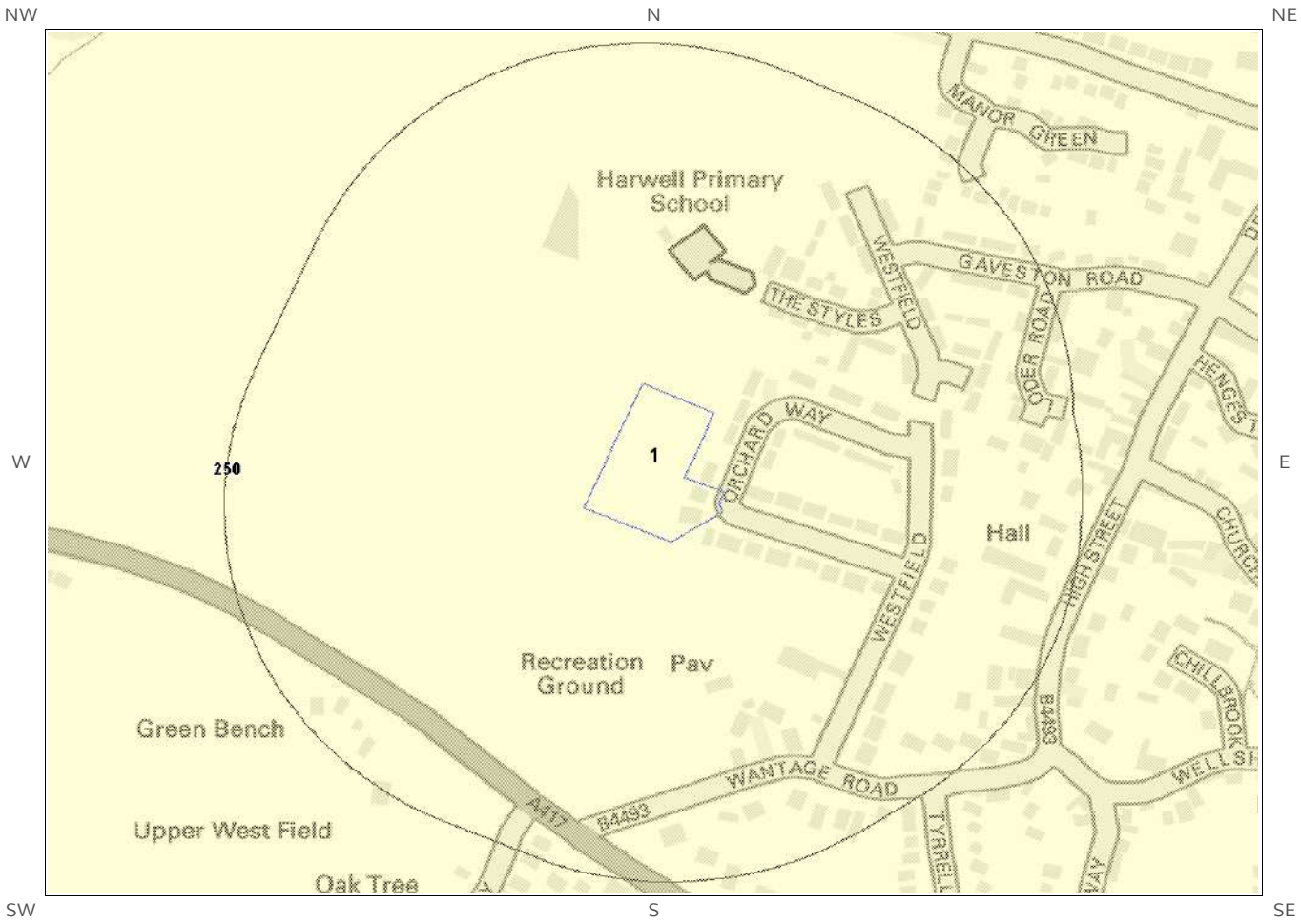
Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

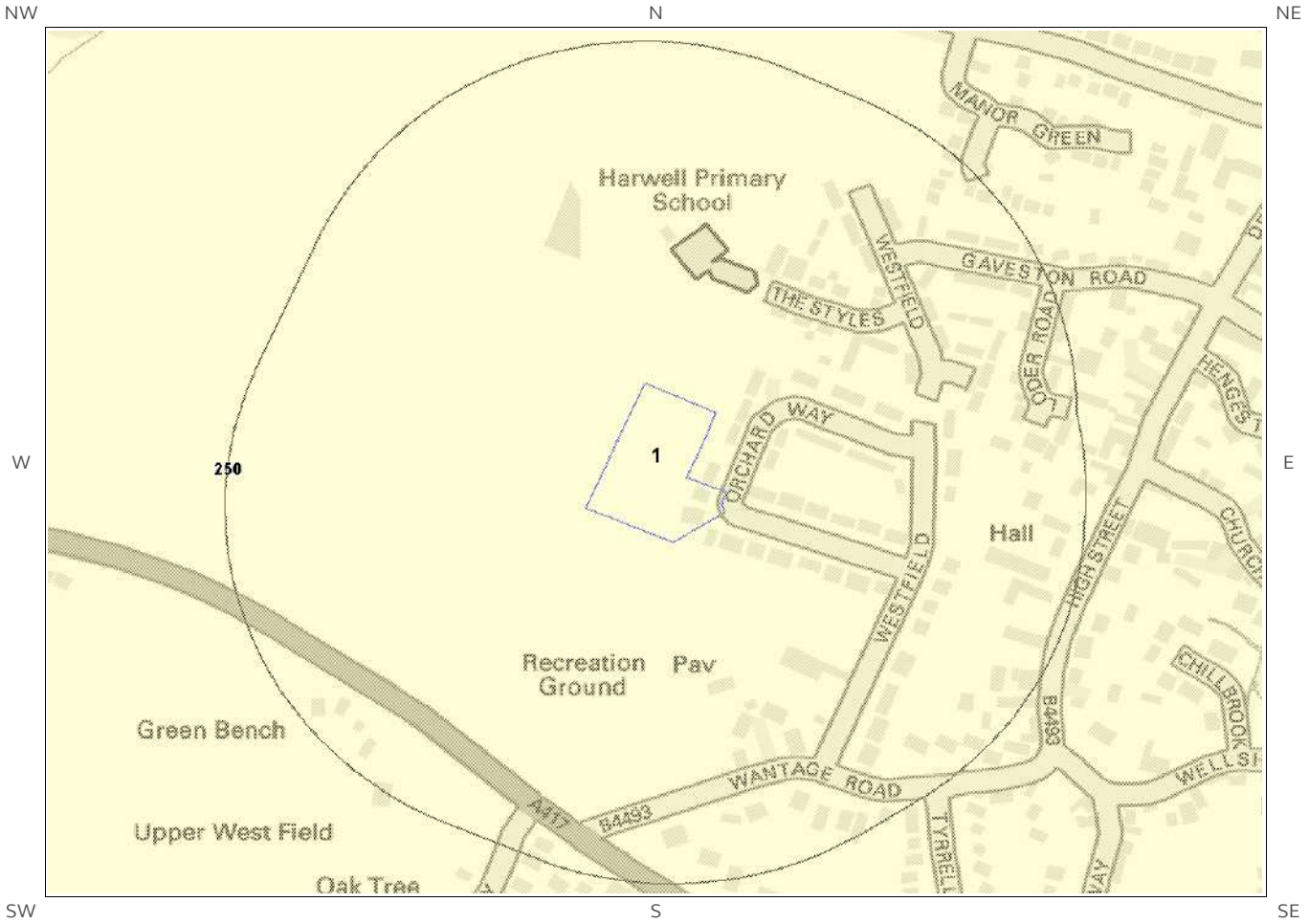
Low
Moderate
High

6.3 Ground Dissolution of Soluble Rocks map



Ground Dissolution Soluble Rocks Legend

6.4 Compressible Deposits map



Compressible Deposits Legend

Site Outline

125
250
Search Buffers (m)

No Data / Null

Negligible

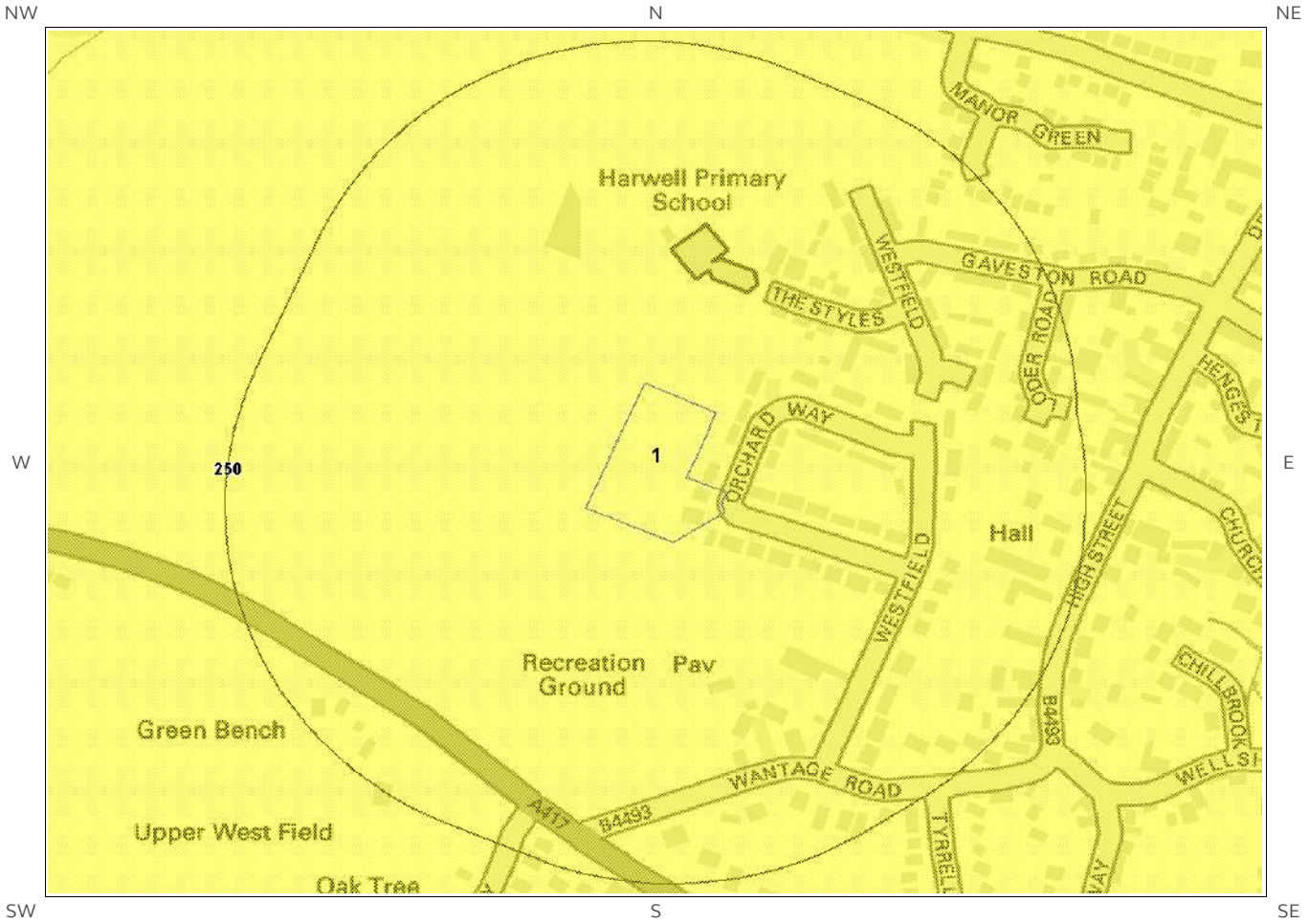
Very Low

Low

Moderate

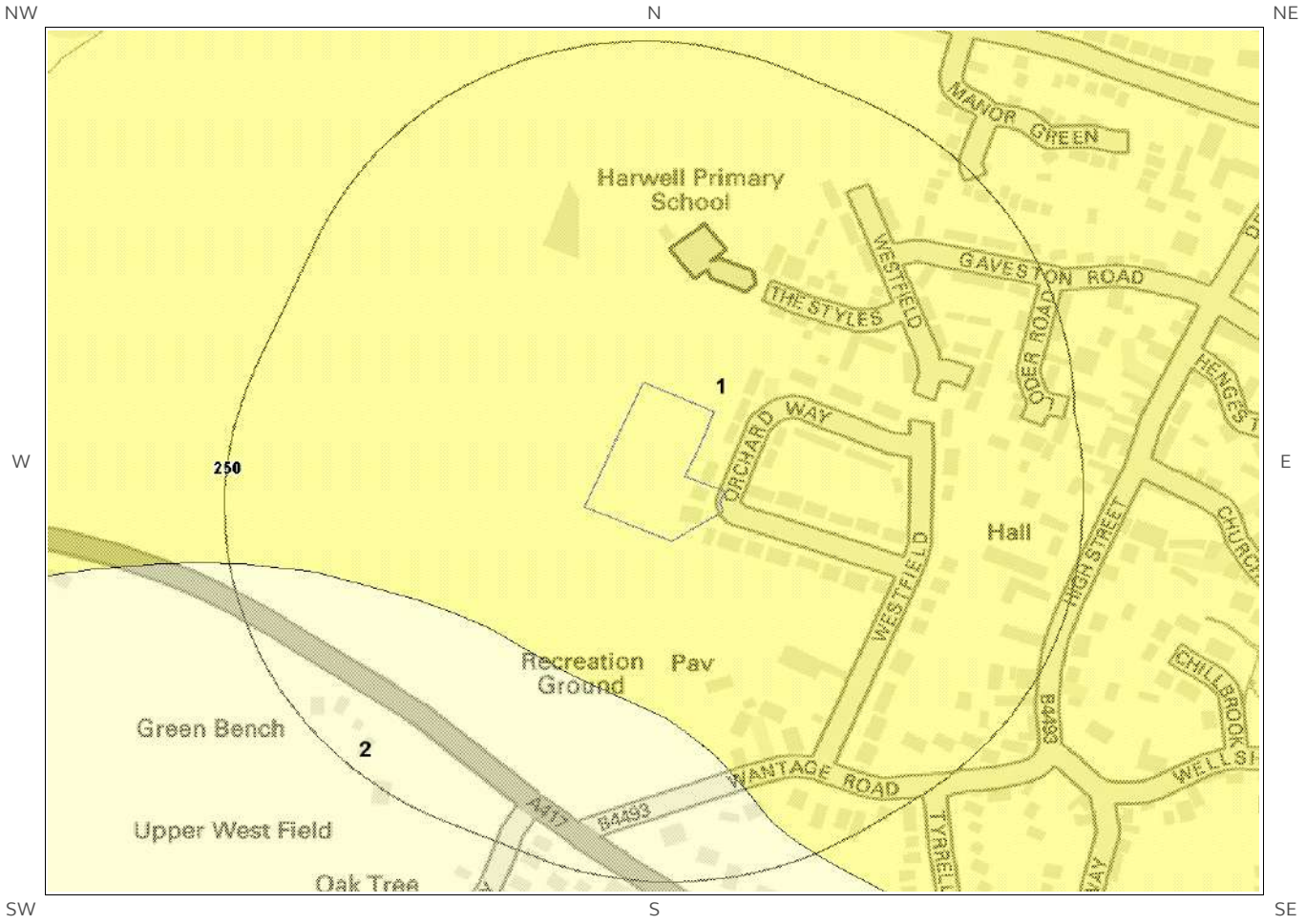
High

6.5 Collapsible Deposits map



Collapsible Deposits Legend

6.6 Running Sand map



Running Sand Legend

Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

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? Very Low

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	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.

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.

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.

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

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:

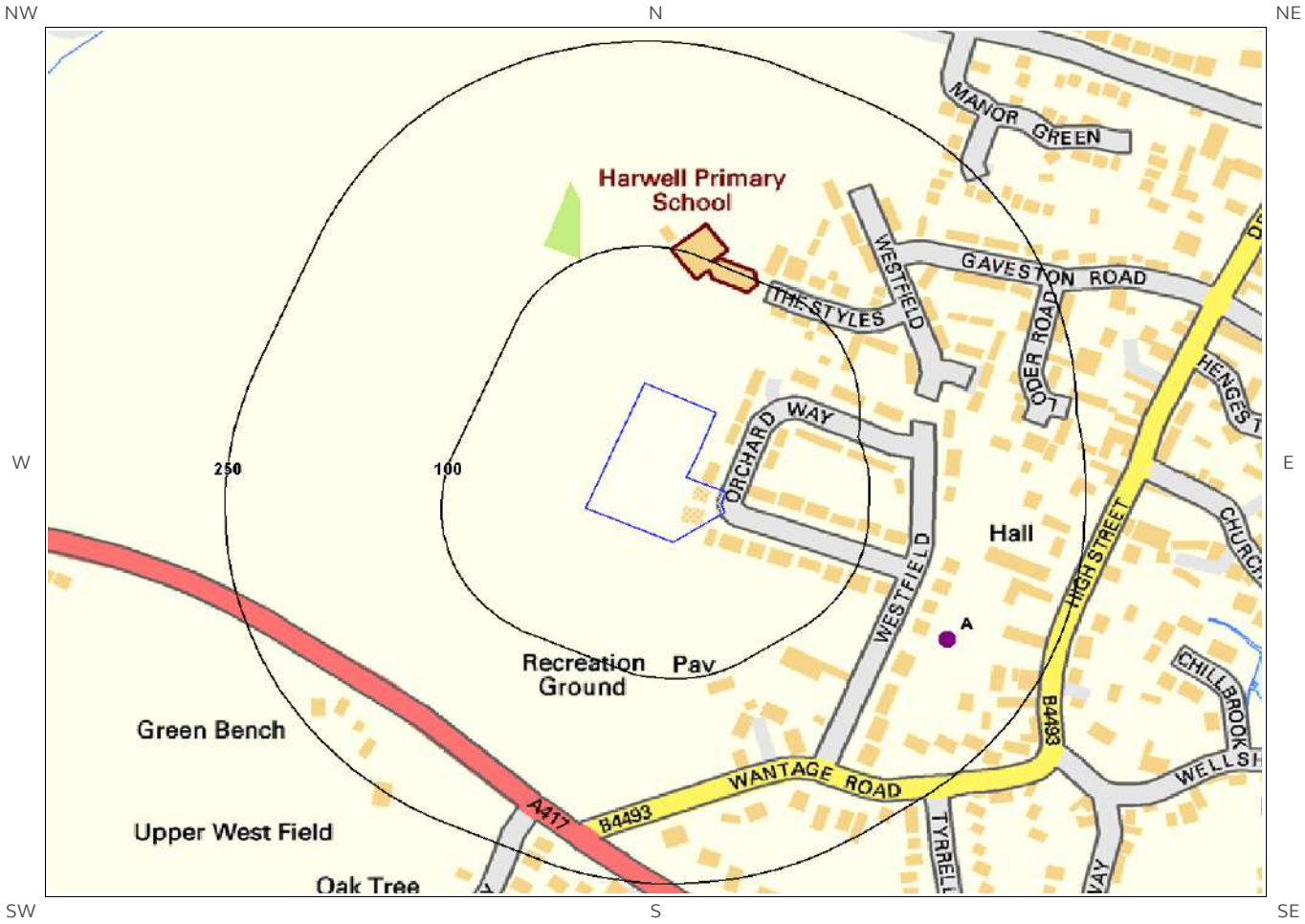
ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible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

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: 5

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
1A	180.0	SE	449000 189000	SU48NE189	Not available	HARWELL HWS4
2A	180.0	SE	449000 189000	SU48NE187	Not available	HARWELL HWS 2
3A	180.0	SE	449000 189000	SU48NE190	Not available	HARWELL HWS5 SCHOOL
4A	180.0	SE	449000 189000	SU48NE191	Not available	HARWELL HWS6
5A	180.0	SE	449000 189000	SU48NE186	Not available	HARWELL HWS 1

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.

8 Estimated Background Soil Chemistry

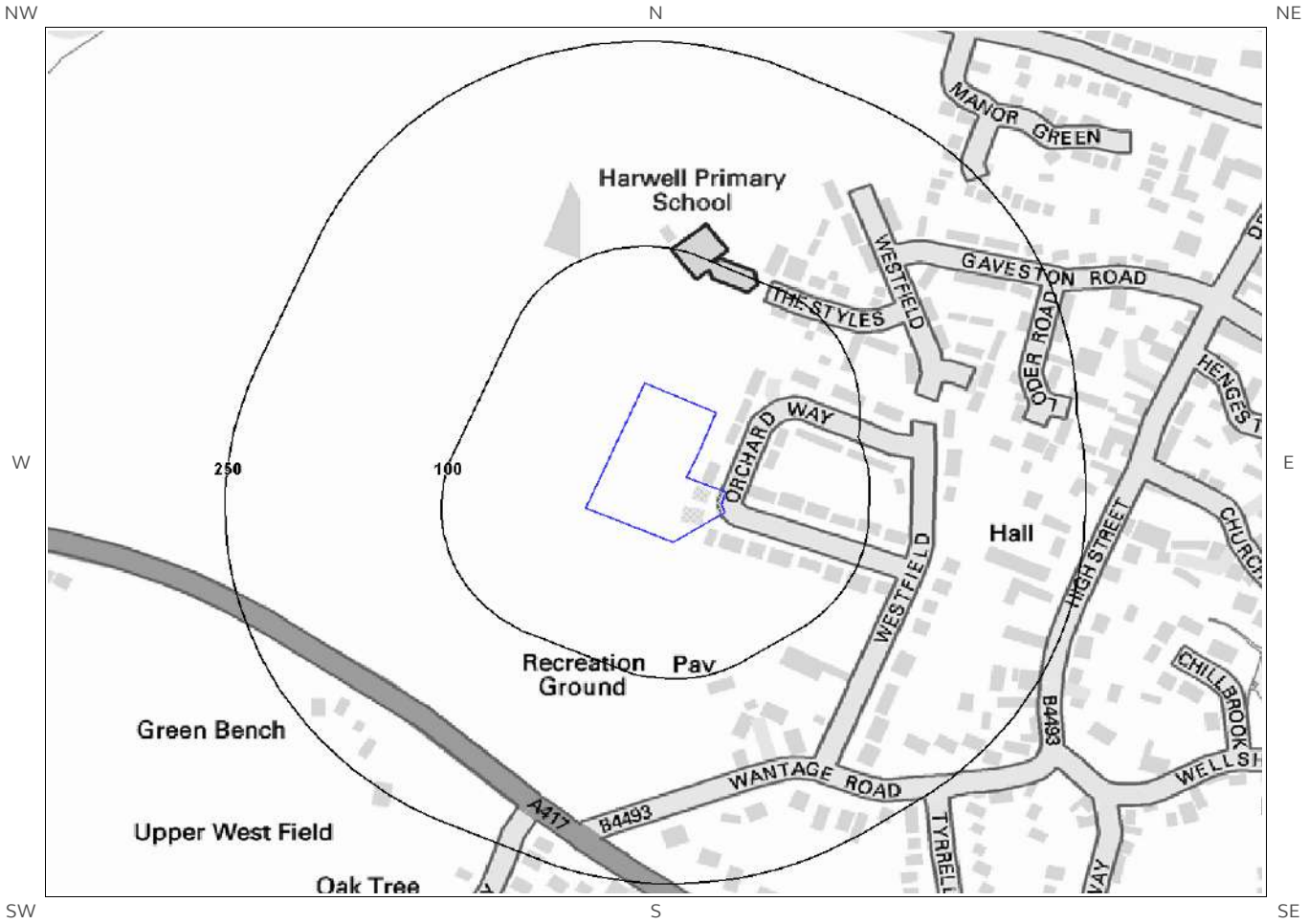
Records of background estimated soil chemistry within 250m of the study site boundary: 1

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	Sediment	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	<15 mg/kg	<100 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

- Site Outline
- 250 / 500 Search Buffers (m)
- Underground or Partially Underground Railway / Subway System
- Railway Tunnel (OS Mapping)
- Abandoned or Dismantled Railway (OpenStreetMap)
- Railway Track (OS Mapping)
- Railway Track (OpenStreetMap)
- High Speed 2
- High Speed 2 Revised Proposed Route
- Crossrail 1
- Railway and/or Tunnel Feature from Historical Mapping

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

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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
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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

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DY5 3LH
Tel: +44 (0) 1384 262 000
Email:**enquiries.gs@jpb.co.uk**
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SO16 0AS

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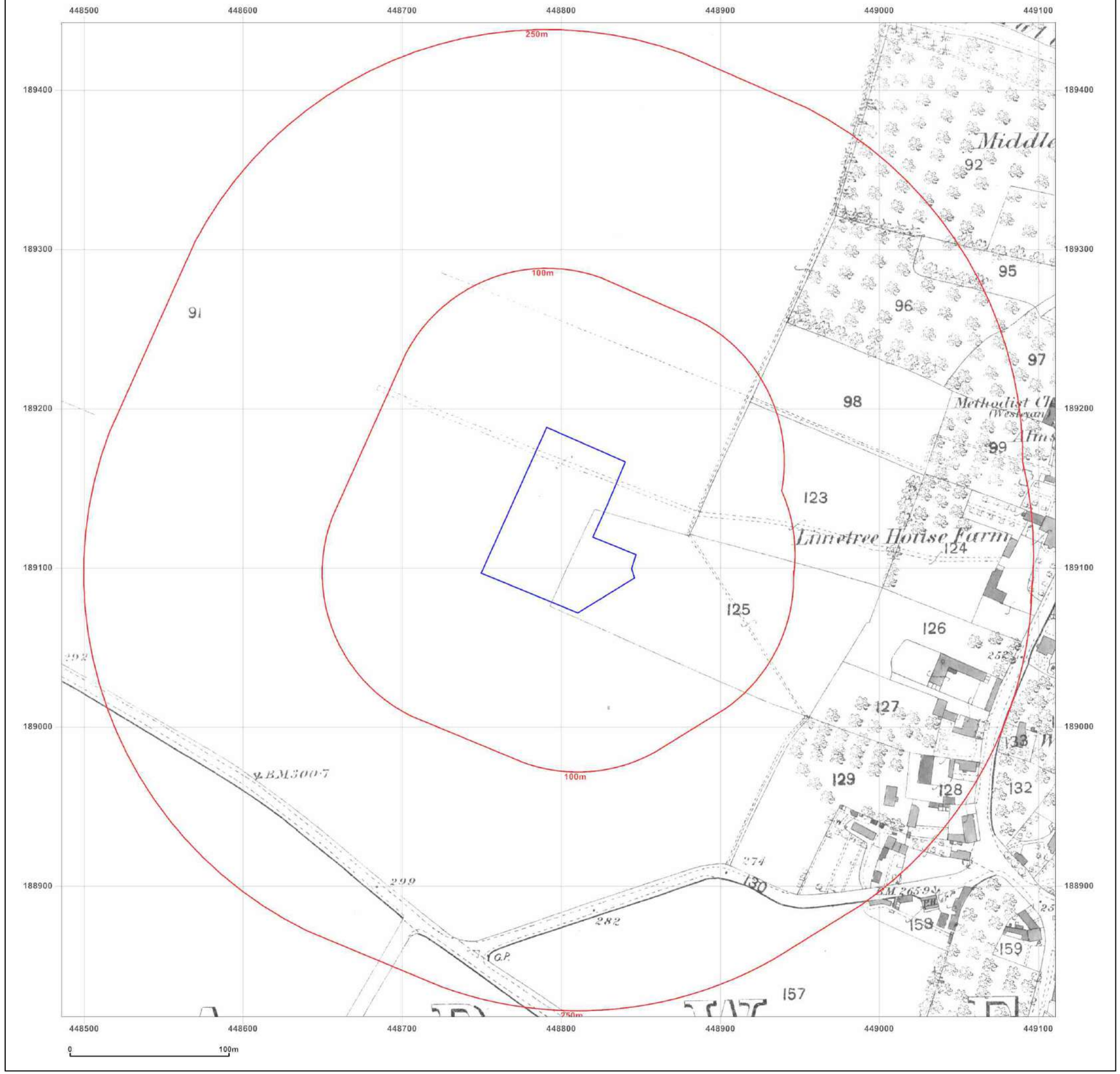

CENTRE MAPS LIVE.
FOR A BETTER POINT OF VIEW

Site Details:

Orchard Way, Harwell, OX11 0LQ

Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: County Series
Map date: **1876**
Scale: 1:2,500
Printed at: 1:2,500

N
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Surveyed 1876
Revised 1876
Edition N/A
Copyright N/A
Levelled N/A

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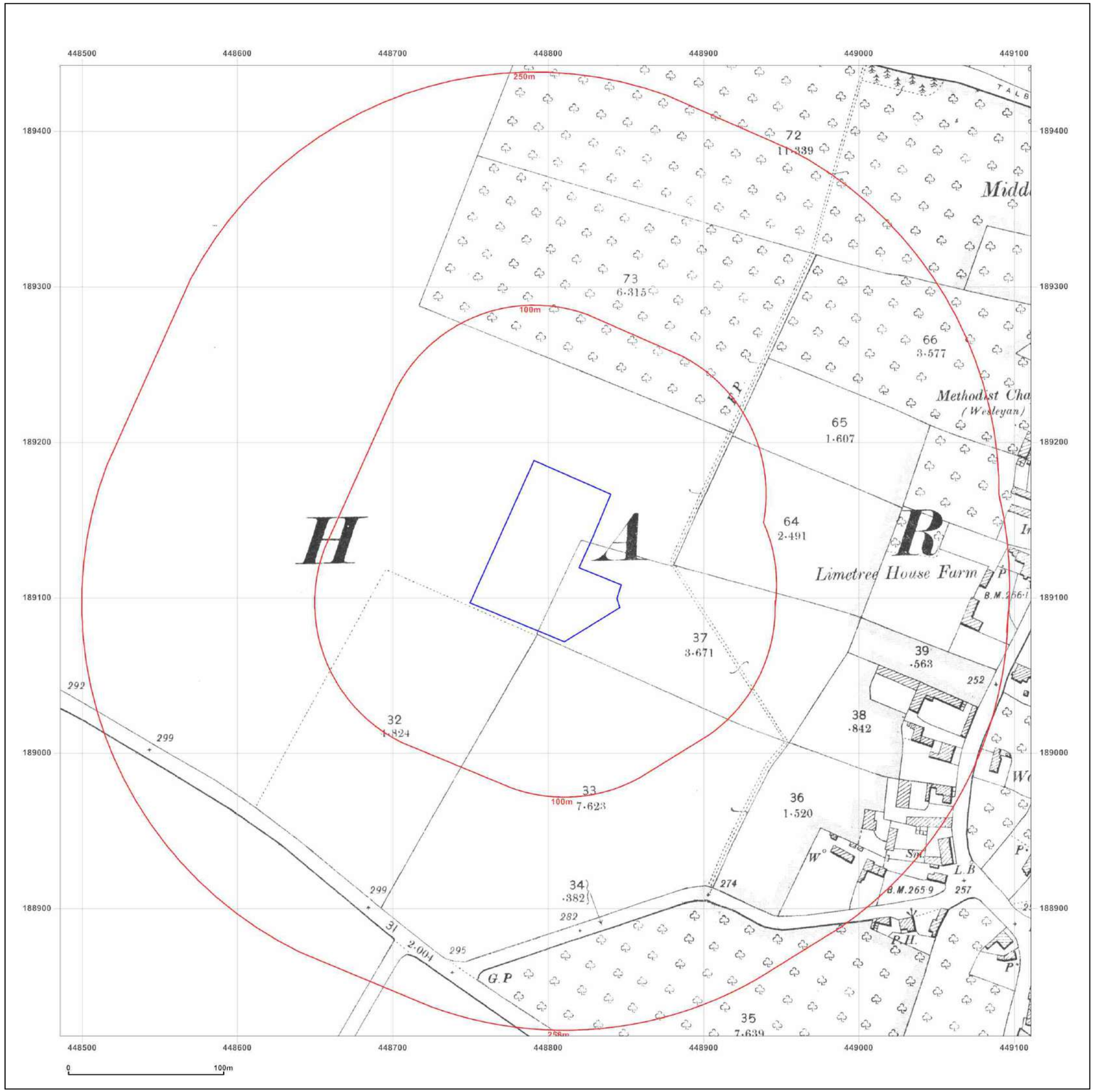

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FOR A BETTER POINT OF VIEW

Site Details:

Orchard Way, Harwell, OX11 0LQ

Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: County Series
Map date: **1899**
Scale: 1:2,500
Printed at: 1:2,500

N
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Surveyed 1899
Revised 1899
Edition N/A
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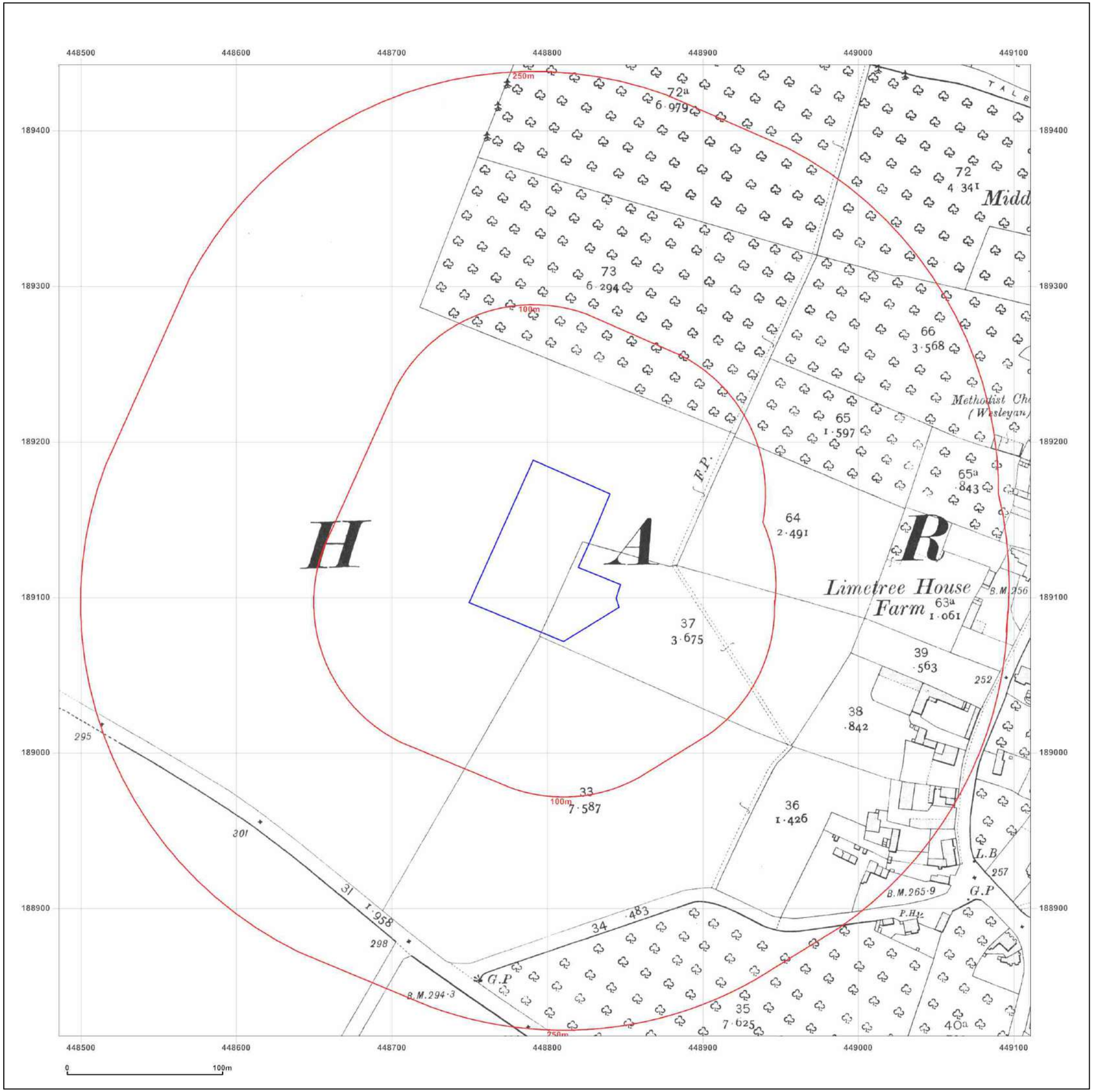

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Site Details:

Orchard Way, Harwell, OX11 0LQ

Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: County Series
Map date: **1912**
Scale: 1:2,500
Printed at: 1:2,500

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Surveyed 1912
Revised 1912
Edition N/A
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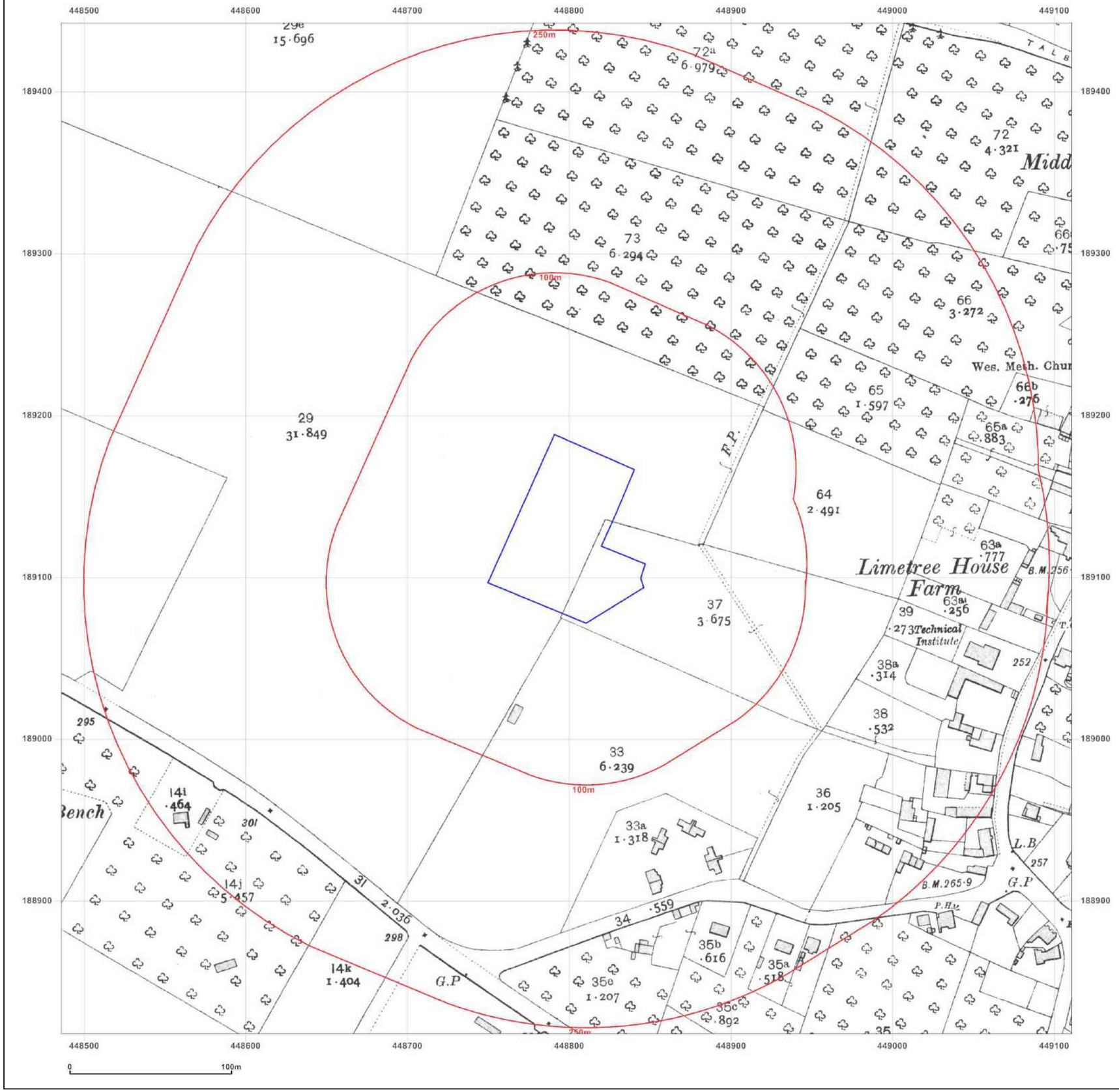

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Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: County Series

Map date: **1933**

Scale: 1:2,500

Printed at: 1:2,500

N
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Surveyed 1933
Revised 1933
Edition N/A
Copyright N/A
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Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: National Grid
Map date: **1969**
Scale: 1:2,500
Printed at: 1:2,500

N
W E
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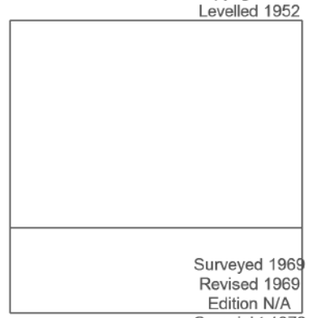
Surveyed 1969
Revised 1969
Edition N/A
Copyright 1970
Levelled 1952



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Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: National Grid
Map date: **1990-1994**
Scale: 1:2,500
Printed at: 1:2,500

N
W E
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Surveyed 1990
Revised 1990
Edition N/A
Copyright 1992
Levelled N/A

Surveyed N/A
Revised 1990
Edition N/A
Copyright 1991
Levelled N/A

Surveyed 1994
Revised 1994
Edition N/A
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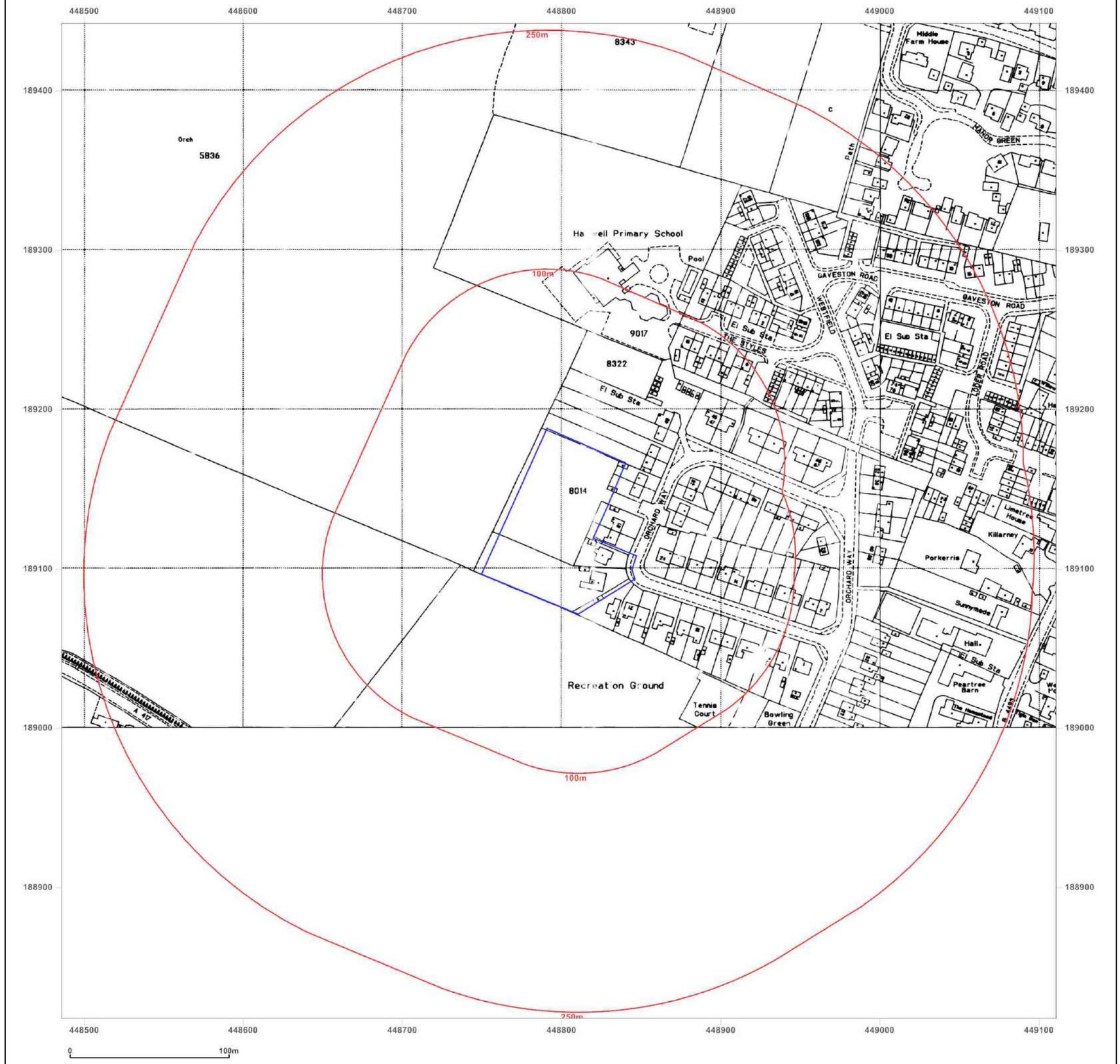

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Site Details:

Orchard Way, Harwell, OX11 0LQ

Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: National Grid
Map date: **1994**
Scale: 1:2,500
Printed at: 1:2,500

N
W E
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Surveyed 1994
Revised N/A
Edition N/A
Copyright 1994
Levelled N/A

Surveyed 1994
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Edition N/A
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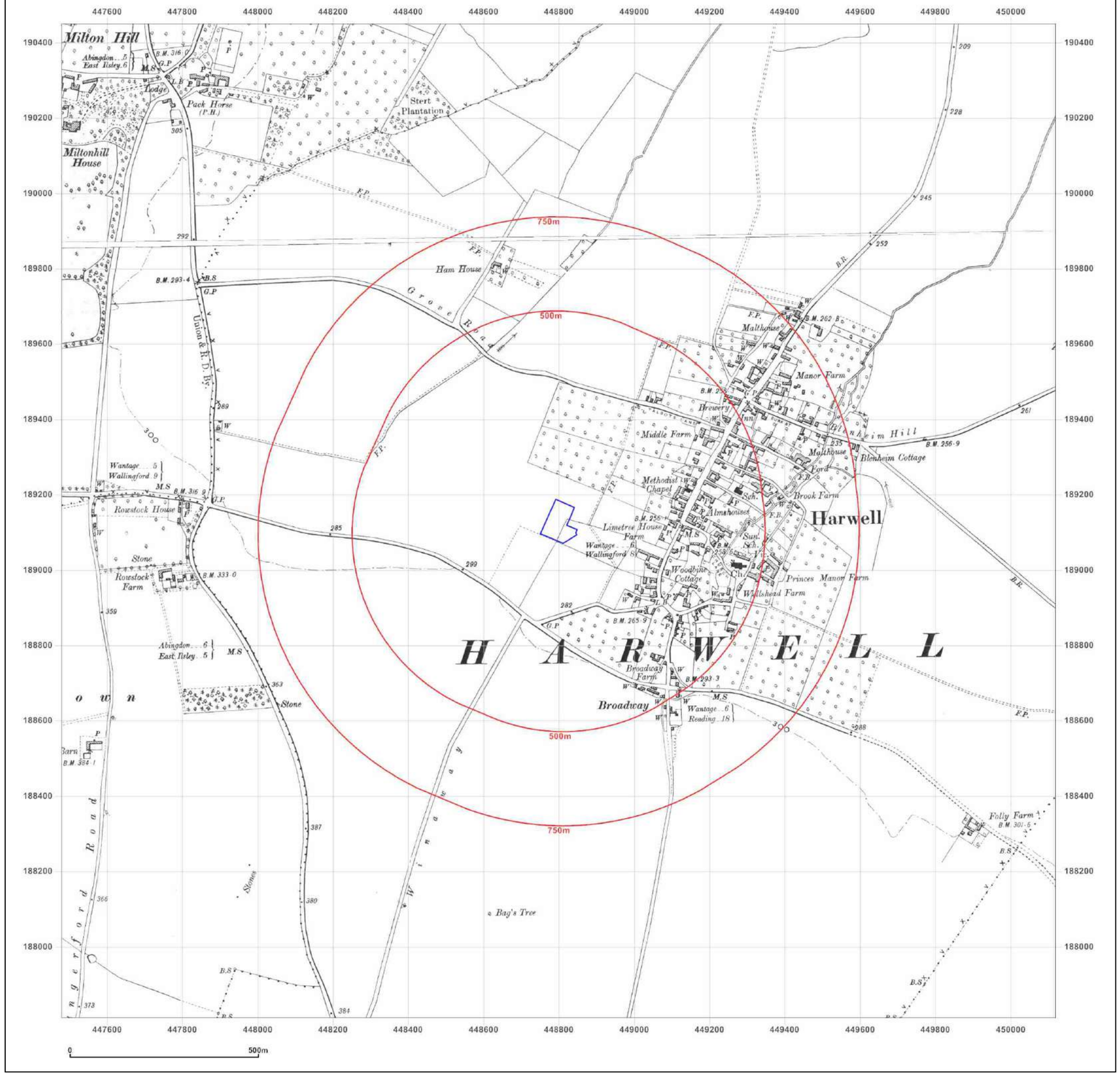

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Site Details:

Orchard Way, Harwell, OX11 0LQ

Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: County Series

Map date: **1898**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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Surveyed 1874
Revised 1898
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1874
Revised 1898
Edition N/A
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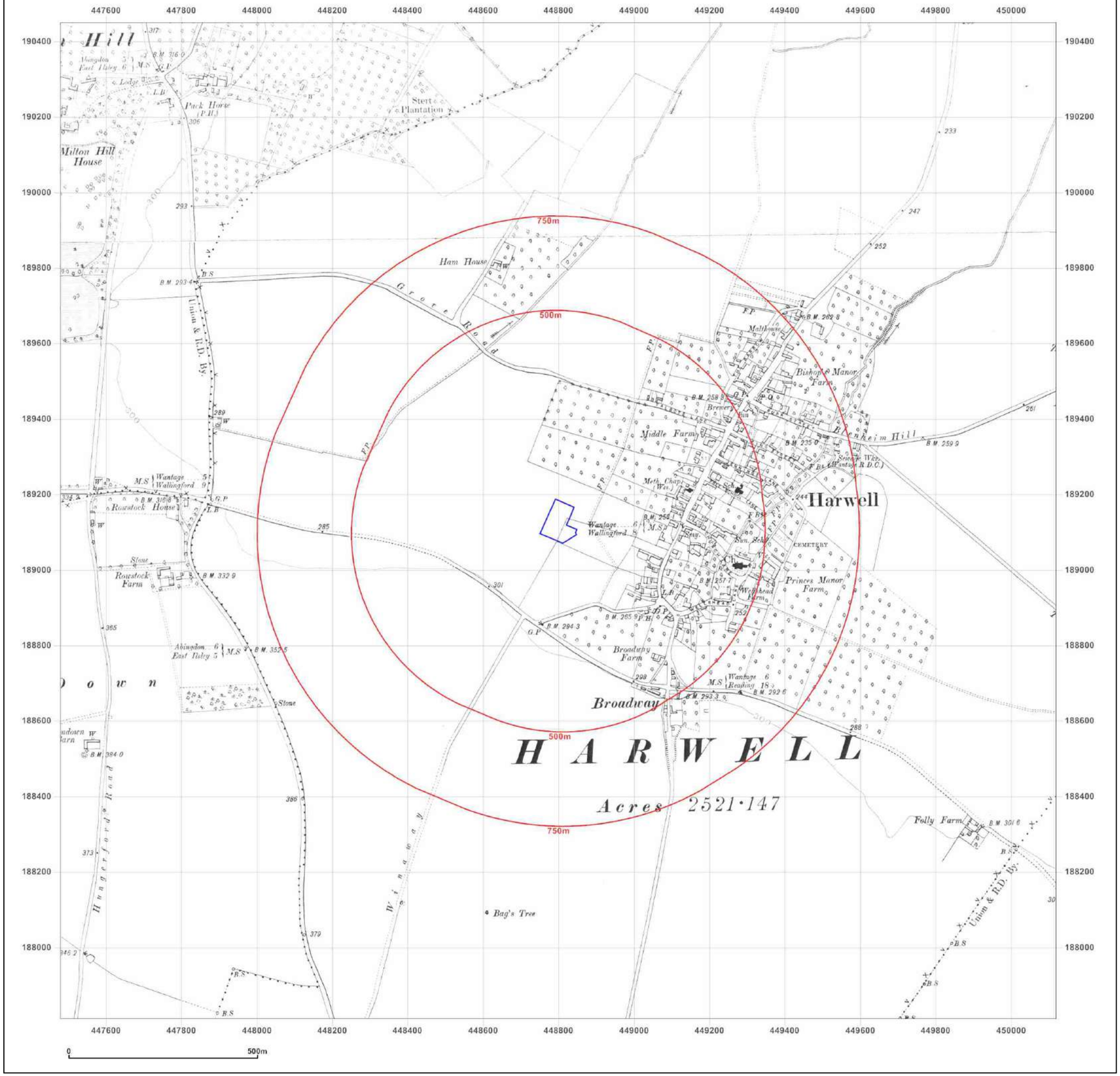

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Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: County Series
Map date: **1910**
Scale: 1:10,560
Printed at: 1:10,560

N
W E
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Surveyed 1874
Revised 1910
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1874
Revised 1910
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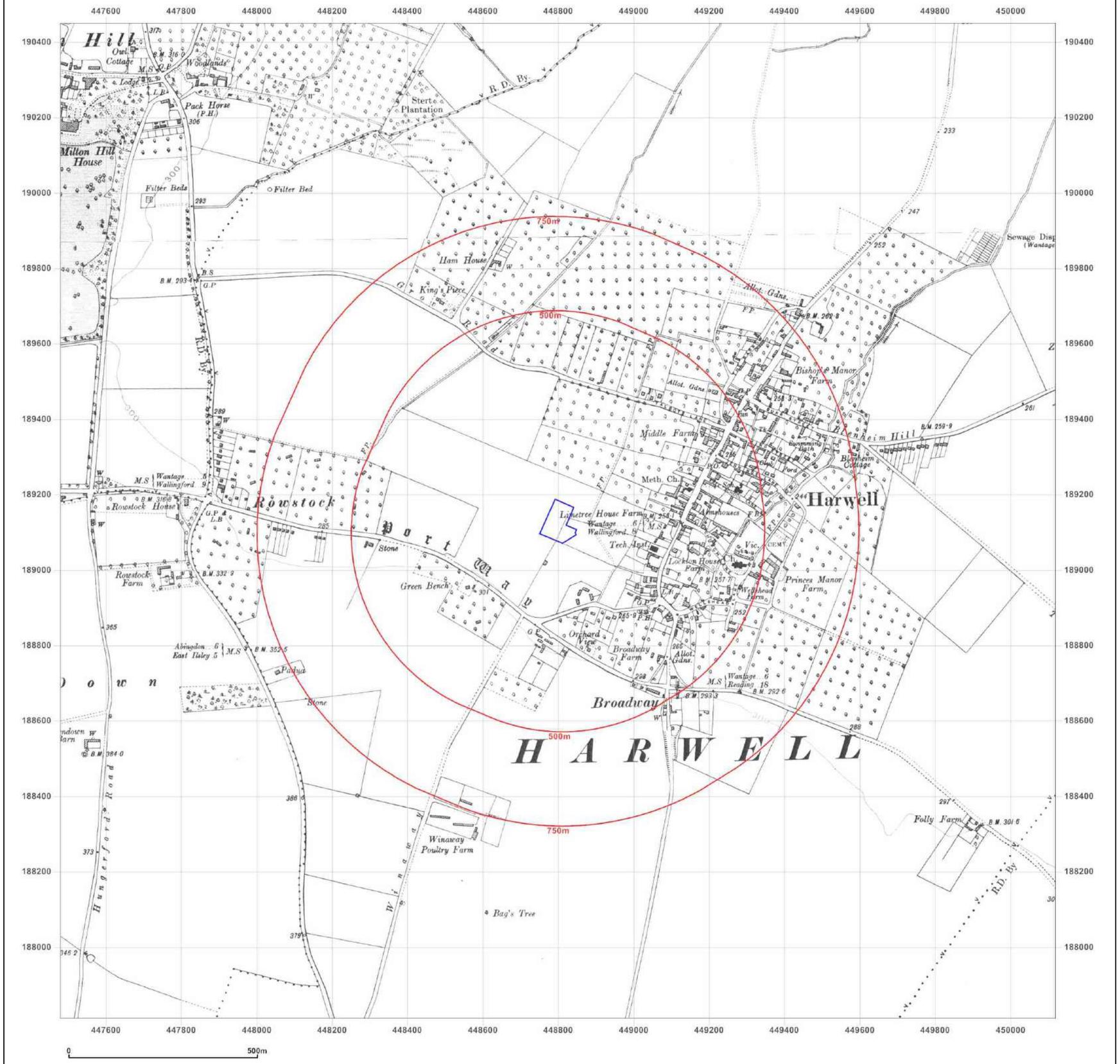

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Site Details:

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Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: County Series

Map date: **1931-1932**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1874
Revised 1932
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1874
Revised 1931
Edition N/A
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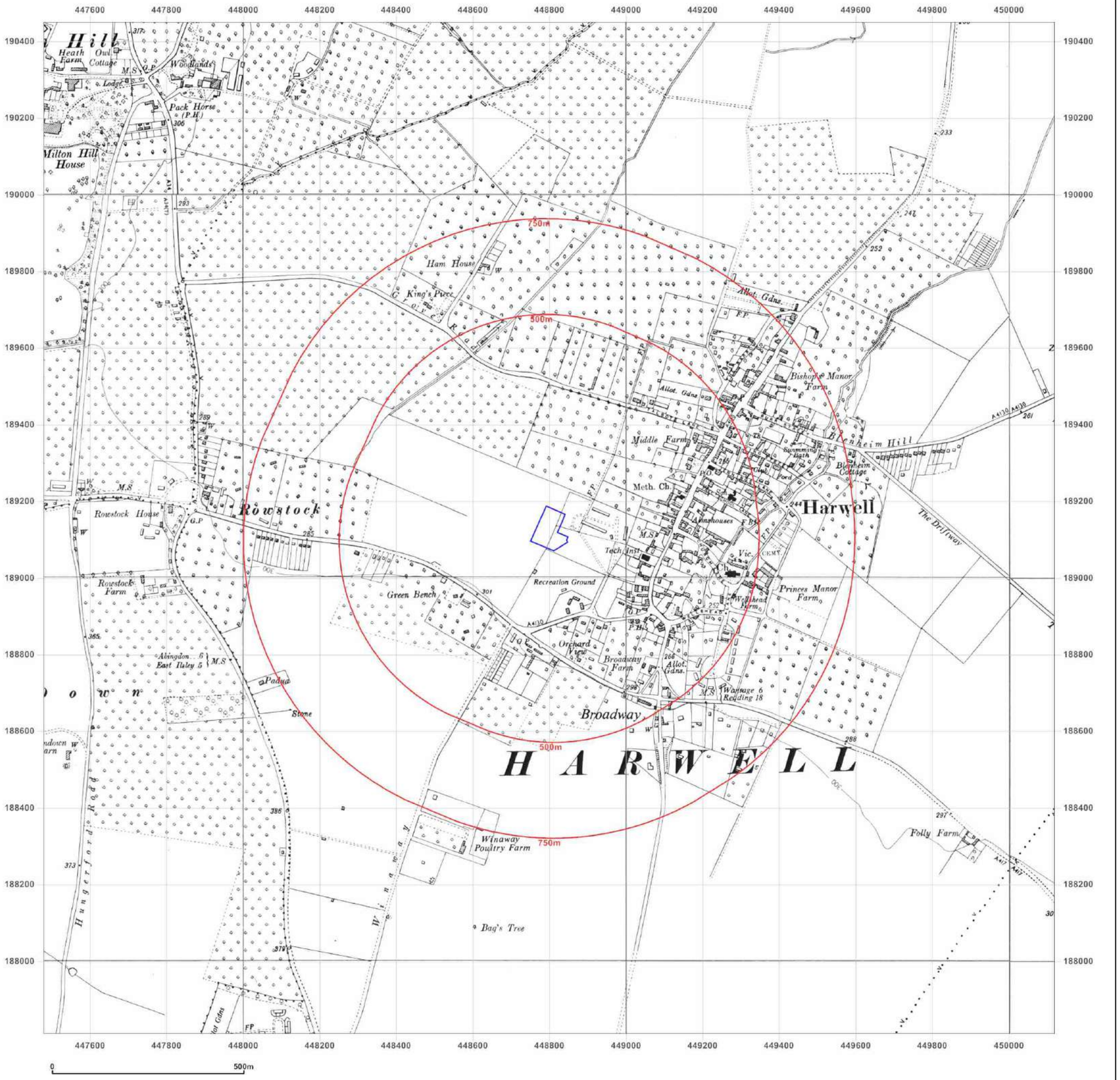

CENTRE MAPS LIVE.
FOR A BETTER POINT OF VIEW

Site Details:

Orchard Way, Harwell, OX11 0LQ

Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: Provisional

Map date: **1955-1956**

Scale: 1:10,560

Printed at: 1:10,560

N
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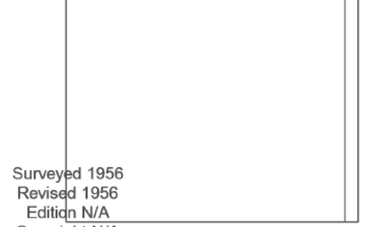
Surveyed 1956
Revised 1956
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1955
Revised 1955
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1956
Revised 1956
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1956
Revised 1956
Edition N/A
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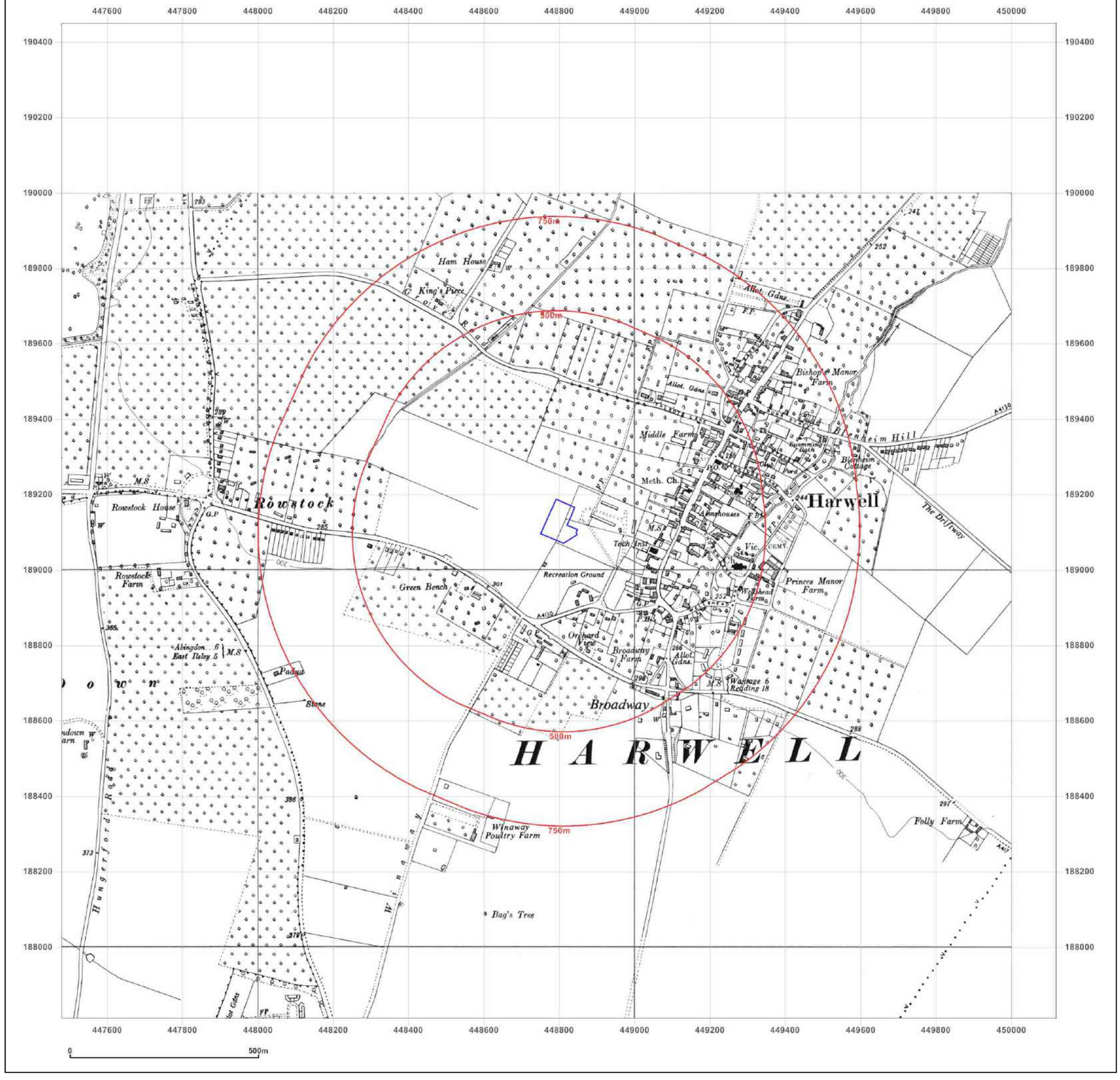

CENTRE MAPS LIVE.
FOR A BETTER POINT OF VIEW

Site Details:

Orchard Way, Harwell, OX11 0LQ

Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: Provisional
Map date: **1960**
Scale: 1:10,560
Printed at: 1:10,560

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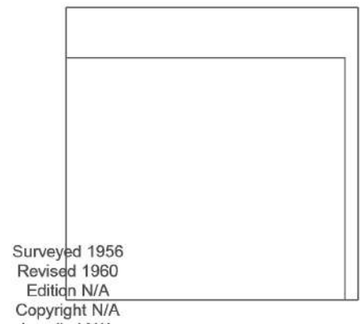

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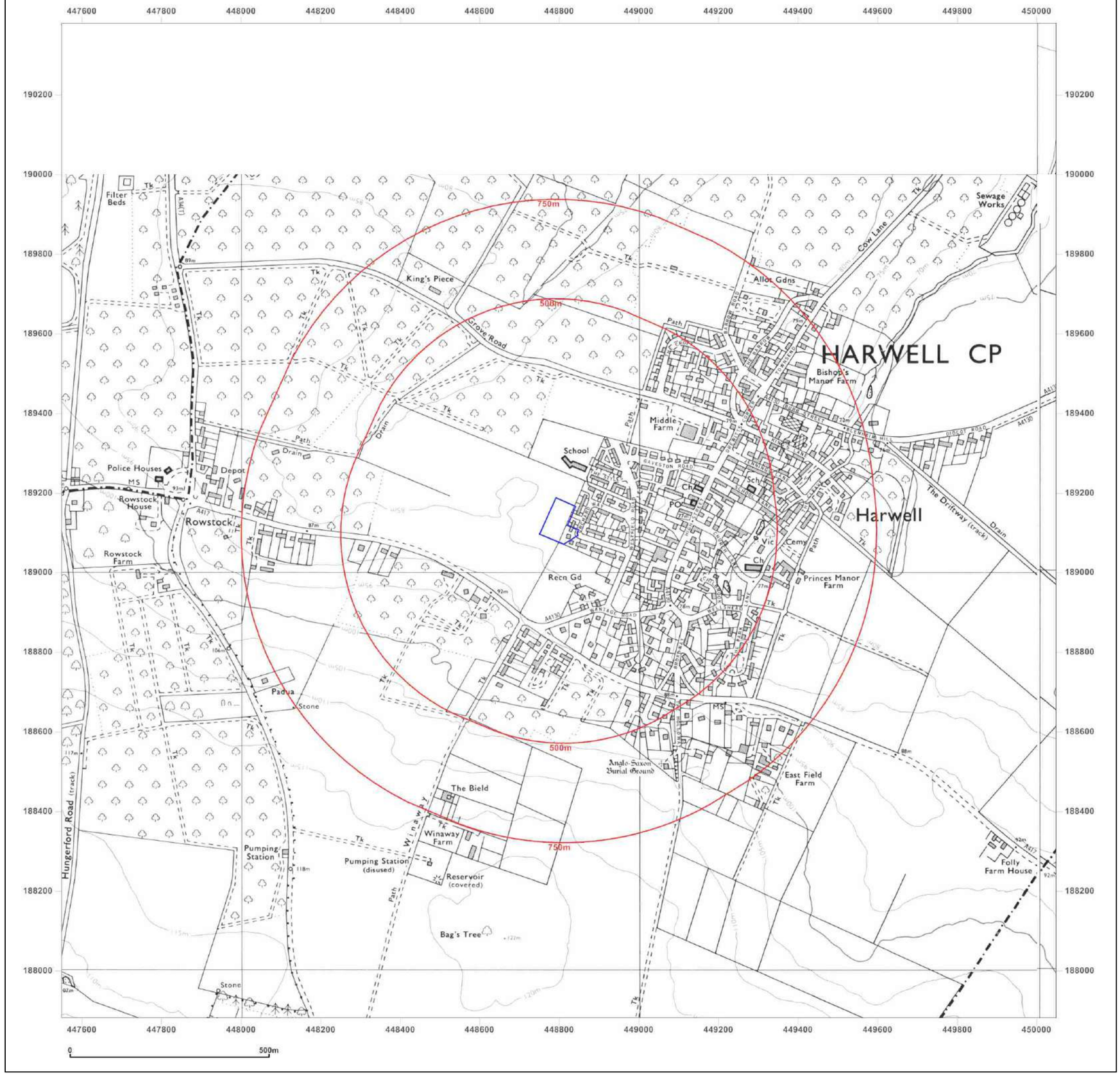

CENTRE MAPS LIVE.
FOR A BETTER POINT OF VIEW

Site Details:

Orchard Way, Harwell, OX11 0LQ

Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: National Grid

Map date: **1970-1975**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1972
Revised 1975
Edition N/A
Copyright 1975
Levelled N/A

Surveyed 1970
Revised 1971
Edition N/A
Copyright 1972
Levelled 1970

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Revised 1970
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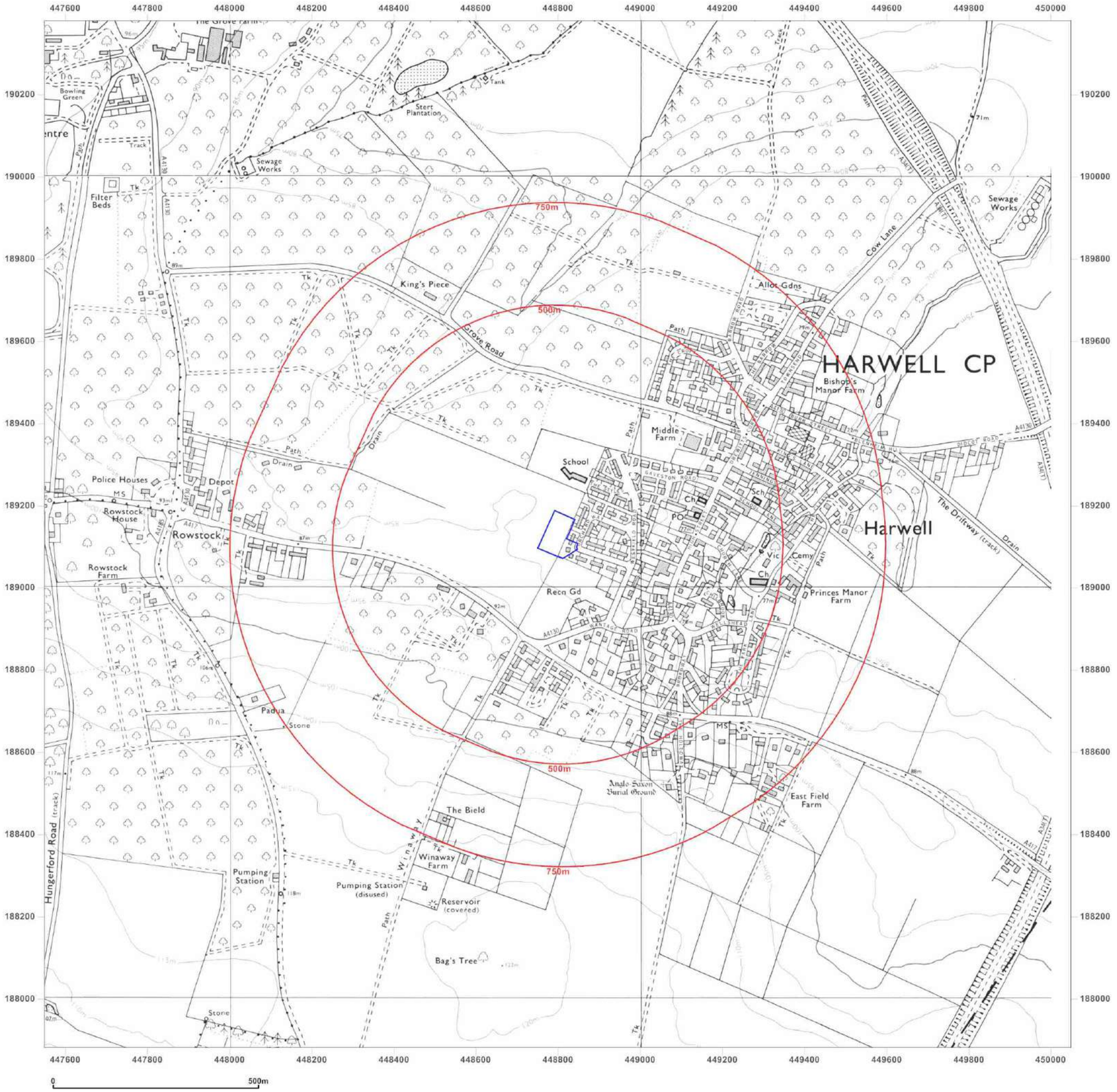

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Site Details:

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Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: National Grid

Map date: **1980**

Scale: 1:10,000

Printed at: 1:10,000

N
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Surveyed 1973
Revised 1980
Edition N/A
Copyright 1980
Levelled N/A

Surveyed 1970
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Edition N/A
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Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: 1:10,000 Raster
Map date: **2002**
Scale: 1:10,000
Printed at: 1:10,000

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2002

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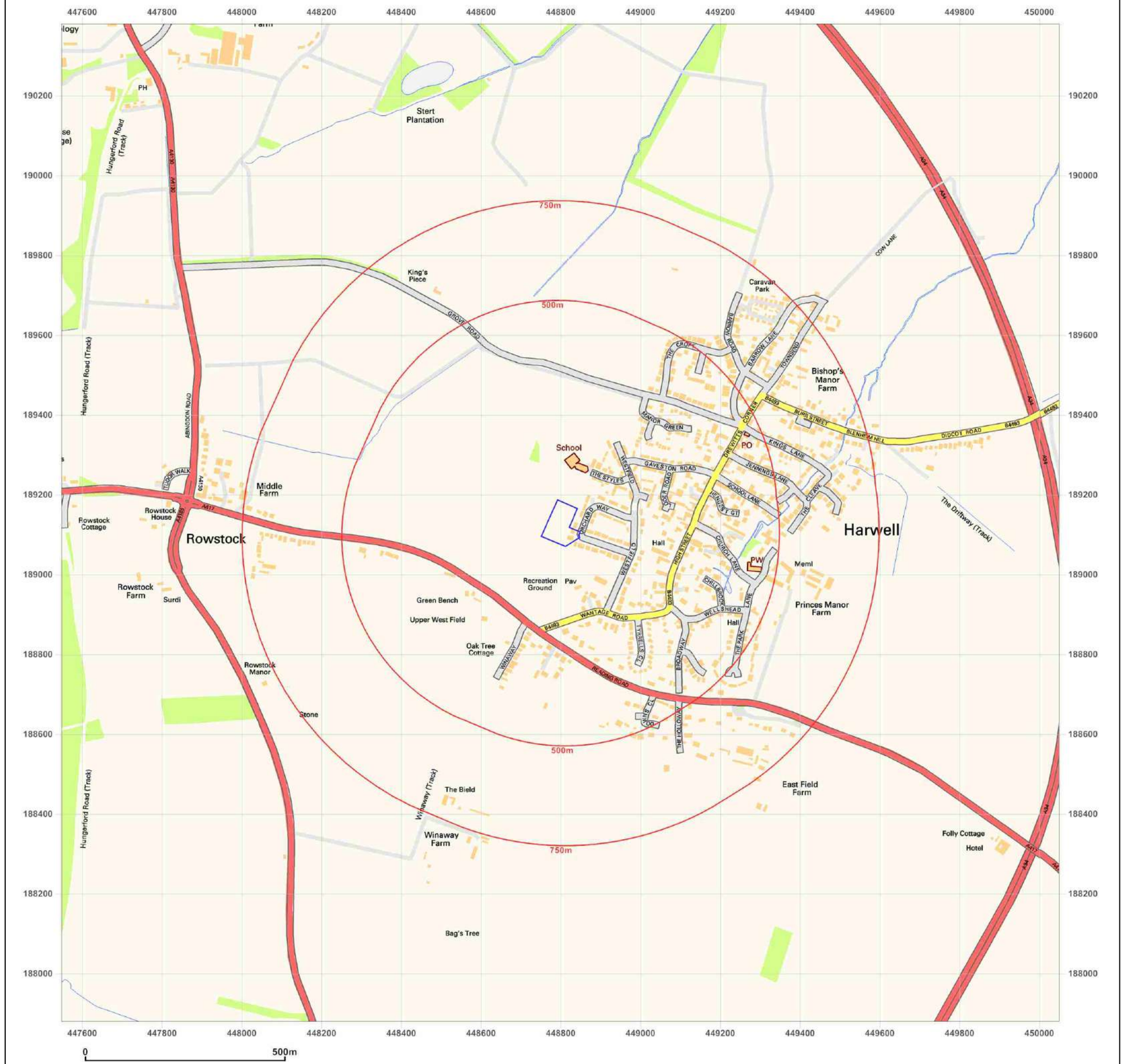

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Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: National Grid
Map date: **2010**
Scale: 1:10,000
Printed at: 1:10,000

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2010

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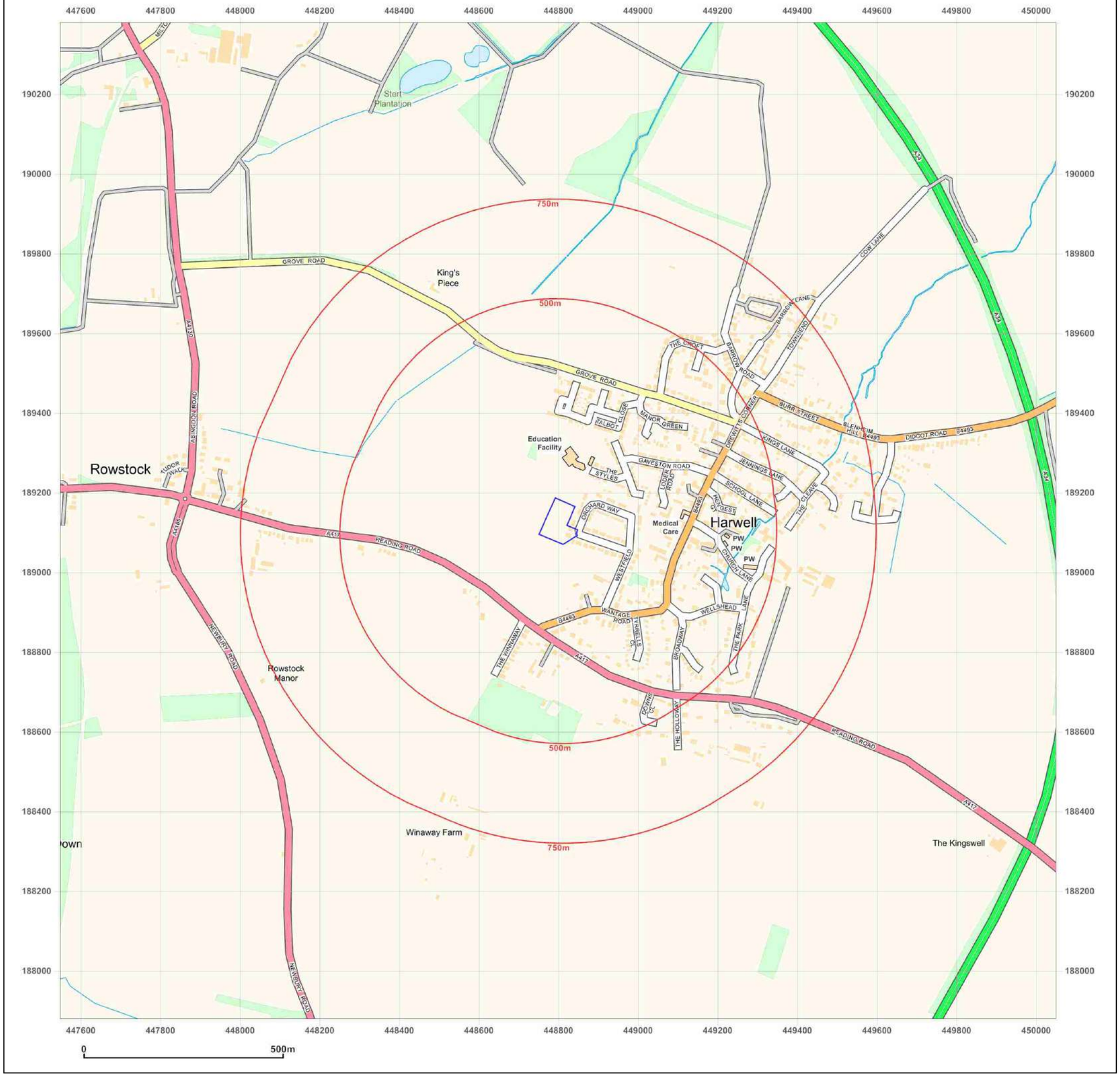

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Client Ref: 13238
Report Ref: CMAPS-CM-798897-13238-100519HIS
Grid Ref: 448798, 189130

Map Name: National Grid
Map date: **2014**
Scale: 1:10,000
Printed at: 1:10,000

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2014

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www.groundsure.com/sites/default/files/groundsure_legend.pdf

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Express Preliminary UXO Risk Assessment

Client	Intergrale
Project	Orchard Way, Harwell
Site Address	Orchard Way, Harwell, OX11 0LH
Report Reference	EP8840-00
Date	21/05/19
Originator	JMa

Assessment Objective

This preliminary risk assessment is a qualitative screening exercise to assess the likely potential of encountering unexploded ordnance (UXO) at the Orchard Way, Harwell site. The assessment involves the consideration of the basic factors that affect the potential for UXO to be present at a site as outlined in Stage One of the UXO risk management process.

Background

This assessment uses the sources of information available in-house to 1st Line Defence Ltd to enable the placement of a development site in context with events that may have led to the presence of German air-delivered or Allied military UXO. The report will identify any immediate necessity for risk mitigation or additional research in the form of a Detailed UXO Risk Assessment. It makes use of 1st Line Defence's extensive historical archives, library and unique geo-databases, as well as internet resources, and is researched and compiled by UXO specialists and graduate researchers.

The assessment directly follows CIRIA C681 guidelines "Unexploded Ordnance, a Guide for the Construction Industry". The document will therefore assess the following factors:

- Basic Site Data
- Previous Military Use
- Indicators of potential aerial delivered UXO threat
- Consideration of any Mitigating Factors
- Extent of Proposed Intrusive Works
- Any requirement for Further Work

It should be noted that the vast majority of construction sites in the UK will have a low or negligible risk of encountering UXO and should be able to be screened out at this preliminary stage. The report is meant as a common sense 'first step' in the UXO risk management process. The content of the report and conclusions drawn are based on basic, preliminary research using the information available to 1st Line Defence at the time this report was produced. It should be noted that the only way to entirely negate risk from UXO to a project would be to support the works proposed with appropriate UXO risk mitigation measures. It is rarely possible to state that there is absolutely 'no' risk from UXO to a project.

Risk Assessment Considerations	
Site location and description/current use	The site is located in the village of Harwell within Oxfordshire. It is composed of two parcels of land that are separated by a residential structure and adjoining garden. The northern parcel is bordered north and south by residential structures. The southern parcel is bordered north by a residential structure and south by an area of open grassland. Both parcels are bordered east by Orchard Way and west by an area of open grassland. The northern parcel is occupied by open grass land. The southern parcel is occupied by a residential structure and its' adjoining garden.  The site is approximately centred on the OS grid reference: **SU 4880489146**.
Are there any indicators of current/historical military activity on/close to the site?	In-house geo-data sets indicate that RAF Harwell was located approximately 1.4km south-west of the site. It is understood that this airfield was used to train bomber squadrons during WWII.[1] Given the airfield's distance from the site, the risk of contamination via allied ordnance is considered unlikely.
What was the pre- and post-WWII history of the site?	Pre-war OS mapping, dated 1933, indicates that both parcels of land were situated within an area of open grassland. The closest structures were located approximately 120m south-east of the site. Post-war OS mapping, dated 1960, indicates some development to the vicinity of the site. A pathway can be viewed approximately adjacent east of the northern parcel. The closest structures were now approximately 40m east of the site.
Was the area subject to bombing during WWII?	During WWII the site was located in the Rural District of Wantage. According to Home Office (HO) statistics, this area sustained a very-low density of bombing with 2.1 items dropped per 1,000 acres. This consisted of 142 High Explosive (HE) bombs, 5 Oil Bombs, 8 Phosphorus Bombs, and 1 V-1 Pilotless Aircraft. An anecdotal account for the area suggests that no bombs were dropped on the village of Harwell.[2]
Is there any evidence of bomb damage on/close to the site?	As the site was occupied by open land pre- and post-war, damage on site is difficult to determine. The acquisition of high-resolution WWII-era aerial photography may be able to confirm the exact composition of the site following the war.

[1] http://controltowers.co.uk/H-K/Harwell.htm

[2] https://www.village4a1000years.com/wwii/harwell-in-wartime/

To what degree would the site have been subject to access?	It is considered likely that the site would have been subject to limited access throughout the war. This is due to the lack of structures present on site.
To what degree has the site been developed post-WWII?	Present-day aerial imagery indicates that some development has occurred to the site since WWII. The two parcels of land are no longer situated in the same area of open grassland. The southern parcel is now occupied by a residential structure and adjoining garden. The northern parcel has remained occupied by open grassland.
What is the nature and extent of the intrusive works proposed?	The nature and extent of works proposed was not available at the time of writing.

Summary and Conclusions

During WWII the site was located in the Rural District of Wantage. According to Home Office (HO) statistics, this area sustained a very-low density of bombing with 2.1 items dropped per 1,000 acres.

The site appears to have been occupied by an area of open grassland during the war. As such, it is anticipated that it would have been subject to limited access. It has also been difficult to assess potential damage to the site due to the limitations of OS mapping.

Within areas of a higher bombing density, these factors would be considered problematic. However, we understand that the village of Harwell did not experience any bombing incidents during the war. Therefore, the risk of aerial delivered bombs is not considered higher than background level for this area.

In regards to allied ordnance contamination, our in-house geo-data sets indicate that RAF Harwell was located approximately 1.4km south-west of the site. Given this distance, the risk of allied ordnance contamination is considered unlikely.

Recommendations

Given the findings of this preliminary report it is recommended that **no further action** be taken in regards to this site.

Whilst further research could be undertaken in the form of a Detailed UXO Risk Assessment, it is not considered likely that this would significantly alter the findings of this report.

If the client has any anecdotal or empirical evidence of UXO risk on site, please contact 1st Line Defence.

Appendix D

Trial Pit Logs

Integrale Limited, Suite 7, Westway Farm Business Park, Wick Road, Bishop Sutton, Somerset, BS39 5XP United Kingdom
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Registered Office: The Granary, Chewton Fields, Ston Easton, Somerset, BA3 4BX United Kingdom VAT Reg. No. 609 7402 37

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EXPLORATORY HOLE EXPLANATION SHEET

SAMPLES AND TESTS

AMAL	Amalgamated sample	J	Jar sample	HVP	Hand-held shear vane test
B	Bulk disturbed sample	LB	Large bulk disturbed sample	HSV	Hand-held shear vane test
BLK	Block sample	M	Mazier type sample	MEX	Mexicone penetrometer test
C	Core sample	SPTLS	Standard penetration sample	PID	Photoionization detector (gas)
CBR	CBR mould sample	TW	Thin-walled push in sample		
D	Small disturbed sample	U	Undisturbed sample - open drive		
ES	Environmental sample	UT	Thin wall open drive tube sampler		
EW	Environmental water sample	W	Water sample		
G	Gas sample				

SOILS

- Topsoil
- Concrete
- Made Ground (Fill)
- Peat
- Clay
- Silt
- Sand
- Gravel
- Cobbles
- Boulders

Note: composite soil types will be signified by combined soil types e.g.

- Silty Sand

SEDIMENTARY

- Chalk
- Limestone
- Conglomerate
- Breccia
- Sandstone
- Siltstone
- Mudstone
- Shale
- Coal
- Pyroclastic (Volcanic Ash)
- Gypsum, Rocksalt, etc.
- Void/Broken Ground

IGNEOUS

- Coarse Grained Igneous
- Medium Grained Igneous
- Fine Grained Igneous

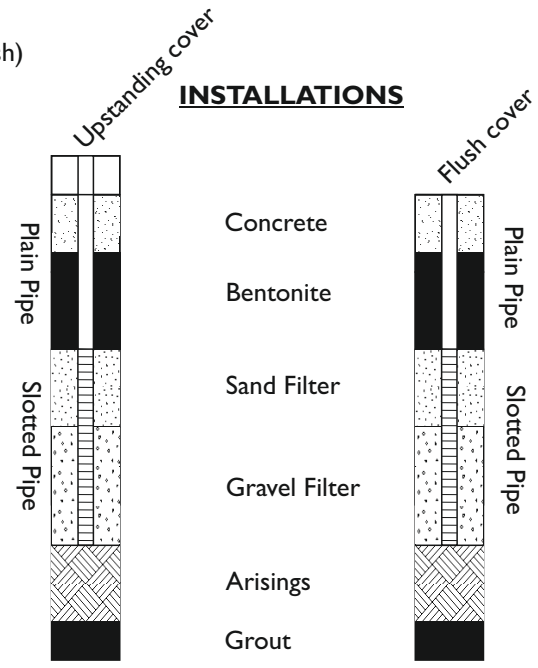
METAMORPHIC

- Coarse Grained Metamorphic
- Medium Grained Metamorphic
- Fine Grained Metamorphic

WATER SYMBOLS

- Water Level (after 20 minutes)
- Water Strike

INSTALLATIONS



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STANDARD METHODOLOGY FOR MECHANICAL TRIAL PITTING

Trial pits are mechanically excavated using a wheeled or tracked backhoe or mini-excavator, typically fitted with toothed buckets. The trial pit locations are selected using information on the proposed redevelopment, existing buried services and structures, ongoing site use, reinstatement requirements and time constraints. Those positions are shown on Figure 1 and the trial pit records included as a separate appendix.

Trial pitting was directed and supervised full-time by an experienced engineering geologist who carried out insitu testing, kept a record of the strata encountered, noted the pit side stability and ease of digging, any water ingresses, took photographs and recovered representative disturbed samples.

Insitu testing comprised hand shear vane measurement in appropriate cohesive strata to provide a direct reading of insitu undrained shear strength. Tests were completed from within the pit to depths of approximately 1.2m below ground level and within excavated spoil below this. The hand shear vane is inserted into cohesive soil and rotated at an even speed equivalent to one rotation per 60 seconds. Three tests are typically taken and the average result used as the undrained shear strength in kN/m^2.

Mexicone penetrometer testing was undertaken either from ground level or at shallow depth within trial pits and the test results are included in the trial pit records. The mexicone penetrometer is a simple, hand-held device which gives a direct read out of equivalent CBR strength, on a cylindrical gauge. Readings are recorded for each 75mm penetration and where suitable soils are present, successive readings up to 0.6m total penetration can be achieved. However, the test can abort on coarse granular soils or other obstructions and in this case the term 'refusal' is given in the test records.

On completion the pits were backfilled with their spoil, compacted with the excavator bucket and the surplus left mounded to allow for subsequent consolidation settlement. If specific reinstatement has been requested by the client, this is confirmed in the main text of this report.

The trial pit records have been prepared using Gint software, taking into account both site descriptions and subsequent laboratory testing.

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Understanding Ground Conditions

Trial Pit Log

Trialpit No
TP1
Sheet 1 of 1

Project Name: Orchard Way	Project No. 19058	Co-ords: - Level: 82.61	Date 21/05/2019
Location: Harwell, OX11 0LH		Dimensions (m): 2.4 x 0.6 Depth 1.45	Scale 1:15
Client: Feltham Construction Limited			Logged IL

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.20	82.41		TOPSOIL: (Soft dark grey brown slightly sandy slightly gravelly silty Clay. Gravel is subangular fine to coarse sandstone. Large roots).
	0.50	D		1.20	81.41		Firm brown grey slightly gravelly silty sandy CLAY. Gravel is subangular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
	1.40	D		1.45	81.16		Moderately weak to moderately strong grey green SANDSTONE in a silty clay matrix. (UPPER GREENSAND FORMATION)
							End of pit at 1.45 m

1
2
3

Remarks: Mexicone at 0.6m - 4, 6, 6, refusal.
No groundwater encountered.
Soakaway completed.
Relatively hard digging at 1.2m depth.

Stability: Vertical and stable.

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Understanding Ground Conditions

Trial Pit Log

Trialpit No
TP2
Sheet 1 of 1

Project Name: Orchard Way	Project No. 19058	Co-ords: - Level: 82.24	Date 21/05/2019
Location: Harwell, OX11 0LH		Dimensions (m): 2.3 x 0.6 Depth 1.75	Scale 1:15
Client: Feltham Construction Limited			Logged IL

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES					TOPSOIL: (Comprising soft grey slightly gravelly silty Clay. Gravel is subangular to subrounded fine to coarse brick, wood, flint and charcoal).
				0.25	81.99		Firm grey green mottled orange slightly sandy slightly gravelly silty CLAY. Gravel is subangular fine to coarse very weak sandstone. (WEATHERED UPPER GREENSAND FORMATION)
	0.60	D					*Becoming stiff at 1.0m depth.*
	1.30	B					
				1.40	80.84		Moderately weak grey-green SANDSTONE recovered as gravel in a silty clay matrix. (UPPER GREENSAND FORMATION)
				1.75	80.49		End of pit at 1.75 m

1
2
3

Remarks: Refusal at 1.75m on sandstone bedrock.
No groundwater encountered.
Relatively hard digging below 1.4m depth.

Stability: Vertical and stable.

Intégrale
Understanding Ground Conditions

Trial Pit Log

Trialpit No
TP3
Sheet 1 of 1

Project Name: Orchard Way	Project No. 19058	Co-ords: - Level: 82.29	Date 21/05/2019
Location: Harwell, OX11 0LH		Dimensions (m): 2 x 0.6 Depth 2.50	Scale 1:15
Client: Feltham Construction Limited			Logged IL

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.20	82.09		TOPSOIL: (Comprising soft dark grey slightly gravelly silty Clay. Gravel is subangular fine to coarse brick, charcoal and wood).
	0.50	D		0.80	81.49		Firm grey slightly sandy slightly gravelly silty to very silty CLAY. Gravel is subangular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
	0.90	D		1.10	81.19		Stiff grey green mottled orange slightly sandy slightly gravelly silty CLAY. Gravel is subangular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
	2.30	D		2.50	79.79		Weak to moderately strong very thinly to thinly bedded SANDSTONE recovered as gravel in a silty sandy clay matrix. (UPPER GREENSAND FORMATION) *Sandstone beds typically c.3cm thick.* End of pit at 2.50 m

Remarks: Refusal at 2.5m on sandstone bedrock.
No groundwater encountered.
Relatively easy digging below 1.1m depth.
Mexicone at 0.6m - 4, 3.5, 4, 4.5, refusal.

Stability: Vertical and stable.

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Understanding Ground Conditions

Trial Pit Log

Trialpit No
TP4
Sheet 1 of 1

Project Name: Orchard Way	Project No. 19058	Co-ords: - Level: 82.63	Date 21/05/2019
Location: Harwell, OX11 0LH		Dimensions (m): 2 × 0.6, Depth 2.15	Scale 1:15
Client: Feltham Construction Limited			Logged IL

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.05	ES		0.10	82.53		TOPSOIL: (Comprising soft dark grey slightly sandy silty Clay. Rare gravel of charcoal).
	0.40	D					Firm grey slightly sandy slightly gravelly silty CLAY. Gravel is subangular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
	0.95	D					*Light grey at 0.95m depth.*
				1.10	81.53		Weak to moderately strong very thinly to thinly bedded grey green with streaks of orange SANDSTONE recovered as gravel and cobbles in a silty clay matrix. (UPPER GREENSAND FORMATION)
							Sandstone beds typically 2-3cm thick.
							Sandstone beds typically 4-5cm thick.
				2.15	80.48		End of pit at 2.15 m

1
2
3

Remarks: Refusal at 2.15m on sandstone bedrock.
No groundwater encountered.
Relatively hard digging below 1.1m depth.
Mexicone at 0.45m - 3.5, 3.5, refusal.

Stability: Vertical and stable.

Appendix E

Soakaway Analyses

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STANDARD METHODOLOGY FOR SOAKAWAY TESTING

Some trial pits also include soakaway testing in order to assess the soils permeability for design of stormwater drainage. The soakaway tests were completed in accordance with BRE Digest 365 (September 1991). This included excavation of pits to generally 1-2m depth, which were then filled with water on one to three occasions depending on the rate of infiltration. The water was supplied by a water bowser and discharged into the pits using a centrifugal pump. The falling head was recorded and therefore the rate of infiltration into the soils beneath.

The soakaway results have been prepared using a Microsoft Excel spreadsheet.

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Soil Infiltration Rate Test. BRE 365 (2007) Soakaway Design

Job No:	19058			
Job Name:	Land to the Rear of 29-35 Orchard Way, Harwell			
Prepared By:	IL	Date:	24/05/2019	Sheet: 1 of 1
Checked By:	CW	Date:	29/05/2019	

TP 1

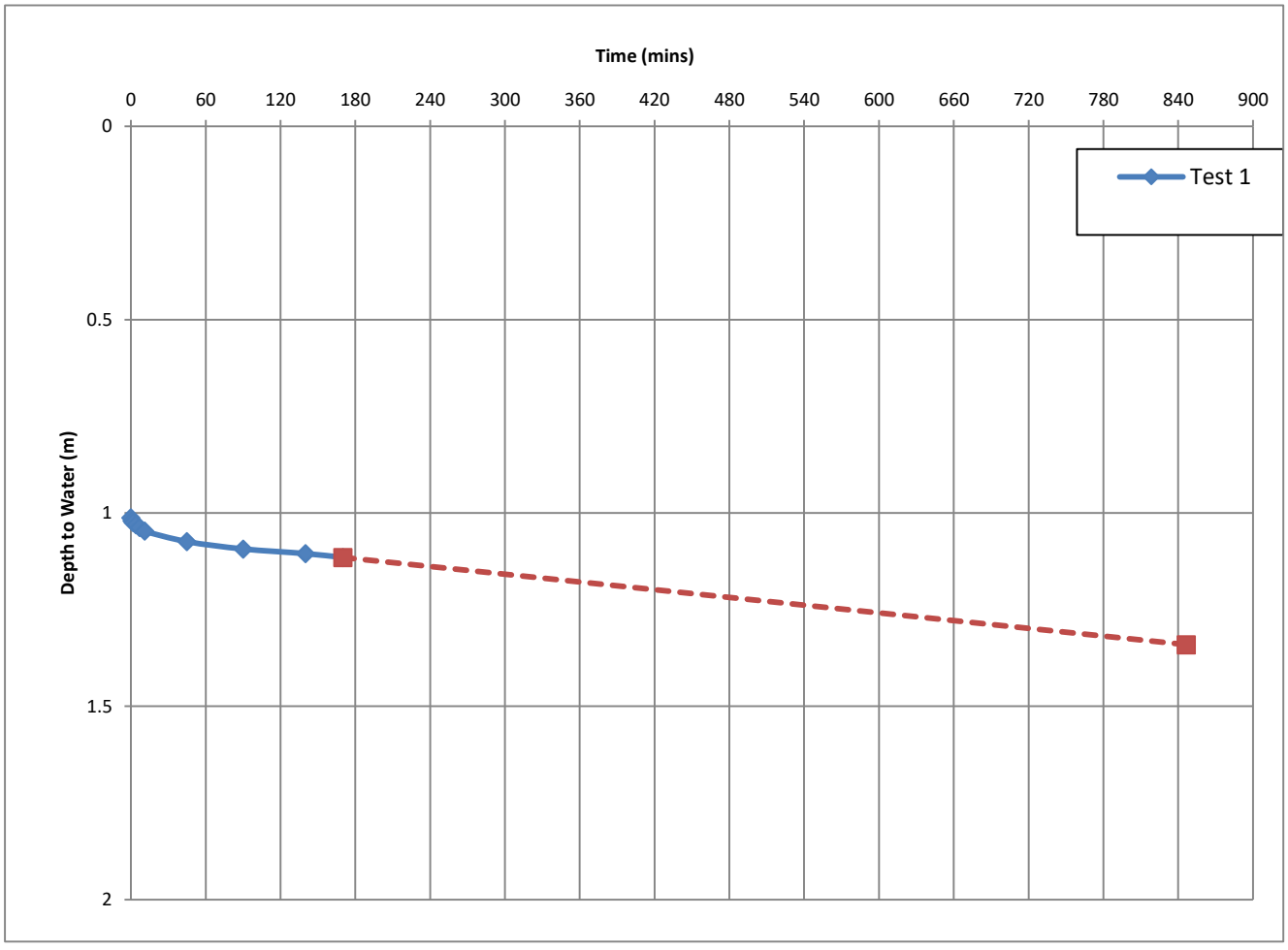
Date of Test: 20/05/2019

Length (m): 2.40 **Width (m):** 0.60 **Depth (m):** 1.45

Remarks: One test attempted within time available on site.

	Test 1	Test 2	Test 3
Effective Storage Depth$_{75\text{-}25\%}$ (m)	0.22		
A = Surface Area$_{50\%}$ (m^2)	2.75		
V = Effective Storage Volume$_{75\text{-}25\%}$ (m^3)	0.32		
t = Time$_{75\text{-}25\%}$ (mins)	657.0		
Soil Infiltration Rate (m/s)	**2.90E-06**		

Extrapolated Soil Infiltration Rate (m/s) **2.90E-06**



Appendix F

Window Sample Borehole Logs

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STANDARD METHODOLOGY FOR WINDOWLESS SAMPLING BOREHOLES & CONTINUOUS DYNAMIC PENETRATION TESTING (CDPT)

Windowless sampling boreholes and heavy or super heavy continuous dynamic penetration tests were sunk using a small tracked drilling and probing rig. The types of drilling are identified on each of the borehole records included as a separate appendix. The locations are given in Figure 1 and selected using information on the proposed redevelopment, existing buried services and structures, ongoing site use, reinstatement requirements and time constraints.

The windowless sampling technique consists of driving a hollow tube sampler with a plastic liner into the ground by repeated blows using the dynamic probing apparatus. This sampler is extracted from the ground by a pneumatically operated jack and the sample extracted from the plastic liner for logging. Deeper sections of the strata are sampled by driving successively smaller diameter samplers into the ground. If the material is suitable, the soil strength is examined using a pocket penetrometer.

Continuous dynamic probing is a simple test consisting of driving a rod, with an oversized cone point, into the ground with a uniform hammer blow. The blow count is recorded for every 100mm penetration (N100). The equipment is a machine driven unit using a 63.5kg hammer dropping through 0.75m onto 32mm diameter rods with a 1500mm^2 cone. The equipment confirms to the DPSH probing apparatus in Clause 3.2 of Part 9 of BS 1377 (199)). The equivalent SPT 'N' value can be estimated by multiplying the blow count by 3-5, dependant on soil characteristics. This method has been used to interpret soil strengths given on the CDPT plots.

Drilling was directed and supervised full-time by an experienced geologist who kept a record of the strata encountered, recorded the groundwater ingress and also recovered representative disturbed samples.

On completion the boreholes were either backfilled with their spoil, and if requested the surface reinstated, or a standpipe installation fitted.

The borehole records have been prepared using Gint software, taking into account both site descriptions and subsequent laboratory testing.

Intégrale
Understanding Ground Conditions

Borehole Log

Borehole No.
WS1
Sheet 1 of 1

Project Name: Orchard Way	Project No. 19058	Co-ords: -	Hole Type WLS
Location: Harwell, OX11 0LH		Level: 82.66	Scale 1:15
Client: Feltham Construction Limited		Dates: 21/05/2019 - 21/05/2019	Logged By IL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.05	ES		0.10	82.56		TOPSOIL: (Soft to firm dark grey slightly sandy slightly gravelly silty Clay. Gravel is subangular to angular fine to medium flint and sandstone. Occassional pieces of wood).
		0.30	ES					MADE GROUND: (Comprising soft slightly sandy slightly gravelly silty Clay. Gravel is subangular to angular fine to coarse brick, sandstone, wood and charcoal).
		0.80	D		0.40	82.26		Firm brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
		1.00		CPT (2,2/3,3,2,2) N = 10	1.00	81.66		Medium dense GRAVEL in a silty clay matrix. Gravel is subangular to angular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
					1.25	81.41		Firm grey green locally orange slightly sandy slightly gravelly to gravelly silty CLAY. Gravel is subangular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
					1.40	81.26		Stiff grey green with thin streaks of orange and white slightly sandy slightly gravelly silty CLAY. Gravel is subangular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
								Occasional orange old plant rootlet structures.
		2.00		CPT (10,13/14,15,15,6 for 20mm) N = 61	1.95	80.71		*Refusal on sandstone band.* End of borehole at 1.95 m

Remarks
Refusal on sandstone.
No groundwater encountered.
Installation to 1.95m.

Intégrale
Understanding Ground Conditions

Borehole Log

Borehole No.
WS2
Sheet 1 of 1

Project Name: Orchard Way	Project No. 19058	Co-ords: -	Hole Type WLS
Location: Harwell, OX11 0LH		Level: 82.76	Scale 1:15
Client: Feltham Construction Limited		Dates: 21/05/2019 - 21/05/2019	Logged By IL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES		0.15	82.61		TOPSOIL: (Comprising soft to firm dark grey brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular fine to medium brick, flint and sandstone).
		0.20	ES					MADE GROUND: (Comprising firm grey slightly sandy slightly gravelly silty Clay. Gravel is subangular fine to medium brick, charcoal, brick, flint, wood and sandstone).
					0.40	82.36		Stiff grey green slightly sandy slightly gravelly silty CLAY. Gravel is subangular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
		1.00	ES					
		1.00		CPT (4,5/5,6,7,7) N = 25				
		1.60		CPT (12,13/13,16,16,5 for 20mm) N = 61				
					1.95	80.81		*Refusal on sandstone.* End of borehole at 1.95 m

Remarks
Refusal on sandstone.
No groundwater encountered.

Intégrale
Understanding Ground Conditions

Borehole Log

Borehole No.
WS3
Sheet 1 of 1

Project Name: Orchard Way	Project No. 19058	Co-ords: -	Hole Type WLS
Location: Harwell, OX11 0LH		Level: 82.70	Scale 1:15
Client: Feltham Construction Limited		Dates: 21/05/2019 - 21/05/2019	Logged By IL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.05	ES		0.10	82.60		TOPSOIL: (Comprising soft dark grey brown slightly sandy slightly gravelly silty Clay. Gravel is subangular fine to medium charcoal, brick, tile, wood, flint and sandstone).
		0.25	ES					MADE GROUND: (Comprising firm grey slightly sandy slightly gravelly silty Clay. Gravel is subangular fine to medium brick, charcoal, brick, flint, wood and sandstone).
					0.40	82.30		Firm brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
		0.70	D					
		1.00		CPT (2,3/3,3,4,4) N = 14	1.00	81.70		Firm grey green speckled white and orange silty CLAY. Occasional plant rootlets. (WEATHERED UPPER GREENSAND FORMATION)
		1.30	D					
					1.70	81.00		Dense grey green slightly clayey silty GRAVEL. Gravel is subangular to angular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
					1.80	80.90		
					1.90	80.80		Moderately strong fine to medium grained SANDSTONE. (UPPER GREENSAND FORMATION)
		2.00		CPT (8,10/12,12,13,13 for 70mm) N = 51				*Refusal on sandstone.*
								End of borehole at 1.90 m

1
2
3

Remarks
Refusal on sandstone.
No groundwater encountered.

Intégrale
Understanding Ground Conditions

Borehole Log

Borehole No.
WS4
Sheet 1 of 1

Project Name: Orchard Way	Project No. 19058	Co-ords: -	Hole Type WLS
Location: Harwell, OX11 0LH		Level: 82.43	Scale 1:15
Client: Feltham Construction Limited		Dates: 21/05/2019 - 21/05/2019	Logged By IL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	82.23		TOPSOIL: (Soft dark brown grey slightly silty slightly sandy slightly gravelly Clay. Gravel is subangular fine to medium flint. Roots and rootlets).
					0.30	82.13		MADE GROUND: (Comprising firm grey brown slightly gravelly silty Clay. Gravel is subangular to subrounded fine to medium flint and charcoal).
		0.50	D					Firm light grey green silty CLAY. (WEATHERED UPPER GREENSAND FORMATION)
		1.00		CPT (3,3/5,6,5,5) N = 21	0.95	81.48		Medium dense grey green slightly silty clayey GRAVEL. Gravel is subangular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
					1.30	81.13		Firm grey green silty gravelly CLAY. Gravel is subangular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
					1.50	80.93		*Becoming slightly gravelly at 1.35m depth.*
					1.60	80.83		Dense grey green slightly clayey silty GRAVEL. Gravel is subangular to angular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
		1.90		CPT (25 for 40mm/50 for 40mm) N = 375	1.90	80.53		Firm grey green slightly gravelly silty CLAY. Gravel is subangular fine to coarse weak sandstone. Occasional remnant plant root structures. (WEATHERED UPPER GREENSAND FORMATION)
					2.00	80.43		Moderately weak to moderately strong medium grained SANDSTONE. (UPPER GREENSAND FORMATION)
								Refusal on sandstone.
								End of borehole at 2.00 m

1
2
3

Remarks
Refusal on sandstone.
No groundwater encountered.

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Understanding Ground Conditions

Borehole Log

Borehole No.
WS5
Sheet 1 of 1

Project Name: Orchard Way	Project No. 19058	Co-ords: -	Hole Type WLS
Location: Harwell, OX11 0LH		Level: 82.40	Scale 1:15
Client: Feltham Construction Limited		Dates: 21/05/2019 - 21/05/2019	Logged By IL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15	82.25		TOPSOIL: (Soft dark brown grey slightly gravelly silty Clay. Gravel is subrounded to subangular fine to medium flint. Roots and rootlets).
					0.40	82.00		MADE GROUND: (Comprising firm brown grey slightly gravelly silty Clay. Gravel is subangular to angular fine to medium sandstone, charcoal and flecks of brick).
		0.70	D					Firm grey slightly gravelly silty CLAY. Gravel is subrounded to subangular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
		1.00		CPT (2,3/4,4,5,5) N = 18	1.00	81.40		*Becoming gravelly at 0.95m depth.*
					1.15	81.25		Medium dense silty clayey GRAVEL. Gravel is subangular fine to coarse sandstone. (WEATHERED UPPER GREENSAND FORMATION)
		1.30	D					Grey green mottled orange slightly gravelly silty CLAY. Gravel is subangular fine to coarse weak sandstone. (WEATHERED UPPER GREENSAND FORMATION)
					1.50	80.90		*Becoming gravelly at 1.45m depth.*
		1.80		CPT (25 for 45mm/50 for 70mm) N = 51				Very weak to weak grey green fine to medium grained bands of SANDSTONE. (UPPER GREENSAND FORMATION)
					1.90	80.50		Moderately weak white grey fine to medium grained SANDSTONE. (UPPER GREENSAND FORMATION)
					1.95	80.45		*Refusal on sandstone.*
								End of borehole at 1.95 m

1
2
3

Remarks
Refusal on sandstone.
No groundwater encountered.
Installation to 1.95m.

Intégrale

Appendix G

Gas & Groundwater Monitoring

Integrale Limited, Suite 7, Westway Farm Business Park, Wick Road, Bishop Sutton, Somerset, BS39 5XP United Kingdom
Tel: 01275 333 036 www.integrale.uk.com

Registered Office: The Granary, Chewton Fields, Ston Easton, Somerset, BA3 4BX United Kingdom VAT Reg. No. 609 7402 37

Intégrale
Understanding Ground Conditions

Suite 7, Westway Farm Business Park
Wick Road, Bishop Sutton, Somerset,
BS39 5XP, United Kingdom

Tel: 01275 333036
www.integrale.uk.com

STANDARD METHODOLOGIES FOR STANDPIPE INSTALLATIONS, SAMPLING and MONITORING FOR GAS AND GROUNDWATER

Standpipe Installations in Trial Pits

Simple 30-50mm diameter plastic standpipes are installed in trial pits during backfilling. These consist of slotted pipe throughout the buried length to within 0.5m of the ground surface, with unslotted pipe above. These are capped off with removable stop-ends above ground level. They provide a useful guide to soil gas conditions within the backfilled trial pit, however some soil gas will be lost by dispersal within the loose backfill at the surface of the pit. They are commonly used for monitoring standing groundwater levels which would develop within excavations, however careful consideration has to be given to the possible infiltration of rainfall and throughflow into the sump created by the excavated pit.

Standpipe Installations in Boreholes

Simple standpipes to measure the hydrostatic head of groundwater are formed in boreholes using 50mm diameter pipe. The details of individual installations are provided on borehole records. Typically the lower length is formed in slotted pipe, with the upper 1m unslotted. The annulus between the riser pipe and the borehole wall is filled with clean granular material. Details of any bentonite seals or grouting are given on the borehole records. A removable gas tap is fitted where gas monitoring is required and standpipes typically have a metal access cover concreted in at ground level.

Standpipe piezometers are formed by using a Casagrande type piezometer tip at the base of the pipe, set in a granular response zone of sand or pea gravel. The response zone is isolated from the strata above and below by placing 500mm thick bentonite seals. The remaining annulus above the bentonite seal is filled with a cement bentonite grout or similar.

Groundwater Monitoring & Sampling

Details of return monitoring visits are included in this appendix. Groundwater standing levels are measured by inserting an electrically operated dip meter into the standpipe and recording the level to 2 decimal places, relative to existing ground level. Where groundwater levels are critical to calculation of hydraulic gradients or flow directions, the measurement is taken to 3 decimal places and to a marked point on the standpipe cover. That point is then surveyed and levelled to provide accurate calculations.

Groundwater samples are recovered using either Waterra valves and sample tubing or by manually lifting water from the standpipe using a bailer. For contamination analyses, the boreholes are initially purged by removing up to 3 borehole volumes of water, allowing the rest level to redevelop and taking a sufficient sample into custom containers. If groundwater does not recover sufficiently, the purged water may be used as the sample.

Gas Monitoring

Monitoring is usually completed in standpipes prior to groundwater measurements, using portable instruments. Details are given on the monitoring tables, and typically using a PhoCheck Tiger photoionisation detector to measure volatile organic compounds in ppm and a GA5000 Gas meter to measure oxygen, carbon dioxide and methane, both by % Lower Explosive Limit and % Volume. Atmospheric pressure and temperature are also recorded. Measurements are taken immediately on opening the gas valve and the highest to lowest levels recorded. If levels fluctuate, then this is recorded, with the maximum reading and a more typical or rest level given.

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Integrale
Site: Harwell
Date: 13/06/2019

Quote No:
Visit No: 1 **of** 3
Operator: W.M

Project Manager: Phil Sanders

Monitoring Point	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				WELL AND WATER DATA		Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Water level (mbgl)	Depth of well (m)	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Min.	Steady			Peak	Steady					
WS1	ND	ND	ND	ND	2.5	2.5	1	1	ND	ND	18.9	18.9	NA	NA	0.1	0.1	0	60	DRY	1.94	
WS5	ND	ND	ND	ND	5.3	5.3	ND	ND	ND	ND	14.8	14.8	NA	NA	0.0	0.0	0	60	DRY	2.05	
Max	**ND**	**ND**	**ND**	**ND**	**5.3**	**5.3**	**1**	**1**	**ND**	**ND**	**18.9**	**18.9**	**NR**	**ND**	**0.1**	**0.1**	**0**	**60**	**DRY**	**2.05**	
Min	**ND**	**ND**	**ND**	**ND**	**2.5**	**2.5**	**ND**	**ND**	**ND**	**ND**	**14.8**	**14.8**	**NR**	**0.0**	**0.0**	**0.0**	**-0.1**	**60**	**DRY**	**1.94**	

ND - Not detected

NR - Not recorded

NA - Non applicable

METEOROLOGICAL AND SITE INFORMATION: (Select correct box with X or enter data, as applicable)

State of ground:		Dry		Moist	x	Wet		Snow		Frozen
Wind:		Calm	x	Light		Moderate		Strong		
Cloud cover:		None		Slight		Cloudy	x	Overcast		
Precipitation:		None	x	Slight		Moderate		Heavy		
Time monitoring performed:			08:30	Start			09:00	End		
Barometric pressure (mbar):			994	Start			994	End		
Pressure trend (Daily):				Falling		Steady		Rising		
Source:	TIMEANDDATE.COM									
Air Temperature (Deg. C):			13	Before			13	After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter:

Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +100/-50 l/hour
Differential Pressure: (+/-) 1000 Pa
Date of last calibration:
Date of next calibration:

Ambient air check: **CH_4** 0.0 **CO_2** 0.1 **O_2** 20.9

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Integrale
Site: Harwell
Date: 19/06/2019

Quote No:
Visit No: 2 **of** 3
Operator: W.M

Project Manager: Phil Sanders

Monitoring Point	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				WELL AND WATER DATA		Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Water level (mbgl)	Depth of well (m)	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Min.	Steady			Peak	Steady					
WS1	0.1	0.1	2.0	2.0	2.3	2.3	1	1	ND	ND	12.0	12.0	NA	NA	0.1	0.1	0	60	DRY	1.94	
WS5	0.1	0.1	2.0	2.0	2.2	2.2	1	1	ND	ND	18.7	18.7	NA	NA	0.0	0.0	0	60	DRY	2.05	
Max	**0.1**	**0.1**	**2.0**	**2.0**	**2.3**	**2.3**	**1**	**1**	**ND**	**ND**	**18.7**	**18.7**	**NR**	**ND**	**0.1**	**0.1**	**0**	**60**	**DRY**	**2.05**	
Min	**0.1**	**0.1**	**2.0**	**2.0**	**2.2**	**2.2**	**1**	**1**	**ND**	**ND**	**12.0**	**12.0**	**NR**	**0.0**	**0.0**	**0.0**	**-0.1**	**60**	**DRY**	**1.94**	

ND - Not detected

NR - Not recorded

NA - Non applicable

METEOROLOGICAL AND SITE INFORMATION: (Select correct box with X or enter data, as applicable)

State of ground:		Dry		Moist	x	Wet		Snow		Frozen
Wind:		Calm	x	Light		Moderate		Strong		
Cloud cover:		None		Slight		Cloudy	x	Overcast		
Precipitation:	x	None		Slight		Moderate		Heavy		
Time monitoring performed:			07:50	Start			08:15	End		
Barometric pressure (mbar):			999	Start			999	End		
Pressure trend (Daily):				Falling		Steady		Rising		
Source:	TIMEANDDATE.COM									
Air Temperature (Deg. C):			16	Before			16	After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: G505312
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +100/-50 l/hour
Differential Pressure: (+/-) 1000 Pa
Date of last calibration: 28/05/2019
Date of next calibration: 16/10/2019

Ambient air check: **CH_4** 0.0 **CO_2** 0.1 **O_2** 20.9

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Integrale
Site: Harwell
Date: 27/06/2019

Quote No:
Visit No: 3 **of** 3
Operator: W.M

Project Manager: Phil Sanders

Monitoring Point	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				WELL AND WATER DATA		Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Water level (mbgl)	Depth of well (m)	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Min.	Steady			Peak	Steady					
WS1	0.1	0.1	2.0	2.0	2.6	2.6	1	1	ND	ND	18.3	18.3	NA	NA	0.0	0.0	0	60	DRY	1.94	
WS5	0.1	0.1	2.0	2.0	6.3	6.3	ND	ND	ND	ND	14.6	14.6	NA	NA	0.1	0.1	0	60	DRY	2.05	
Max	**0.1**	**0.1**	**2.0**	**2.0**	**6.3**	**6.3**	**1**	**1**	**ND**	**ND**	**18.3**	**18.3**	**NR**	**ND**	**0.1**	**0.1**	**0**	**60**	**DRY**	**2.05**	
Min	**0.1**	**0.1**	**2.0**	**2.0**	**2.6**	**2.6**	**ND**	**ND**	**ND**	**ND**	**14.6**	**14.6**	**NR**	**0.0**	**0.0**	**0.0**	**-0.2**	**60**	**DRY**	**1.94**	

ND - Not detected

NR - Not recorded

NA - Non applicable

METEOROLOGICAL AND SITE INFORMATION: (Select correct box with X or enter data, as applicable)

State of ground:	X	Dry		Moist		Wet		Snow		Frozen
Wind:		Calm		Light	X	Moderate		Strong		
Cloud cover:		None	X	Slight		Cloudy		Overcast		
Precipitation:	x	None		Slight		Moderate		Heavy		
Time monitoring performed:			07:30	Start			07:50	End		
Barometric pressure (mbar):			1020	Start			1020	End		
Pressure trend (Daily):				Falling		Steady		Rising		
Source:	TIMEANDDATE.COM									
Air Temperature (Deg. C):			14	Before			14	After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: G505312
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +100/-50 l/hour
Differential Pressure: (+/-) 1000 Pa
Date of last calibration: 28/05/2019
Date of next calibration: 16/10/2019

Ambient air check: **CH_4** 0.0 **CO_2** 0.1 **O_2** 20.9

Intégrale

Appendix H

Results of Geotechnical Laboratory Testing

Integrale Limited, Suite 7, Westway Farm Business Park, Wick Road, Bishop Sutton, Somerset, BS39 5XP United Kingdom
Tel: 01275 333 036 www.integrale.uk.com

Registered Office: The Granary, Chewton Fields, Ston Easton, Somerset, BA3 4BX United Kingdom VAT Reg. No. 609 7402 37

Intégrale
Understanding Ground Conditions

Suite 7, Westway Farm Business Park
Wick Road, Bishop Sutton, Somerset,
BS39 5XP, United Kingdom

Tel: 01275 333036
www.integrale.uk.com

STANDARD METHODOLOGY FOR GEOTECHNICAL SAMPLING

Soil samples are recovered from trial pits or borehole samples using a stainless steel trowel and immediately placed into airtight plastic tubs or bags, as appropriate for the testing. If required the soil samples may be wrapped in cling film, particularly in suspected desiccated soils. Samples are labelled with the site name, investigation location and depth and placed into either cool boxes or large bulk bags for transit from site. An analytical schedule is drawn up in line with the actual ground conditions proven, proposed site use and likely design parameters.

Samples are sent to a specialist testing laboratory. Testing is completed in line with BS1377 as far as possible and details of the test method and UKAS accreditation are provided by the laboratory on the results sheets in a separate appendix.

Test Report

South West Geotechnical Ltd
Unit 3 Brooklands,
Howden Road,
Tiverton,
Devon
EX16 5HW

Job No:	11445	**Date Received:**	03/06/19
Job Name:	Orchard Way, Harwell	**Date Sent:**	12/06/19
Client Name:	Integrale	**Transmittal Number:**	T4677
Client Job No:	19058	**Senders Initials:**	DT
Client Address	Suite 7, Westway Farm Business Park, Wick Road, Bishop Sutton, Bristol, BS39 5XP	**Report Revision No.**	1
		Sampled by SWG lab staff?	NO

Ref.	Test Detail	No. of Tests / Report No.
A1	BS1377: Part 2: 1990: Clause 3 - Moisture Content - UKAS Accredited	6
A5	BS1377: Part 2: 1990: Clause 4 & 5 - Atterberg Limits - UKAS Accredited	3

Sampling not performed by South West Geotechnical laboratory staff. Results apply to the samples as received.

Approved Signatories:

Dan Ayre (Quality Manager)

David Trowbridge (Laboratory Manager)

8260
Accredited to
ISO/IEC
17025:2017

SOUTH WEST GEOTECHNICAL

Summary of Classification Test Results

Unit 3 Brooklands,
Howden Road,
Tiverton,
Devon
EX16 5HW

Project No.	Project Name
11445	Orchard Way
Client Job No.	**Client**
11445	Integrale

UKAS TESTING 8260 Accredited to ISO/IEC 17025:2017

Hole No.	Sample				Soil Description	*mc* Cl.3.2	Passing 425µm	LL	PL Cl5.3	PI Cl5.4	Particle density	Remarks
	Type	Top	Base	Ref		%	%	%	%	%	Mg/m3	
TP1	D	0.50		-	Light grey slightly gravelly slightly sandy CLAY	25	88 - Sieved	44	21	23	-	
TP3	D	0.90		-	Light grey slightly gravelly slightly sandy CLAY	36	100 - Natural	69	27	42	-	
TP4	D	0.40		-	Grey slightly gravelly slightly sandy CLAY	23	-	-	-	-	-	
WS2	D	1.00		-	Greenish grey slightly gravelly slightly sandy CLAY	34	93 - Sieved	60	31	29	-	
WS3	D	0.70		-	Light greenish grey slightly gravelly slightly sandy CLAY	26	-	-	-	-	-	
WS5	D	1.30		-	Light greenish grey slightly gravelly slightly sandy CLAY	30	-	-	-	-	-	
						-	-	-	-	-	-	
						-	-	-	-	-	-	
						-	-	-	-	-	-	
						-	-	-	-	-	-	

Preparation Clauses: Particle Density (BS1377:Part 1: 1990: CL7.4.4) Atterberg Limits (BS1377:Part 1: 1990: CL7.4.3) Moisture Content (BS1377: Part 1: 1990: CL7.3.3 & 7.4.2)

Key

Atterberg Limits BS1377-2:1990
4pt cone (CL.4.3) unless :
1pt - single point test (CL.4.4)
4.2.3 - Natural
4.2.4 - Sieved
Moisture Content (mc) %

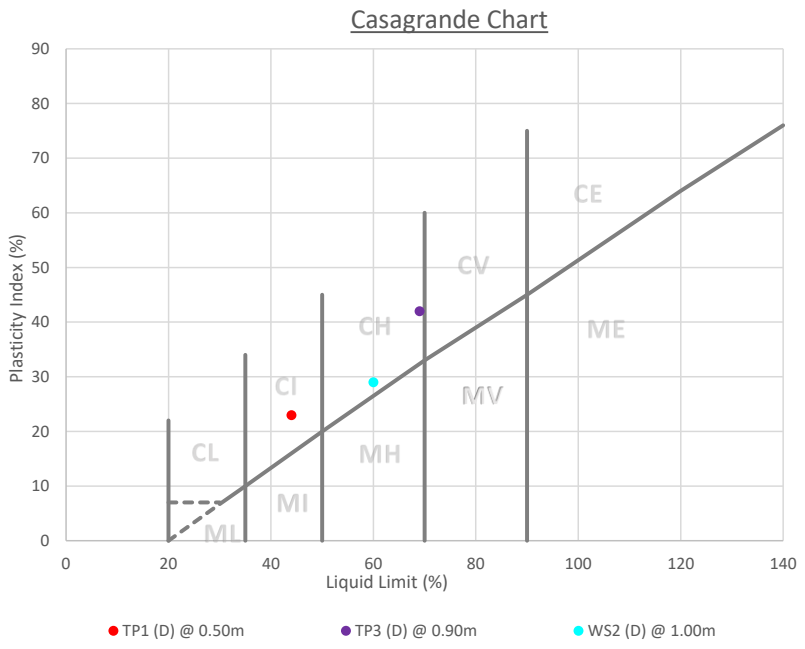
Particle density BS1377-2:1990
sp - small pyknometer CL.8.3
gj - gas jar CL.8.2

Date	Approved By	Page No.	1
13/06/2019	David Trowbridge - Laboratory Manager	KL001R Index Summary	

Graphical Summary of Atterberg Test Results

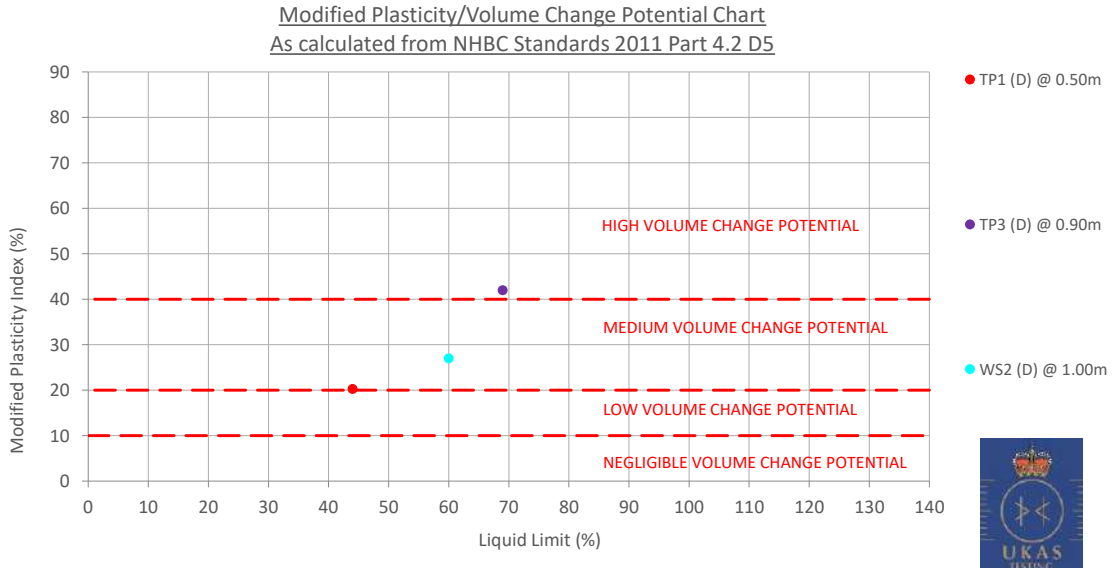
Unit 3 Brooklands,
Howden Road,
Tiverton,
Devon
EX16 5HW

Project No.	Project Name
11445	Orchard Way, Harwell
Client Job No.	**Client**
19058	Integrale



Sample ID	Plasticity Index (%)	Modified Plasticity Index (%)
TP1 (D) @ 0.50m	23	20
TP3 (D) @ 0.90m	42	42
WS2 (D) @ 1.00m	29	27
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

The Modified Plasticity Index (I'p) is defined as the Plasticity Index (Ip) of the soil multiplied by the percentage of particles less than 425µm.
ie. I'p x % less than 425um/100%



KL001a Index Graphical Summary	Approved By	Date
	David Trowbridge - Laboratory Manager	13/06/2019 17:22

8260
Accredited to ISO/IEC 17025:2017

Intégrale

Appendix I

Contamination Analyses

Integrale Limited, Suite 7, Westway Farm Business Park, Wick Road, Bishop Sutton, Somerset, BS39 5XP United Kingdom
Tel: 01275 333 036 www.integrale.uk.com

Registered Office: The Granary, Chewton Fields, Ston Easton, Somerset, BA3 4BX United Kingdom VAT Reg. No. 609 7402 37

Intégrale
Understanding Ground Conditions

Suite 7, Westway Farm Business Park
Wick Road, Bishop Sutton, Somerset,
BS39 5XP, United Kingdom

Tel: 01275 333036
www.integrale.uk.com

STANDARD METHODOLOGY FOR CONTAMINATION SAMPLING & SCHEDULING

Soil samples for contamination analyses are recovered from trial pits or borehole samples using a stainless steel trowel and immediately placed into airtight amber glass jars, vials, or plastic tubs, as appropriate for the testing. These samples are labelled with the site name, investigation location and depth and placed into cool boxes for transit from site. Groundwater samples recovered during subsequent monitoring visits are similarly treated.

An analytical schedule is drawn up in line with the desk study findings, guidance given in CLR 8 and any relevant industry information, the actual ground conditions proven and proposed site use.

Samples are sent via overnight courier to the specialist testing laboratory. Testing is scheduled for MCERTS accredited analyses as far as possible and details of the test method are provided by the laboratory on the results sheets in a separate appendix. A standard turnaround of 10 working days is adopted unless otherwise agreed with the client at the time of instruction.

Isabel Lees
Integrale Limited
Unit 7
Westway Farm Business Park
Wick Road
Bishop Sutton
Somerset
BS39 5XP

e: isabellees@integrale.uk.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 19-43815

Project / Site name:	Orchard Way Harwell	**Samples received on:**	30/05/2019
Your job number:	19058	**Samples instructed on:**	31/05/2019
Your order number:	0920	**Analysis completed by:**	11/06/2019
Report Issue Number:	1	**Report issued on:**	11/06/2019
Samples Analysed:	8 soil samples		

Signed:

Zina Abdul Razzak
Senior Quality Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 19-43815

Project / Site name: Orchard Way Harwell

Your Order No: 0920

Lab Sample Number				1235641	1235642	1235643	1235644	1235645
Sample Reference				TP3	WS2	WS3	TP1	WS5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.20	0.05	0.10	0.70
Date Sampled				21/05/2019	21/05/2019	21/05/2019	21/05/2019	21/05/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	16	15	13	13	18
Total mass of sample received	kg	0.001	NONE	1.1	1.1	0.98	1.1	0.81
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.3	7.6	7.6	7.6	7.7
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	-
Thiocyanate as SCN	mg/kg	5	NONE	< 5.0	< 5.0	5.1	< 5.0	-
Total Sulphate as SO_4	%	0.005	MCERTS	0.051	0.053	0.107	0.038	0.025
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	-	-	0.025
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	-	24.7
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	2.8	< 1.0	-
Elemental Sulphur	mg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	-
Total Sulphur	%	0.005	MCERTS	-	-	-	-	0.010
Organic Matter	%	0.1	MCERTS	3.1	2.9	7.1	1.5	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	-
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	< 0.80	< 0.80	-

Analytical Report Number: 19-43815

Project / Site name: Orchard Way Harwell

Your Order No: 0920

Lab Sample Number				1235641	1235642	1235643	1235644	1235645
Sample Reference				TP3	WS2	WS3	TP1	WS5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.20	0.05	0.10	0.70
Date Sampled				21/05/2019	21/05/2019	21/05/2019	21/05/2019	21/05/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5.6	6.7	10	3.3	-
Barium (aqua regia extractable)	mg/kg	1	MCERTS	46	48	140	48	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.61	0.73	0.66	0.49	-
Boron (water soluble)	mg/kg	0.2	MCERTS	1.7	1.6	2.6	1.1	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.8	< 0.2	-
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	18	22	27	16	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	19	18	82	12	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	26	20	63	12	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	13	15	16	14	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.2	< 1.0	< 1.0	< 1.0	-
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	20	21	24	18	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	43	39	560	31	-
Petroleum Hydrocarbons								
TPH C10 - C40	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	-

Analytical Report Number: 19-43815

Project / Site name: Orchard Way Harwell

Your Order No: 0920

Lab Sample Number				1235646	1235647	1235648		
Sample Reference				WS1	WS3	WS4		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.80	1.30	0.50		
Date Sampled				21/05/2019	21/05/2019	21/05/2019		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1		
Moisture Content	%	N/A	NONE	16	19	17		
Total mass of sample received	kg	0.001	NONE	0.64	0.59	0.66		
Asbestos in Soil	Type	N/A	ISO 17025	-	-	-		
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.9	8.4	7.8		
Total Cyanide	mg/kg	1	MCERTS	-	-	-		
Thiocyanate as SCN	mg/kg	5	NONE	-	-	-		
Total Sulphate as SO_4	%	0.005	MCERTS	0.025	0.051	0.037		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.057	0.064	0.10		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	56.9	64.0	102		
Sulphide	mg/kg	1	MCERTS	-	-	-		
Elemental Sulphur	mg/kg	5	MCERTS	-	-	-		
Total Sulphur	%	0.005	MCERTS	0.012	0.019	0.017		
Organic Matter	%	0.1	MCERTS	-	-	-		
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	-	-	-		
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	-	-	-		
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-		
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-		
Fluorene	mg/kg	0.05	MCERTS	-	-	-		
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-		
Anthracene	mg/kg	0.05	MCERTS	-	-	-		
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-		
Pyrene	mg/kg	0.05	MCERTS	-	-	-		
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-		
Chrysene	mg/kg	0.05	MCERTS	-	-	-		
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-		
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-		
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-		
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-		
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-		
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-	-	-		

Analytical Report Number: 19-43815

Project / Site name: Orchard Way Harwell
Your Order No: 0920

Lab Sample Number				1235646	1235647	1235648		
Sample Reference				WS1	WS3	WS4		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.80	1.30	0.50		
Date Sampled				21/05/2019	21/05/2019	21/05/2019		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-		
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-		
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	-	-		
Boron (water soluble)	mg/kg	0.2	MCERTS	-	-	-		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	-	-		
Chromium (hexavalent)	mg/kg	4	MCERTS	-	-	-		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	-	-		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-		
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-		
Petroleum Hydrocarbons								
TPH C10 - C40	mg/kg	10	MCERTS	-	-	-		

The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 19-43815

Project / Site name: Orchard Way Harwell

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1235641	TP3	None Supplied	0.10	Brown loam and clay with gravel and vegetation.
1235642	WS2	None Supplied	0.20	Brown loam and clay with gravel and vegetation.
1235643	WS3	None Supplied	0.05	Brown loam and clay with gravel and vegetation.
1235644	TP1	None Supplied	0.10	Brown loam and clay with gravel and vegetation.
1235645	WS5	None Supplied	0.70	Brown clay and sand with gravel.
1235646	WS1	None Supplied	0.80	Light brown clay and sand with gravel and vegetation.
1235647	WS3	None Supplied	1.30	Light brown clay and sand.
1235648	WS4	None Supplied	0.50	Brown clay and sand.

The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 19-43815

Project / Site name: Orchard Way Harwell

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Elemental sulphur in soil	Determination of elemental sulphur in soil by extraction in acetonitrile followed by HPLC.	In-house method based on Secondsite Property Holdings Guidance for Assessing and Managing Potential	L021-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Thiocyanate in soil	Determination of thiocyanate in soil by extraction in water followed by acidification followed by addition of ferric nitrate followed by discrete analyser (spectrophotometer).	In-house method	L082-PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS

Analytical Report Number : 19-43815

Project / Site name: Orchard Way Harwell

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
TP1		S	19-43815	1235644	c	Sulphide in soil	L010-PL	c
TP1		S	19-43815	1235644	c	Total cyanide in soil	L080-PL	c
TP3		S	19-43815	1235641	c	Sulphide in soil	L010-PL	c
TP3		S	19-43815	1235641	c	Total cyanide in soil	L080-PL	c
WS2		S	19-43815	1235642	c	Sulphide in soil	L010-PL	c
WS2		S	19-43815	1235642	c	Total cyanide in soil	L080-PL	c
WS3		S	19-43815	1235643	c	Sulphide in soil	L010-PL	c
WS3		S	19-43815	1235643	c	Total cyanide in soil	L080-PL	c

Key: a - No sampling date b - Incorrect container
c - Holding time d - Headspace e - Temperature

Analytical Report Number: 19-43815

Project / Site name: Orchard Way Harwell

Your Order No: 0920

Lab Sample Number				1235641	1235642	1235643	1235644	1235645	1235646	1235647
Sample Reference				TP3	WS2	WS3	TP1	WS5	WS1	WS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.20	0.05	0.10	0.70	0.80	1.30
Date Sampled				21/05/2019	21/05/2019	21/05/2019	21/05/2019	21/05/2019	21/05/2019	21/05/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**							
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	16	15	13	13	18	16	19
Total mass of sample received	kg	0.001	NONE	1.1	1.1	0.98	1.1	0.81	0.64	0.59
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	-	-	-
General Inorganics										
pH - Automated	pH Units	N/A	MCERTS	7.3	7.6	7.6	7.6	7.7	7.9	8.4
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	-	-	-
Thiocyanate as SCN	mg/kg	5	NONE	< 5.0	< 5.0	5.1	< 5.0	-	-	-
Total Sulphate as SO_4	%	0.005	MCERTS	0.051	0.053	0.107	0.038	0.025	0.025	0.051
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	-	-	0.025	0.057	0.064
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	-	24.7	56.9	64.0
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	2.8	< 1.0	-	-	-
Elemental Sulphur	mg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	-	-	-
Total Sulphur	%	0.005	MCERTS	-	-	-	-	0.010	0.012	0.019
Organic Matter	%	0.1	MCERTS	3.1	2.9	7.1	1.5	-	-	-
Total Phenols										
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	-	-	-
Speciated PAHs										
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-
Total PAH										
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	< 0.80	< 0.80	-	-	-
Heavy Metals / Metalloids										
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5.6	6.7	10	3.3	-	-	-
Barium (aqua regia extractable)	mg/kg	1	MCERTS	46	48	140	48	-	-	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.61	0.73	0.66	0.49	-	-	-
Boron (water soluble)	mg/kg	0.2	MCERTS	1.7	1.6	2.6	1.1	-	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.8	< 0.2	-	-	-
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	-	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	18	22	27	16	-	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	19	18	82	12	-	-	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	26	20	63	12	-	-	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	-	-	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	13	15	16	14	-	-	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.2	< 1.0	< 1.0	< 1.0	-	-	-
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	20	21	24	18	-	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	43	39	560	31	-	-	-
Petroleum Hydrocarbons										
TPH C10 - C40	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	-	-	-

Exceeded GAC Value
Exceeded WRAS Value
Exceeded PHYTO Value

Analytical Report Number: 19-43815

Project / Site name: Orchard Way Harwell
Your Order No: 0920

Lab Sample Number				1235648
Sample Reference				WS4
Sample Number				None Supplied
Depth (m)				0.50
Date Sampled				21/05/2019
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	N/A	NONE	17
Total mass of sample received	kg	0.001	NONE	0.66
Asbestos in Soil	Type	N/A	ISO 17025	-
General Inorganics				
pH - Automated	pH Units	N/A	MCERTS	7.8
Total Cyanide	mg/kg	1	MCERTS	-
Thiocyanate as SCN	mg/kg	5	NONE	-
Total Sulphate as SO_4	%	0.005	MCERTS	0.037
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.10
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	102
Sulphide	mg/kg	1	MCERTS	-
Elemental Sulphur	mg/kg	5	MCERTS	-
Total Sulphur	%	0.005	MCERTS	0.017
Organic Matter	%	0.1	MCERTS	-
Total Phenols				
Total Phenols (monohydric)	mg/kg	1	MCERTS	-
Speciated PAHs				
Naphthalene	mg/kg	0.05	MCERTS	-
Acenaphthylene	mg/kg	0.05	MCERTS	-
Acenaphthene	mg/kg	0.05	MCERTS	-
Fluorene	mg/kg	0.05	MCERTS	-
Phenanthrene	mg/kg	0.05	MCERTS	-
Anthracene	mg/kg	0.05	MCERTS	-
Fluoranthene	mg/kg	0.05	MCERTS	-
Pyrene	mg/kg	0.05	MCERTS	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-
Chrysene	mg/kg	0.05	MCERTS	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-
Total PAH				
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-
Boron (water soluble)	mg/kg	0.2	MCERTS	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-
Chromium (hexavalent)	mg/kg	4	MCERTS	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-
Petroleum Hydrocarbons				
TPH C10 - C40	mg/kg	10	MCERTS	-

Exceeded GAC Value
Exceeded WRAS Value
Exceeded PHYTO Value

Isabel Lees
Integrale Limited
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i2 Analytical Ltd.
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WD18 8YS

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Analytical Report Number : 19-43821

Project / Site name:	Orchard Way Harwell	**Samples received on:**	30/05/2019
Your job number:	19058	**Samples instructed on:**	31/05/2019
Your order number:	0920	**Analysis completed by:**	11/06/2019
Report Issue Number:	1	**Report issued on:**	11/06/2019
Samples Analysed:	2 wac multi samples		

Signed: K. Lewicka

Katarzyna Lewicka
Head of Reporting Section
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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Waste Acceptance Criteria Analytical Results

Report No:	**19-43821**						
					Client:	**INTEGRALE**	
Location	**Orchard Way Harwell**						
Lab Reference (Sample Number)	1235695				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	21/05/2019				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS1						
Depth (m)	0.30						
Solid Waste Analysis							
TOC (%)**	1.0				3%	5%	6%
Loss on Ignition (%) **	4.2				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg) #	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.9				100	--	--
pH (units)**	7.7				--	>6	--
Acid Neutralisation Capacity (mol / kg)	7.9				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 3 preparation utilising end over end leaching procedure)	2:1 mg/l	8:1 mg/l		Cumulative 10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
Arsenic *	< 0.010	< 0.010		< 0.050	0.5	2	25
Barium *	0.0071	0.0087		0.085	20	100	300
Cadmium *	< 0.0005	< 0.0005		< 0.0020	0.04	1	5
Chromium *	< 0.0010	< 0.0010		0.0074	0.5	10	70
Copper *	0.062	0.013		0.18	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	< 0.0030	< 0.0030		< 0.020	0.5	10	30
Nickel *	0.0034	0.0049		0.047	0.4	10	40
Lead *	< 0.0050	< 0.0050		< 0.020	0.5	10	50
Antimony *	< 0.0050	< 0.0050		< 0.020	0.06	0.7	5
Selenium *	< 0.010	< 0.010		< 0.040	0.1	0.5	7
Zinc *	0.012	0.0071		0.076	4	50	200
Chloride *	< 4.0	< 4.0		27	800	4000	25000
Fluoride	1.4	0.81		8.7	10	150	500
Sulphate *	5.9	3.5		38	1000	20000	50000
TDS*	100	62		660	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	22	17		180	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	87						
Moisture (%)	13						
Stage 1							
Volume Eluate L2 (litres)	0.32						
Filtered Eluate VE1 (litres)	0.18						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

*= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation

** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Waste Acceptance Criteria Analytical Results

Report No:	**19-43821**						
					Client:	**INTEGRALE**	
Location	**Orchard Way Harwell**						
Lab Reference (Sample Number)	1235696				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	21/05/2019				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TP2						
Depth (m)	0.10						
Solid Waste Analysis							
TOC (%)**	1.7				3%	5%	6%
Loss on Ignition (%) **	5.0				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg) #	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.9				100	--	--
pH (units)**	8.2				--	>6	--
Acid Neutralisation Capacity (mol / kg)	5.9				--	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test		
(BS EN 12457 - 3 preparation utilising end over end leaching procedure)	mg/l	mg/l		mg/kg	using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.011	0.010		0.10	0.5	2	25
Barium *	0.0065	0.0070		0.070	20	100	300
Cadmium *	< 0.0005	< 0.0005		< 0.0020	0.04	1	5
Chromium *	< 0.0010	< 0.0010		0.0077	0.5	10	70
Copper *	0.066	0.0098		0.16	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	< 0.0030	< 0.0030		< 0.020	0.5	10	30
Nickel *	0.0036	0.0035		0.035	0.4	10	40
Lead *	< 0.0050	< 0.0050		< 0.020	0.5	10	50
Antimony *	< 0.0050	< 0.0050		< 0.020	0.06	0.7	5
Selenium *	< 0.010	< 0.010		< 0.040	0.1	0.5	7
Zinc *	0.0091	0.0024		0.031	4	50	200
Chloride *	< 4.0	< 4.0		29	800	4000	25000
Fluoride	0.62	0.45		4.6	10	150	500
Sulphate *	3.5	3.8		37	1000	20000	50000
TDS*	110	63		680	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	20	19		190	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	0.70						
Dry Matter (%)	83						
Moisture (%)	17						
Stage 1							
Volume Eluate L2 (litres)	0.31						
Filtered Eluate VE1 (litres)	0.18						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

*= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation

** = MCERTS accrediited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Analytical Report Number : 19-43821

Project / Site name: Orchard Way Harwell

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1235695	WS1	None Supplied	0.30	Brown loam and clay with gravel and vegetation.
1235696	TP2	None Supplied	0.10	Brown loam and clay with gravel.

Analytical Report Number : 19-43821

Project / Site name: Orchard Way Harwell

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance	L046-PL	W	NONE
BTEX (Sum of BTEX compounds) in soil	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Chloride in WAC leachate (BS EN 12457-3 Prep)	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
DOC in WAC leachate (BS EN 12457-3 Prep)	Determination of dissolved organic carbon in leachate by TOC/DOC NDIR analyser.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L037-PL	W	NONE
Fluoride in WAC leachate (BS EN 12457-3 Prep)	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L033-PL	W	ISO 17025
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L047-PL	D	MCERTS
Metals in WAC leachate (BS EN 12457-3 Prep)	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L039-PL	W	ISO 17025
Mineral Oil in Soil C10 - C40	Determination of dichloromethane/hexane extractable hydrocarbons in soil by GC-MS.	In-house method based on USEPA 8270	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
PCB's by GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	MCERTS
Phenol Index in WAC leachate (BS EN 12457-3 Prep)	Determination of monohydric phenols in leachate by continuous flow analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270. MCERTS accredited except Coronene.	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in WAC leachate (BS EN 12457-3 Prep)	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L039-PL	W	ISO 17025
TDS in WAC leachate (BS EN 12457-3 Prep)	Determination of total dissolved solids in leachate by electrometric measurement.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L031-PL	W	NONE
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	MCERTS

Analytical Report Number : 19-43821

Project / Site name: Orchard Way Harwell

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Appendix J

Proposed Development

Integrale Limited, Suite 7, Westway Farm Business Park, Wick Road, Bishop Sutton, Somerset, BS39 5XP United Kingdom
Tel: 01275 333 036 www.integrale.uk.com

Registered Office: The Granary, Chewton Fields, Ston Easton, Somerset, BA3 4BX United Kingdom VAT Reg. No. 609 7402 37

SOFT LANDSCAPE

Road trees.
Acer campestre 'Elsrijk'

10m high x 6m wide
after 25 years
Up to 26m high

Plant. Type 1
Photinia x fraseri
'Little Red Robin'

Plant. Type 2
Hebe Franciscana
'Blue Gem'

Plant. Type 3
Viburnum Davidii

PLANTS	Type 1	Type 2	Type 3
Plot 1 Harriette 3Bed		6m	4.5m
Plot 2 Harriette 2Bed		6m	4.5m
Plot 3 Harriette 3Bed		14m	2m
Plot 4 Pollard	6.5m	4m	6m
Plot 5 Pollard	6m		3m
Plot 6 Pollard	6m		3m
Plot 7 Pollard	8m		4m
Plot 8 Pollard	6.5m		7m
Plot 9 Pollard	7m		
Total m	40m	30m	34m
Total (3x3L No. Per m)	120	90	102

Extant hedge
New native hedgerow
Hawthorn
(Crataegus monogya)

Woodchip

Turf

Planting to housing side
with horizontal wire
hedging supports
400mm, 800mm.
4 plants per linear m.

Seeding of lawns with appropriate wildflower lawn mixture.

HARD LANDSCAPE

Charcoal
Natural
Limestone

Parking
Marshall priora - Charcoal

Road
Marshall priora - Natural

Private Garden.
Marshalls sawn limestone
Pale grey

Pea Gravel

Closeboard panel fence 1.8m
- 1.8 m heigh frame ledged
and braced closeboard gate

Closeboard Fence 1.2m

Post and Rail_Animal mesh

Closeboard Fence 1m

FEATURES

Bike Store - Overlap Apex
W:201cm D:83cm H:172cm
2 Adult + 1 Kid Bike spaces

Timber Bin Store
W:153Ocm D:810 H:1300cm

Bat boxes

Bird boxes

Street Lighting

Existing Level

Proposed Level

GIA

GIA	HOUSE	GARDEN
Plot 1 Harriette 3Bed	109.07m²	142.55m²
Plot 2 Harriette 2Bed	109.07m²	94.60m²
Plot 3 Harriette 3Bed	109.07m²	105.98m²
Plot 4 Pollard	135.23m²	175.00m²
Plot 5 Pollard	135.23m²	125.23m²
Plot 6 Pollard	135.23m²	115.84m²
Plot 7 Pollard	135.23m²	160.42m²
Plot 8 Pollard	135.23m²	165.83m²
Plot 9 Pollard	135.23m²	120.69m²

LEVELS

LEVELS	FINISH FLOOR	EAVE	RIDGE
Plot 1 Harriette 3Bed	82.70m	88.70m	91.54m
Plot 2 Harriette 2Bed	82.75m	88.75m	91.59m
Plot 3 Harriette 3Bed	82.80m	88.80m	91.64m
Plot 4 Pollard	83.10m	89.10m	92.61m
Plot 5 Pollard	83.00m	89.00m	92.51m
Plot 6 Pollard	83.00m	89.00m	92.51m
Plot 7 Pollard	83.00m	89.00m	92.51m
Plot 8 Pollard	82.70m	88.70m	92.21m
Plot 9 Pollard	82.55m	88.55m	92.06m

Drawn by	Checked by	Description	Date	Revision
AM	CS	Areas adjusted. Levels added	10/06/2019	P3
AM	CS	Amended as per comments	06/06/2019	P2
AM	CS	Preliminary issue	28/05/2019	P1

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Client
Feltham Construction

Project
Harwell

Drawing Title
Site Plan - Ground Floor

Scale
1:100 @ A1

Date
28.05.2019

Status
PRELIMINARY

Drawing Number
FC906-H-100

Revision
P3

25 Orchard Way Harwell		GIA	Garden
Plot 1	2 Bed Ascent Detached	90	80
Plot 2	2 Bed Ascent Detached	90	75
Plot 3	4 Bed Hariette Detached with roofspace	120	115
Plot 4	3 Bed Hariette Detached	103	120
Plot 5	4 Bed Hariette Detached with roofspace	120	142
Plot 6	3 Bed Hariette Detached	103	116
Plot 7	4 Bed Hariette Detached with roofspace	120	113

Project Title: Proposed Seven new dwellings at 25 Orchard Way Harwell OX11 0LQ

Drawing Title: Block Plan (Indicative Layout)

Drawing No: P18-020-FPL-025 *Rev:*

Scale: 1:500 @A3 *Date:* 9-4-19

FELTHAM —PROPERTIES—