

RETFORD ROAD, SOUTH LEVERTON DRAINAGE STATEMENT

INTRODUCTION

This document has been produced in conjunction with the proposed planning approved residential scheme (21/00775/FUL) at Priory Farm, Retford Road, South Leverton. The information produced is to support the discharge of Planning Condition 20.

The site is a 0.355 ha in size and in accordance with the approval is to be developed to provide five new residential dwellings. The site currently hardstanding areas, including the slabs from agricultural buildings now demolished to enable the development of the site.

Castle Rock Geotech have undertaken a Phase 2 site investigation which confirms ground conditions to be CLAYs and Siltstone with only minimal surface made ground associated with the previous use.

EXISTING SITE DRAINAGE

Surface Water

Severn Trent Water (STW) records confirm an existing 150mm diameter surface water sewer located in Retford Road (south of site), crossing part of the site frontage. Within the site is a private surface water drainage system serving the agricultural buildings and hard standings which were used as part of the sites previous use. The private surface water system discharges to the STW sewer in Retford Road (manhole MH1111), see attached FORTEM drawing 1158-001 - Existing Site Drainage.

The existing surface water drainage system has been assessed from records and an intrusive site visit on 28.04.21. As part of this assessment the existing impermeable area was assessed and recorded as 0.24ha. Therefore the existing brownfield runoff for the site is:

Brownfield Runoff	Total Existing Site Runoff
0.24ha x 140l/s/ha =	33.6l/s

Foul Water

STW records confirm an existing 150mm diameter foul water sewer located in Retford Road (south of site), crossing part of the site frontage. Within the site there is an existing private foul manhole connecting to the foul sewer network within Retford Road (MH1102), please see attached FORTEM Drawing 1158-001 Existing Site Drainage.

SURFACE WATER DRAINAGE

The proposed development has been assessed for the potential surface water outfall/discharge in accordance with National Planning Practice Guidance, see summary below:

Outfall/Discharge Option (Ranked in order of Preference)	✓/✗	Notes
1. Infiltration	✗	Castle Rock Geotech ground investigation report (180401N) included percolation testing, with no infiltration recorded. This combined with shallow groundwater readings (circa 0.5m bgl) confirms infiltration drainage is not suitable for the proposed development.
2. Discharge to Watercourse	✗	There are no recorded watercourses within or near the site.
3. Discharge to Public Surface Water Sewer.	✓	Severn Trent records show that there is an existing 150mm diameter surface water sewer to the south of the site. This system has previously served the sites former buildings and hard standings.
4. Discharge to Public Combined Sewer.	✗	No combined sewers within area.

In accordance with the review above and the existing discharge arrangement from the site, it is proposed to discharge surface water from the site to the existing 150mm diameter STW sewer located in Retford Road. The proposed development impermeable area is 0.143ha, which provides a 40% reduction from the previous use and therefore reduction in flow and discharge volume to the existing sewer network. Based upon the 40% reduction it is proposed for the development discharge to be unrestricted, discharging via the existing connection to MH111, please see attached FORTEM drawing 1158-002 - Proposed Drainage Network.

FOUL WATER DRAINAGE

It is proposed for foul water to connect to the existing 150mm diameter STW foul water sewer in Retford Road, via the existing private connection located within site, see attached FORTEM drawing 1158-002 - Proposed Drainage Network.

Supporting Documents:

- FORTEM drawing 1158-001 Existing Site Drainage
- FORTEM drawing 1158-002 Proposed Drainage Network
- Castle Rock Geotech: Combined Phase 1 Desk Study & Phase 2 Ground Investigation Report
- Severn Trent Existing Sewer Records

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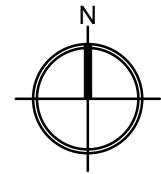


VIEW ON EXISTING BUILDING



KEY:

- DEVELOPMENT BOUNDARY
- - - ● EXISTING PUBLIC FOUL SEWER (SEVERN TRENT RECORDS)
- - - ● EXISTING PUBLIC SURFACE WATER SEWER (SEVERN TRENT RECORDS)
- - - □ MH PRIMARY PRIVATE FOUL WATER NETWORK
- - - □ MH PRIMARY PRIVATE SURFACE WATER NETWORK
- - - ● SECONDARY PRIVATE SURFACE NETWORK (ASSUMED)

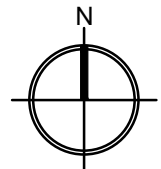


NOTES:

1. THIS DRAWING IS BASED UPON ARTREUM PROPOSED SITE LAYOUT 1017-001-02-01 REV C, HAYCOCK & TODD SITE SURVEY S9460 DATED JULY 2019, SEVERN TRENT SEWER RECORDS DATED 27.04.21 AND ORDNANCE SURVEY MAPS.
2. THIS DRAWING HAS BEEN PRODUCED FROM SEWER RECORDS AND AN INTRUSIVE SITE INSPECTION 28.04.21. THE TOTAL EXISTING IMPERMEABLE AREA MEASURES 0.240 ha.
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE FORTM DRAINAGE STATEMENT 1158-R001-V1.

Rev	Date	Amendments	By
Drawing Status: PLANNING			
FORTEM			
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Client			
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Project			
RETFORD ROAD, SOUTH LEVERTON			
Drawing Title.			
EXISTING SITE DRAINAGE			
Drawn: JH		Scale: 1:500 @ A3	
Checked: ADC		Date: MAY 2022	
Drawing No.			Rev.
1158 - 001			-

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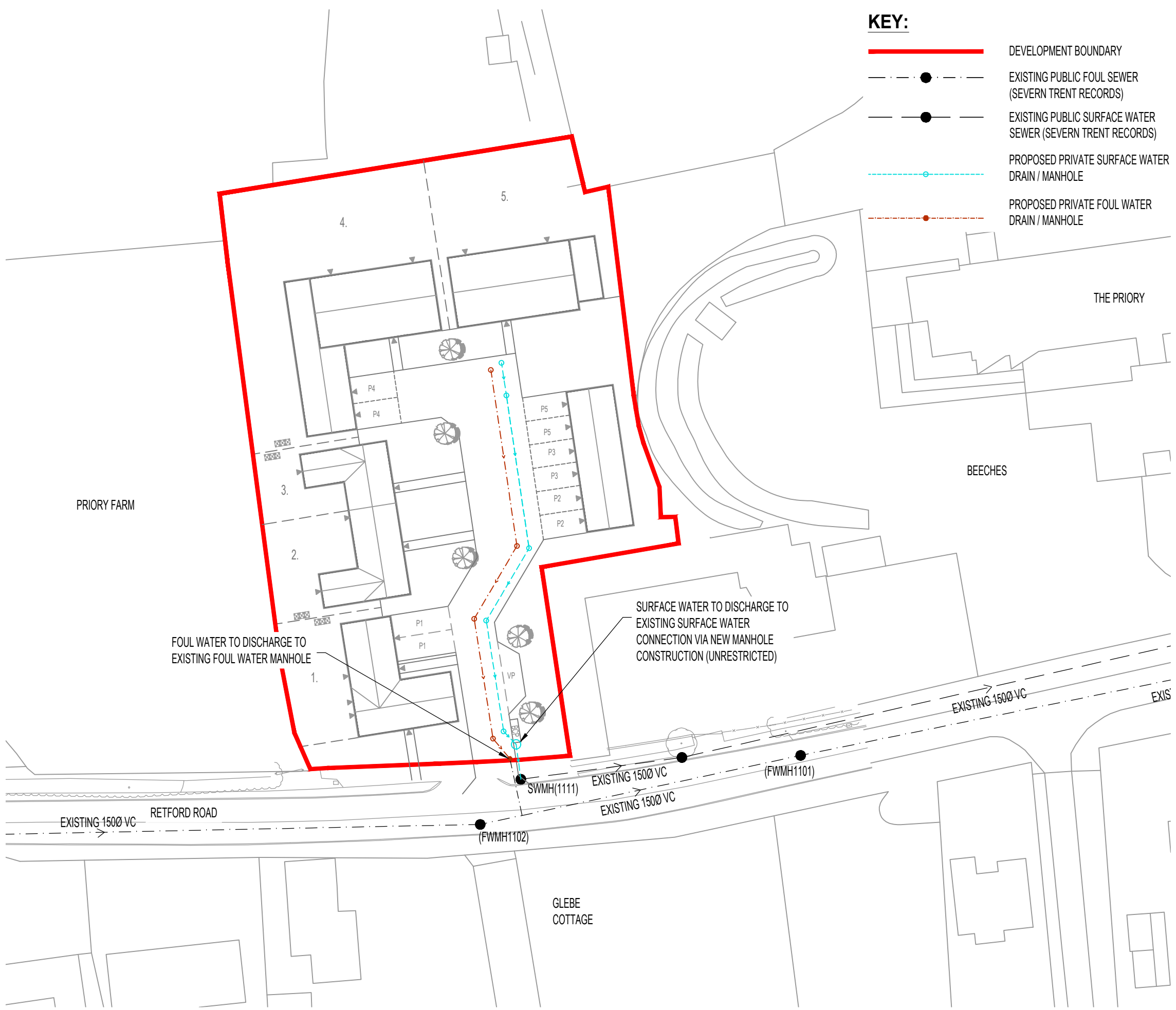


KEY:

- DEVELOPMENT BOUNDARY
- - - ● - - - EXISTING PUBLIC FOUL SEWER (SEVERN TRENT RECORDS)
- - - ● - - - EXISTING PUBLIC SURFACE WATER SEWER (SEVERN TRENT RECORDS)
- - - ○ - - - PROPOSED PRIVATE SURFACE WATER DRAIN / MANHOLE
- - - ● - - - PROPOSED PRIVATE FOUL WATER DRAIN / MANHOLE

NOTES:

1. THIS DRAWING IS BASED UPON ARTREUM PROPOSED SITE LAYOUT 1017-001-02-01 REV C, HAYCOCK & TODD SITE SURVEY S9460 DATED JULY 2019, SEVERN TRENT SEWER RECORDS DATED 27.04.21 AND ORDNANCE SURVEY MAPS.
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Rev	Date	Amendments	By

Drawing Status: **PLANNING**



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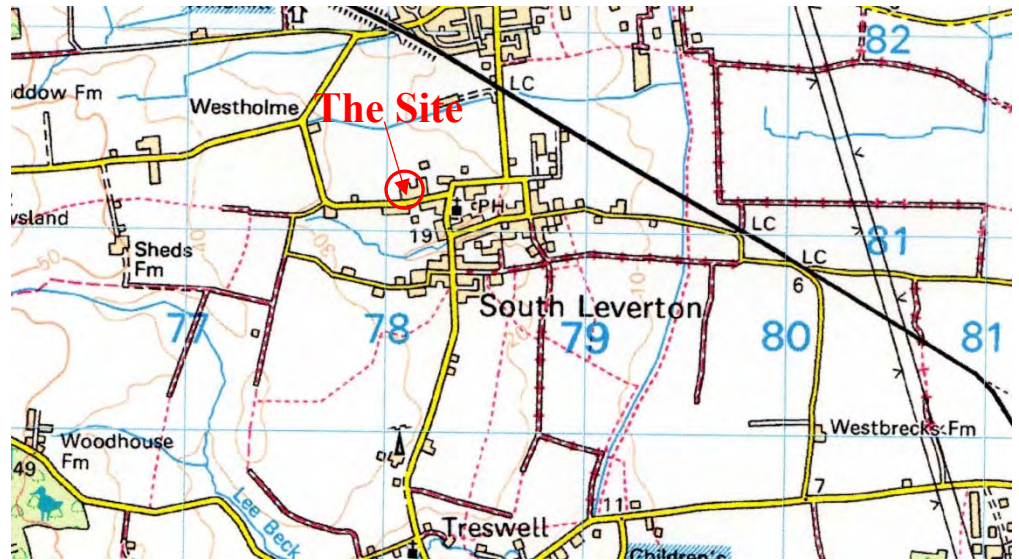
Client
RIDLEY HOMES

Project
**RET FORD ROAD,
 SOUTH LEVERTON**

Drawing Title.
PROPOSED DRAINAGE NETWORK

Drawn: JH	Scale: 1:500 @ A3
Checked: ADC	Date: MAY 2022

Drawing No.	1158 - 002	Rev.	-
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Mr & Mrs W. Tompkins

**Proposed Residential Development,
Priory Farm, Retford Road,
South Leverton, Notts.**

**Combined Phase I Desk Study &
Phase II Ground Investigation Report**



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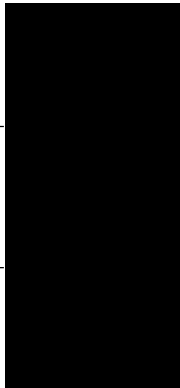
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Project Ref:	Date	Version
180401N	June 2018	Final

APPROVAL SHEET & FOREWORD

**COMBINED
PHASE I DESK STUDY & PHASE II GROUND INVESTIGATION REPORT
FOR
MR & MRS W. TOMPKINS
FOR A
PROPOSED RESIDENTIAL DEVELOPMENT,
AT
PRIORY FARM, RETFORD ROAD,
SOUTH LEVERTON,
NOTTINGHAMSHIRE**

<i>Report Status: Final</i>		Date of Issue: 19th June 2018
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FOREWORD

This report has been prepared by Castle Rock Geotech with all reasonable skill, care and diligence within the terms of the Contract with the client, and taking account of the information made available by the client, as well as the manpower and resources devoted to it by agreement with the client.

Castle Rock Geotech disclaims any responsibility to the client and others in respect of any matters outside the scope of the above Contract.

This report is confidential to the client and their assigns, and Castle Rock Geotech accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known.

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REPORT ON A COMBINED PHASE I DESK STUDY & PHASE II GROUND INVESTIGATION FOR A PROPOSED RESIDENTIAL DEVELOPMENT AT PRIORY FARM, RETFORD ROAD, SOUTH LEVERTON, NOTTINGHAMSHIRE

1.0 INTRODUCTION

1.1 Background

Castle Rock Geotech (CRG) was instructed by Nettledale Ltd (*'Project Managers'*) acting on behalf of Mr & Mrs W. Tompkins (*'Client'*) to undertake a combined Phase I desk study and Phase II ground investigation in order to enable the Local Planning Authority to discharge condition no. 14 of Bassetlaw District Council Planning Application Number: 17/01427/FU, for a proposed residential development at Priory Farm, Retford Road, South Leverton, Nottinghamshire, DN22 0BY.

1.2 Proposed Development

The proposed development comprises the demolition of an agricultural building and the construction of two detached dwellings with garages consisting of a two-storey house sited to the west of the existing access road, set central to the plot and fronting Retford Road and a bungalow sited in the north-east of the site. The location and layout of the proposed development are shown on the Nettledale Ltd *'Block Plan'* drawing, presented as **Figure 2**.

It has been assumed that site levels will not change significantly. If the above is not the case, the recommendations contained within this report may require some amendment.

1.3 Objectives

The objectives of the Phase I Desk Study included the following:

- Provide a desk-based study of the environmental setting, historical development, geology, hydrogeology, hydrology, mining and stability issues; and
- Assess the presence and likely extent of any potential environmental hazards associated with the historical land uses on the site and in the surrounding area;
- Development of a Preliminary Conceptual site Model (PSCM).

The objectives of the intrusive Phase II Ground Investigation included the following:

- Provide an assessment of any ground contamination and ground gas conditions in order to identify issues potentially affecting site development;
- Ascertain the sequence and engineering properties of the substrate in order to determine suitable methods of design and construction for foundations, surface slabs and drainage.

This report was prepared solely for the use of Mr & Mrs W. Tompkins, Nettledale Ltd, their clients and appointees. No responsibility will be accepted where this report, either in its entirety or in part, is used by a third party, or for any development other than that described here.

Whilst this report may express an opinion on the possible configuration of strata and contaminants between or beyond exploratory hole positions or on the possible presence of features based on visual, verbal or published evidence, this is for guidance only, and no liability can be accepted for its accuracy.

1.4 Scope of Works

The scope of the Phase I Desk Study included the following:

- Review of historical mapping to ascertain historical land use of the site and surrounding area, paying particular attention to the potential for contamination;
- Review of published geology, hydrogeology, hydrology, coal mining, mining, radon gas data and stability issues pertaining to the site and surrounding area;
- Review of Groundsure Geo Insight and Enviro Insight Reports;
- Development of a Preliminary Conceptual Site Model (PSCM) identifying potential sources of contamination, sensitive receptors and plausible pathways linking the two; and

The site works were undertaken on the 19th April 2018 and the scope of the intrusive Phase II Ground Investigation works comprised of the following:

- Seven windowless sampler boreholes advanced to a maximum refusal depth of 2.45m below existing ground level (begl) in order to investigate the ground and groundwater conditions underlying the proposed development site;
- Standard Penetration Tests (SPTs) in order to determine soil / rock strength;
- Installation of standpipes in three of the boreholes for subsequent ground gas / groundwater level monitoring;
- Two windowless sampler boreholes, both advanced to a maximum depth of 2.00m below existing ground level and including the installation of temporary standpipes in each of the boreholes for subsequent falling head / infiltration testing;
- In-situ testing and soil sampling for environmental and geotechnical laboratory testing;
- Logging and description of soil / rock samples.

Subsequent laboratory testing and site monitoring comprised:

- Chemical contamination (screening) analysis – 9 no. soil samples;
- Atterberg Limit determinations – 5 no. soil samples;
- Water soluble sulphate and pH tests – 14 no. soil samples;
- Ground gas / groundwater level monitoring – 4 no. visits.

This report contains the results of desk study research, details of the site, fieldwork and laboratory testing undertaken. The strata encountered are described and an interpretative geo-environmental assessment of the ground conditions is made with respect to the proposed residential development at Priory Farm, South Leverton.

1.5 Sources of Information

The following sources of information have been consulted as part of the desk study for the site.

- A site walk-over;
- A series of County Series and Ordnance Survey Maps; dated 1885 to 2014;
- A Groundsure Geo Insight Report (Ref: HMD-4866251);
- A Groundsure Enviro Insight Report (Ref: HMD-4866250);
- British Geological Survey (BGS) maps and publications for the site including 1:50,000 Series Sheet 101, 'East Retford' (Solid & Drift Edition), dated 1998;
- Geological Survey of Great Britain: *Geology of the country around East Retford, Worksop and Gainsborough: Explanation of one-inch geological sheet 101*, dated 1973;
- British Geological Survey Website – www.bgs.ac.uk;
- The Coal Authority and The Law Society publication 'Coal Mining and Brine Subsidence Searches – Directory and Guidance', Sixth Edition (2006);
- The Coal Authority Interactive map viewer – www.mapapps2.bgs.ac.uk/coalauthority;
- BRE Report BR211 'Radon: guidance on protective measures for new dwellings', (2007);
- Bassetlaw District Council Planning Portal Website – www.bassetlaw.gov.uk/online-applications.

1.6 Limitations of the Study

The findings and opinions provided in this document are made in good faith and are based on data provided by third parties (Groundsure, the Environment Agency, the Coal Authority and Regulatory Bodies) and the report / intrusive investigation was undertaken in accordance with the conditions described for 'Phase I Desk Study & Phase II Ground Investigation' in the attached Notes on Limitations (**Appendix X**).

The accuracy of map extracts cannot be guaranteed and it should be recognised that different conditions on and adjacent to the site may have existed between and subsequent to the various map surveys.

2.0 SITE LOCATION AND DESCRIPTION

2.1 Site Location

The site, which is irregular in plan area, is located on the northern side of Retford Road, towards the western margin of the village, approximately 7.5kms to the east of Retford town centre. The development site is centred upon approximate Ordnance Survey Grid Reference ⁴78103E, ³81181N, as shown on the Site Location Plans presented as **Figure 1**.

2.2 Site Description

The proposed development site currently comprises mainly hardcore surfaced hardstanding areas around a steel framed, steel clad agricultural building, which will eventually be demolished as part of the proposed development. Certain areas comprise asphalt or asphalt scrapings at surface and the apron to the agricultural building is of concrete. The internal slab to the agricultural building is also constructed of concrete. The site falls gently in elevation from north to south and the centre of the site is at an elevation of approximately 34.5m above OD.

Within the site, various stockpiles of concrete rubble and asphalt scrapings were noted, together with both wooden and concrete railway sleepers and various building materials. A secure plant storage area is present to the west of the agricultural building. The building itself was largely empty at the time of the site visit, being used for the storage of a 4WD dumper, some building materials, office furniture and bicycles.

The southern site boundary to Retford Road is open with residential properties lying on the opposite side of the road. The western boundary comprises mainly of a hawthorn hedge with agricultural fields beyond. The northern site boundary is mainly marked by a barn which opens out on to the development site, with a wood panel fence to the east. The eastern site boundary comprises a crescent shaped steel fence in the north with mature trees and a Nursing Home beyond and the brick walls to Priory Farm itself in the south.

The existing site layout is shown on the '*Block Plan*' drawing presented as **Figure 2**.

Photographs / plates (Plates 1 to 9 inclusive) of the site area and immediate environs are presented in **Appendix IX**.

A summary of the surrounding land use is presented in **Table 1** below:

TABLE 1: SURROUNDING LAND USE		
<i>Direction</i>	<i>Adjacent</i>	<i>Nearby</i>
North	Agricultural barn	Agricultural fields
East	Nursing Home	Agricultural fields and Church Street
South	Retford Road	Residential properties
West	Agricultural field	Agricultural fields

3.0 SITE HISTORY

3.1 Ordnance Survey Plans 1884 to 2014

A series of County Series and Ordnance Survey historical maps dating from 1884 to 2014, which are listed and presented in **Appendix I** of this report, have been examined in order to provide an indication of the land use history of the site and its environs. A summary of the site history is tabulated in **Table 2** below:

TABLE 2: SUMMARY OF SITE HISTORY		
Date	Features on the Site	Features Surrounding the Site
1884 - 1886	<ul style="list-style-type: none"> The site forms the southern part of an irregularly shaped agricultural field which extends to the north and is approximately 2.5 acres in plan area. Retford Road lies beyond the southern boundary of the site and a footpath runs from Retford Road across the south-eastern corner of the site to the north of Priory Farm. A number of mature trees are located within the north-western part of the site and along the western boundary. 	<ul style="list-style-type: none"> Priory Farm is located directly to the south-east of the site and a number of structures arranged around a courtyard are present to the east of the site, which are later identified as 'The Priory'. The village centre, including All Saints Church is present some 200m to the east of the study site. Mainly open agricultural fields are present in the wider site environs to the north, west and south of the site. The Manchester, Sheffield & Lincolnshire Railway (subsequently the Great Central Railway and the L.N.E.R) is shown approximately 600m to the north-east of the site, with a Station present at its nearest point. Station Lane (later Station Road) leads from the Station to the village.
1899 - 1977	<ul style="list-style-type: none"> The site appears to be within its present-day boundaries and the eastern boundary of the site is in place including the crescent shaped feature. The footpath from Retford Road has been re-aligned to run through the eastern side of the site. Various small buildings, one of them fronting on to Retford Road, are shown within the site area on the 1921 and subsequent map editions, suggesting the site area may be in use as a farm yard, given the proximity of the adjacent farm buildings. The trees in the north-west of the site have been removed 	<ul style="list-style-type: none"> Some 'ribbon' residential development is shown along the southern side of Retford Road on the 1951 and subsequent map editions.
1989 - 2014	<ul style="list-style-type: none"> The buildings formerly present on the site appear to have been cleared on the 1989 and 1994 map editions and two new structures comprising a large agricultural building in the centre of the site and a smaller building to the south, are present on the 2002 map edition. The smaller building to the south is absent on the subsequent map editions. 	<ul style="list-style-type: none"> A small structure is present in the field to the north of the site directly adjacent to the northern boundary of the study site. To the east of the site the layout of 'The Priory' is extended. A School is identified in the village, some 300m to the north-east of the site.

3.2 Historical Map Review Summary

The historical mapping indicates that the site comprised part of a field adjacent to Priory Farm, which included two small buildings throughout much of the 20th century, prior to development of the existing structure on the site. The present-day site boundaries appear to have been in place since the late 19th century.

Mainly open fields were present in the wider site environs to the north, south and west of the site. The village centre lies some 300m to the east of the site and residential and other development is shown between the site and the village over the mapping period.

It is considered that the historical agricultural use of the site throughout the mapping period as a farm yard may have impacted significantly upon the environmental quality of the site. The mainly agricultural and residential land use in the wider site environs over the mapping period are considered unlikely to have influenced its environmental quality.

4.0 GEOLOGICAL SETTING

4.1 Geology and Hydrogeology

Geology

Artificial / Made Ground

The available geological mapping indicates there are no records of Artificial / Made Ground on site or in the immediate vicinity of the site.

Superficial Deposits

The available geological mapping and the BGS website also indicate there are no records of Superficial or Drift deposits on site.

Solid

The site is mapped as being directly underlain by bedrock of the Mercia Mudstone Group (MMG) of Triassic Age. The MMG is described as typically comprising of ‘*mudstone, red-brown, with subordinate dolomitic siltstone and fine-grained sandstone, greenish grey, common gypsum veins and nodules*’. The MMG weathers to produce interbedded clays, silts and sands.

Faults

There are no faults identified on the geological mapping or by the Groundsure Geo Insight report beneath, or in the immediate vicinity of the site.

Hydrogeology

A review of the Groundsure Enviro Insight Report presented in **Appendix III**, has revealed the following information with respect to the hydrogeology and hydrological assessment of the site:

Aquifer within Bedrock Deposits

The Mercia Mudstone Group bedrock is classified as a Secondary B Aquifer. Secondary B Aquifers are described as ‘*predominately lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. They are generally the water bearing parts of the former non-aquifers*’

4.2 Hydrology

No surface water features are identified within 250m of the site. The nearest surface water feature is a tributary of the River Trent which is located 254m to the south-west of the site at its nearest point.

The Groundsure Enviro Insight Report indicates that the site is not located within an Environment Agency Flood Zone.

The risk of flooding from Rivers and the Sea (RoFRoS) is recorded in the Groundsure Enviro Insight Report as ‘**Very Low**’.

The site is designated by the BGS as being a ‘**Not Prone**’ to groundwater flooding (see notes of Section 7.8 of the Groundsure Enviro Insight Report, presented in **Appendix III**).

4.3 Coal Mining

South Leverton (Nottinghamshire) is not listed as an area requiring the commission of a Coal Mining Report in accordance with The Coal Authority and The Law Society publication ‘*Coal Mining and Brine Subsidence Claim Searches – Directory and Guidance*’ Sixth Edition (2006).

Reference to the Groundsure Geo Insight Report (**Appendix II**) indicates that the study site is not located within the specified search distance of an identified mining area.

Reference to the Coal Authority Interactive map viewer does not identify the site as lying within a ‘*Development High Risk*’ area.

4.4 Ground Workings, Mining, Extraction and Natural Cavities

The Groundsure Geo Insight Report indicates that no historical surface ground working features or current ground workings are identified on site. A single current ground working feature is located 343m to the south-west of the site. This relates to a sandstone quarry, the status of which is described as ‘ceased’.

The site is not located within a Coal Mining area (see Section 4.3, above). The site is not located in an area subject to non-coal mining activity, natural cavities or brine extraction. The site is not located with 1km of a gypsum extraction area.

It is considered that the risk with respect to subsidence relating to mining activities is negligible.

4.5 Natural Ground Subsidence

Geotechnical Data presented within the Groundsure Geo Insight Report identifies the following ground conditions / stability issues. The National Ground Subsidence rating is obtained through six natural ground stability hazard datasets, which are supplied by the 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 presented in **Table 3** below:

TABLE 3: NATURAL GROUND SUBSIDENCE		
<i>Natural Ground Subsidence</i>	<i>Hazard Rating</i>	<i>Details / Comments</i>
Shrink – Swell Clays	Very Low	Ground conditions predominantly low plasticity.
Landslides	Very Low	Slope instability problems are unlikely to be present.
Ground Dissolution of Soluble Rocks	Negligible	Soluble rocks are present but are unlikely to cause problems except under exceptional conditions.
Compressible Deposits	Negligible	No indicators for compressible deposits identified.
Collapsible Deposits	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present.
Running Sand	Negligible	No indicators for running sand identified.

4.6 Radon Gas

In order to establish whether radon precautions will be required in new properties at the site, reference was made to the Building Research Establishment (BRE) Report BR211 titled 'Radon: Guidance on protective measures for new dwellings', 2007. BR211 provides a framework to determine whether radon protective measures should be afforded to dwellings, as follows:

- Annex A: Maps of areas where basic or full protection should be provided.

Annex A indicates the site is not located within an area where basic or full radon protective measures are required as a minimum level of protection, therefore radon protection measures are not considered necessary. This is also confirmed in the Groundsure Geo Insight Report.

5.0 ENVIRONMENTAL SETTING

5.1 General

A review has been made of all regulatory and environmental data recorded for the site and over a 2km radius from the site centre in order to assess the environmental sensitivity of the site and identify any land uses and risks associated with the site and the surrounding area.

Information was principally sourced from a Groundsure Enviro Insight Report, a copy of which is included as **Appendix III**.

5.2 Historical Industrial Sites

- No potentially contaminative land uses are recorded within 250m of the site. A total of 10 no. potentially contaminative past land uses are recorded within a 251 to 500m radius of the site. The nearest 2 no. records within 251m to 500m refer to 'Smithies' 264m and 286m to the south-east of the site. The remaining entries refer to 'Unspecified Pits' and further 'Smithies' all located >300m from the site.
- There are 5 no. records of potentially infilled land within a 251 to 500m radius, all refer to the 'Unspecified Pits', which are recorded as being 330m to 334m to the south-west of the site and therefore, presumably relate to the same feature.
- There are 4 no. records of historic 'Garage' and 'Motor Vehicle Repair' sites. These are all located 348m to 349m to the east of the site and therefore, presumably relate to the same site. No records exist of historic petrol stations and fuel sites within 500m of the site.

The above features are considered unlikely to have had any impact on the environmental quality of the site, due to their nature and distance from the study site.

5.3 Water Abstraction Licences and Discharge Consents

- There are no groundwater or surface water abstractions recorded within 1km of the site.
- There are 2 no. license records for surface water abstractions 1km to 1.5km from the site.
- There are no records of licensed discharge consents recorded within 500m of the site.
- There are no potable water abstractions within 2km of the site.

5.4 Groundwater Vulnerability

- The underlying Mercia Mudstone Group bedrock is classified as a Secondary B Aquifer.
- The site does not lie within a Source Protection Zone (SPZ), as designated by the Environment Agency.

The Groundsure Enviro Insight Report (**Appendix III**) confirms the hydrogeology of the site and immediate environs.

5.5 Environmental Permits, Incidents and Registers

- There are no records of Environmental Permits, Incidents or Registers within a 500m radius of the site, with the exception of a single Part A (2) and Part B Activities and Enforcements identified 363m to the east of the site relating to a 'Waste Oil Burner'.
- There are no records of a Licensed Discharge Consent within 500m of the site (see Section 5.3 – above).

5.6 Environment Agency Recorded Pollution Incidents

- There are no records of Environment Agency Recorded pollution incidences within 500m of the site.

5.7 Landfill Sites and Waste Treatment, Transfer or Disposal Sites

- There are no records of current Environment Agency, BGS/DoE or Local Authority landfill sites within data within 500m of the site. There are no historic landfill sites listed within 1km of the site.
- There are no records of waste treatment, transfer or disposal sites within 500m of the site.

5.8 Current Land Uses

- There is one potentially contaminative land use identified within a 250m radius of the site. This relates to waste storage, processing and disposal activities at New Farm, Retford Road located 50m south-east of the site.
- A single current petrol and fuel site entry is recorded within 500m of the site. This is located 380m to the east of the site on Town Street, South Leverton.
- No records of National Grid high voltage underground electricity transmission cables or high pressure gas pipelines are identified within 500m of the site.
- There are no sites which have been determined as contaminated under Part 2A of the Environmental Protection Act 1990 within 500m of the study site.

5.9 Designated Environmentally Sensitive Sites

- There are no records of designated environmentally sensitive sites within a 1km radius of the study site.
- There are 2 no. records of Site of Special Scientific Interest (SSSI) >1000m from the site. These both refer to Ashton's Meadow 1123m and 1205m to the south of the site.
- The site is located in a DEFRA Nitrate Vulnerable Zone; however this is principally an agricultural designation and has no impact on the proposed redevelopment of the site.

5.10 Local Authority Issues

A review of the pertinent planning information available online held on Bassetlaw District Council (BDC) Planning Portal Website has been undertaken.

BDC have granted full planning permission for the proposed residential development – Application Ref. 17/01427/FUL.

5.11 Planning Enquiries

A review of the pertinent planning information available online held on BDC Planning Portal website regarding this planning application at Priory Farm, South Leverton has been undertaken.

- Available online information includes the Environmental Officers consultation response is included in the Offices Report - Planning Worksheet 11 – Delegated / PCG Report – General (dated March 2018).

The Environmental Officers made the following comments regarding Contaminated Land *‘The information currently available suggests that there has been no contaminative uses at the above site; however, there is the presence of a sensitive receptor and unknown contaminative uses could have occurred on or around that location. Therefore, I would request that the following note is included. If, during the development, land contamination not previously considered is identified, then the Local Planning Authority shall be notified immediately and no further works shall be carried out until a method statement detailing a scheme for dealing with suspect contamination has been submitted to and agreed in writing with the Local Planning Authority’.*

6.0 PRELIMINARY RISK ASSESSMENT

6.1 Introduction

The DEFRA publication '*Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance*' (dated April 2012) states the following with regards to the production of a Conceptual Site Model (CSM) for a site:

'The process of risk assessment involves understanding the risks presented by land, and the associated uncertainties. In practice, this understanding is usually developed and communicated in the form of a 'Conceptual Model'. The development of a CSM is typically undertaken in an iterative process, reflecting the changes in understanding as more detailed site information becomes available.

In developing a CSM, and specifically in the context of land contamination, consideration needs to be given to three essential elements; which form the basis of any risk present. The statutory guidance Sections 3.8 and 3.9 (April 2012) states the following with respect to Part 2A.

Historical contamination of land may present harm to human health and the environment. Current UK legislation stipulates that the risk associated with any potential land contamination is assessed and remediated, if necessary. Under the Town and Country Planning Act 1990 (as amended), potential land contamination is a "material planning consideration" together with the National Planning Policy Framework (March 2012), which means that a planning authority must consider contamination when they prepare development plans or consider individual applications for planning permission. It is the responsibility of the developer to carry out the remediation where it is required and satisfy the Local Authority that the remediation has been carried out as agreed.

'Under Part 2A, for a relevant risk to exist there needs to be one or more contaminant (source) - pathway - receptor [CPR] linkages – contaminant linkage' – by which a relevant receptor might be affected by the contaminants in question. In other words, for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters. For the purposes of this guidance:

- (a) A 'contaminant' is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters.
- (b) A 'receptor' is something that could be adversely affected by a contaminant, for example a person, an organism, and ecosystem, property, or controlled waters. The various types of receptors that are relevant under the Part 2A regime are explained in later sections.
- (c) A 'pathway' is a route by which a receptor is or might be affected by a contaminant.

The term 'contaminant linkage' means the relationship between a contaminant, a pathway and a receptor. All three elements of a contaminant linkage must exist in relation to a particular land area before the land can be considered potentially to be contaminated land under Part 2A, including evidence of the actual presence of contaminants. The term 'significant contaminant linkage', as used in this Guidance, means a contaminant linkage which gives rise to a level of risk sufficient to justify a piece of land being determined as Contaminated Land. The term 'significant contaminant' means the contaminant which forms part of a significant contaminant linkage.

6.2 Preliminary Conceptual Site Model

A preliminary conceptual model has been compiled for the site to determine the potential sources of contamination and the significance of the potential pollutant linkages. This model also informs the potential need for further investigation at the site. The following CPR assessment has been undertaken based on a residential end use for the proposed development.

A summary of the Preliminary Conceptual Site Model is presented in **Table 4** (below).

6.2.1 Potential Sources of Ground Contamination [C]

On-Site Potential Sources

The following potential **On-Site** sources of ground contamination have been identified: -

- Potential contamination such as metals, polycyclic aromatic hydrocarbons (PAHs), and asbestos associated with historical importation of Made Ground to the site from a potentially contaminated source (if present);
- Asbestos containing materials (ACMs) in the fabric of the agricultural building to be demolished;
- Potential organic and inorganic contamination from storage and leakage of fuels, lubricating oils, solvents, etc. on open soils or hardcore hardstanding;
- Potentially aggressive ground conditions in the underlying Made Ground, if present, and the underlying natural superficial deposits and bedrock strata.
- Potential generation of ground gases from both biodegradable materials/hydrocarbon contamination within any Made Ground and/or the superficial deposits underlying the site. Potential ground gases include methane (flammable and asphyxiant) and carbon dioxide (asphyxiant).

Potential Off-Site Sources

Potential **Off-Site** sources of contamination, which may have migrated onto the site from adjacent land, include the following: -

- Potential migration of mobile contaminants such as ground gases/vapours, hydrocarbon impacted soils and waters associated with the residential developments and agricultural land-use around the site.

6.2.2 Potential Migration Pathways [P]

The potential migration pathways at the site are primarily:

Human Receptors

- Direct skin contact with the contaminated soils.
- Inhalation of soil dust and vapours.
- Inhalation of asbestos fibres.
- Ingestion of drinking water in compromised supply pipes.
- Accumulation of ground gas or vapours within buildings followed by inhalation.
- Bioaccumulation in vegetables grown in gardens with subsequent ingestion.

Controlled Waters

- Leaching of soil contaminants to shallow groundwater.
- Vertical and lateral migration of contaminated shallow groundwater into the underlying Secondary B Aquifer.

Buildings

- Accumulation of ground gas within buildings, generating an explosive atmosphere.
- Direct contact between construction materials and aggressive ground conditions.

6.2.3 Potential Receptors [R]

The potential receptors at the site are:

- The construction personnel (i.e. site workers including site investigation, construction and service workers in contact with contaminated soils/dust and/or groundwater) involved with the development of the site (typically short term (acute) exposure).
- Users of neighbouring sites including residents.
- Shallow perched groundwater.
- Controlled Waters, i.e. the underlying Secondary B Aquifer.
- Nearby residential properties.
- The end users (i.e. residents - typically long term (chronic) exposure).
- Buildings / construction materials and water supply pipes.
- Flora and fauna in private garden and soft landscaped areas.

6.3 Summary

The Preliminary Conceptual Site Model (PCSM) of possible CPR pollutant linkages, applicable to the proposed residential development, is summarised in **Table 4** (below).

TABLE 4: PRELIMINARY CONCEPTUAL SITE MODEL				
Contaminant [C]	Pathway [P]	Receptor [R]	Potential Pollutant Linkage	Comments / Possible Mitigation
Potentially contaminated soils associated with the sites current and historic usage	Ingestion and dermal contact	Site / Construction Workers	Yes	<p>Construction personnel could potentially be exposed to contamination associated with the sites current / historical land use. However, this will only be possible where exposure pathway exists (e.g. during development works). ^(A)</p> <p>The chemical composition of the in-situ soils is currently unknown. Phase II ground investigation works will be required to investigate the chemical composition of the soils at the site. ^(B)</p> <p>Construction personnel to wear appropriate PPE.</p>
	Inhalation of dust / fugitive fibres	Site / Construction Workers	Yes	<p>As above ^(A) and ^(B).</p> <p>Construction personnel to wear appropriate PPE. Appropriate control measures can be implemented during construction activities (i.e. dust suppression measures) which would significantly reduce the risk of exposure to dust inhalation and also the impact on the General Public or nearby residential properties.</p> <p>Any asbestos construction materials in the existing buildings should be removed prior to demolition.</p> <p>Any identified asbestos bearing construction materials (ACMs) in Made Ground soils should be identified and treated.</p>
	Ingestion and dermal contact	End Users	Yes	<p>End users could be potentially be exposed to contamination associated with the sites current / historical land use. However, this will only be possible where exposure pathway exists (e.g. private garden and soft landscaped areas). ^(C)</p> <p>As above ^(B).</p>
	Inhalation of dust / fugitive fibres	End Users	Yes	As above ^(B) and ^(C) .
	Vertical and lateral migration / leaching of contamination	Underlying Groundwater (Controlled Waters)	Yes	The site is underlain by a Secondary B Aquifer (Mercia Mudstone Group). There is a Very Low to Low Risk to Controlled Waters although it is noted that there are no abstractions of surface or groundwater in proximity to the site. The need for a chemical assessment of the groundwater would be dependent upon the soil chemical test results and the ground conditions encountered.
	Services / foundations in contact with shallow soils	Construction Materials (including potable water supply pipes / other utilities)	Yes	<p>As above ^(B).</p> <p>Chemical testing is required to confirm the risk of sulphate/acid attack on buried concrete and risk to underground services.</p>
Ground Gases	Vertical and lateral migration	Site / Construction Workers, Buildings and End Users	Yes	Ground gas monitoring is required to assess the ground gas regime at the site and/or the requirement for provision of gas protection measures including a gas membrane.
Radon Gas	Vertical and lateral migration	Buildings & End Users	No	No radon precautions are required at the site.

6.4 Preliminary Qualitative Risk Assessment

A preliminary risk assessment has been undertaken based on the findings of the Conceptual Site Model and the potential pollutant linkages that may exist at the site in accordance with Contaminated Land Report (CLR) 11⁽¹⁾. The risk classification gives a guide and consequence of in accordance with EA R&D66 (2008)⁽²⁾ which is summarised in **Table 5** below. Professional judgement has been used to estimate the combination of probability and consequence of harm posed by the pollutant linkages identified.

TABLE 5: RISK CLASSIFICATION RATING TERMINOLOGY	
<i>Risk Rating</i>	<i>Description</i>
Very High Risk (VH)	<p>There is a high probability that severe harm could arise to a designated receptor from an identified source, or there is evidence that severe harm to a designated receptor is currently happening.</p> <p>Contaminants very likely to represent an unacceptable risk to identified targets.</p> <p>Site probably not suitable for proposed use without mitigation.</p> <p>Enforcement action possible.</p> <p>Urgent action required.</p>
High Risk (H)	<p>Harm is likely to arise to a designated receptor from an identified source.</p> <p>Contaminants likely to represent an unacceptable risk to identified targets.</p> <p>Site probably not suitable for proposed use without mitigation.</p> <p>Action required in the medium term.</p>
Moderate Risk (M)	<p>It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.</p>
Low Risk (L)	<p>It is possible that harm could arise to a designated receptor from an identified source, but it is likely that this harm, if realised, would at worst normally be mild.</p> <p>Contaminants may be present but unlikely to create unacceptable risk to identified targets.</p> <p>Site probably suitable for proposed use without mitigation.</p> <p>Action unlikely to be needed whilst site remains in current use.</p>
Very Low Risk (VL)	<p>There is a low possibility that harm could arise to a receptor. In an event of such being realised is not likely to be severe.</p> <p>If contamination sources are present they are considered to be minor in nature and extent.</p> <p>Site suitable for proposed use without mitigation.</p> <p>No further action required.</p>

⁽¹⁾ Environment Agency (2004). *Model procedures for the Management of Land Contamination*, CLR 11.

⁽²⁾ The NHBC (National House-Building Council) the Environment Agency and the Chartered Institute of Environmental Health, 2008, *Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66*

The risks to the identified receptors may be considered to range from **Low** to **Moderate Risk** for future site occupants, **Very Low** to **Low Risk** for off-site receptors and **Low** to **Moderate Risk** for construction workers.

The risks to Controlled Waters from potential contaminants within the shallow soils and groundwater are considered to be **Very Low** to **Low Risk**.

7.0 METHODS OF INVESTIGATION

7.1 General

The scope of the ground investigation was designed with reference to the published geology and anticipated ground conditions indicated by preliminary desk study information together with the available details of the proposed residential development.

Fieldwork and soil / rock descriptions were carried out in general accordance with the following guidance published:

- BS 5930:2015 ‘Code of Practice for ground investigations’.

The exploratory holes were positioned at accessible locations within the development site area in order to provide adequate coverage of the development footprints. An Exploratory Hole Location Plan is presented as **Figure 3**.

The site works were carried out on 19th April 2018 under the supervision of experienced and suitably qualified Geo-Environmental Engineers from CRG. The site works are summarised in **Table 6** below.

TABLE 6: SUMMARY OF GROUND INVESTIGATION WORKS			
<i>Investigation Method</i>	<i>No. of Positions</i>	<i>Maximum Depth (m begl)</i>	<i>In-situ Testing, Monitoring Wells & Monitoring / Backfill</i>
Boreholes (windowless sampler)	9 (BH01 to BH07 ^(a) incl., SA01 & SA02 ^(b))	2.45	SPTs 3 x 50mm wells 2 x 38mm temporary wells GG & SWL 6 x arisings

(a) – Windowless Sampling Boreholes incl. SPTs (b) – Windowless Sampling Boreholes for falling head infiltration tests

GG – ground gas monitoring / SWL – standing groundwater level

The following sections describe the individual components of the fieldwork undertaken:

7.2 Clearance of Underground Services

Before any intrusive works were undertaken, the client was consulted with reference to known services.

Each proposed exploratory borehole location was also scanned using a cable avoidance tool (CAT - *Radiodetection* RD700+) in order to check for ‘live’ electricity and radio cables and hand excavated starter pits were excavated at certain locations. Simple dowsing techniques were also used in order to check for any potential sub-surface anomalies.

7.3 The Boreholes

Windowless Sampler Boreholes

Seven (7 no.) geo-environmental windowless sampler boreholes (designated BH01 to BH07 inclusive) were advanced using a track mounted 'Premier Compact 110' window sampling rig. The windowless sampler boreholes were all progressed to depths ranging between 2.40m and 2.45m and were completed when little or no further penetration was possible within the natural strata using this method of drilling. The boreholes were advanced commencing with a 101mm diameter sampler and reducing the diameter of the sampler every metre with depth.

From ground level, 1m length tube samplers (with plastic core liners) were driven into the underlying substrata. Category A and B samples were recovered (sample disturbance being influenced by the specific soils encountered).

In-Situ Testing and Sampling

Throughout the boreholes, Standard Penetration Tests (SPTs) were carried out using the open-drive shoe (S) to provide a measure of the strength of the substrate. Testing was undertaken in general accordance with BS 1377: Part 9: 1990, at nominal 1.0m intervals or when refusal of the sampling equipment occurred. Uncorrected SPT 'N'- values are shown on the borehole logs, the number of blows required to drive the cone / sampler over the final 300mm penetration being totalled to give the 'N'- value.

Representative small disturbed (D) samples were recovered from the boreholes for descriptive purposes and for environmental and geotechnical laboratory testing in accordance with accepted industry standards. Disturbed soil samples (sub-samples taken from the core liners) were recovered from the various deposits encountered and were placed in 500ml plastic tubs for detailed examination and subsequent laboratory testing. In addition, environmental samples were recovered throughout the near surface deposits and placed in 250ml glass jars in addition to the plastic tubs described above.

Environmental samples were placed in a cool box with ice packs prior to submission to a UKAS / MCERTS accredited laboratory (under Chain of Custody documentation) as promptly as possible to maintain sample integrity.

Instrumentation

On completion, 50mm diameter ground gas / groundwater level monitoring standpipes were installed in the three of the boreholes, nos. BH01, BH03 & BH04, as detailed on the borehole logs.

Descriptions and depths of the various strata encountered are included on the borehole logs presented in **Appendix IV**, together with sample depths, the results of SPTs, installation details, comments on the groundwater conditions and other relevant information.

Selected photographs / plates of the arisings from the boreholes (Plates 10 to 16 inclusive) are presented in **Appendix IX**.

7.4 Falling Head Infiltration Tests

Two windowless sampler boreholes (ref. SA01 & SA02) were advanced using the window sampling rig at 101mm outside diameter, to depths of 2.00m, in order to undertake falling head / infiltration testing.

Falling head infiltration tests were undertaken in each of the boreholes following installation of a temporary 38mm nominal diameter perforated HDPE standpipe with a gravel filter medium. Testing was carried out by adding water to each of the boreholes and monitoring its rate of percolation into the surrounding substrate. Normally this would be undertaken on three occasions in each borehole, however, the infiltration rates were non-existent, therefore, only a single fill was carried out at each position.

The records of the falling head infiltration tests are presented in **Appendix VIII** and include graphical plots. No infiltration rates could be determined using the methodology provided within BRE Digest 365 (DG365, February 2016). It should be noted that undertaking tests in boreholes is not in strict compliance with BRE Digest 365 'Soakaway Design'.

Descriptions and depths of the various strata encountered are included on the borehole logs, which are also presented in **Appendix IV**. On completion of the infiltration testing the standpipes were removed and the boreholes were backfilled with arisings.

Photographs / plates of the arisings from the boreholes (Plates 17 & 18) are presented in **Appendix IX**.

7.5 Ground Gas / Groundwater Level Monitoring

Monitoring of the installed standpipes has been carried out on four occasions over a 6 week period between the 24th April and 6th June 2018.

Readings were taken for a range of landfill gases including methane (CH₄), carbon dioxide (CO₂), oxygen (O₂), hydrogen sulphide (H₂S) and carbon monoxide (CO) using a Gas Data Ltd – GFM435 gas analyser (MCERTS approved). Atmospheric pressure and gas flow measurement rates were also recorded on each occasion.

In addition, each borehole was also screened with a PID to detect the presence of volatile organic compounds (VOC) using a MiniRAE 3000 Photo-Ionisation Detector (PID).

Groundwater levels were measured using an electronic dipmeter at the same time.

The results of the monitoring are detailed within **Appendix VII** of this report.

8.0 LABORATORY TESTING

8.1 Soil Chemical Contamination Testing

As part of the assessment for potential contamination at the site, chemical analysis was undertaken on 9 no. shallow soil samples recovered from the boreholes. The 6 no. samples of the Made Ground and 3 no. samples of the natural strata were analysed for a general suite of metals, semi-metals, inorganic and organic compounds and asbestos screening.

This analysis was carried out at the UKAS / MCERTS accredited laboratory (No. 2683) of The Environmental Laboratory (ELAB). The samples were analysed for the following determinants:

- Metals and semi-metals (arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium and zinc);
- Inorganic chemical compounds (elemental sulphur, free cyanide, hexavalent chromium, total sulphide, total cyanide and water soluble boron);
- pH value;
- Soil Organic Matter;
- Total Phenols;
- Speciated Polycyclic Aromatic Hydrocarbons (PAH);
- Speciated Total Petroleum Hydrocarbons (TPH) – CWG Method;
- BTEX – benzene, toluene, ethyl benzene, xylenes and MTBE;
- Asbestos screen (5 no. samples);
- Asbestos identification (1 sample).

The results of the soil chemical contamination testing are presented in **Appendix V**.

8.2 Geotechnical Laboratory Testing

The programme of geotechnical laboratory testing was carried out in general accordance with BS 1377 (1990) '*Method of Test for Soils for Civil Engineering Purposes*'. The tests listed below were undertaken and the results are presented in **Appendix VI**.

- | | |
|--|------------|
| • Natural moisture content | 5 samples |
| • Atterberg Limits – Plasticity Indices | 5 samples |
| • Water Soluble Sulphate (SO ₄ - 2:1 soil/water extract) and pH of soil | 14 samples |

The results of the pH and water soluble sulphate concentration analyses are included within the soil chemical contamination test results in **Appendix V**.

9.0 RESULTS OF THE INVESTIGATION

9.1 Summary of Ground Conditions

The strata encountered have been shown to be consistent with the published geological mapping. A summary of the ground conditions encountered in the boreholes is presented in **Table 7** below:

TABLE 7: SUMMARY OF GROUND CONDITIONS		
<i>Description of Strata</i>	<i>Thickness (m)</i>	<i>Depth to top of surface (m)</i>
MADE GROUND: 'Compact' sandy gravelly HARDCORE fill with ash, brick and concrete rubble, crushed aggregate, river gravel, clinker, etc and occasionally (SA02 only) with a slight hydrocarbon odour, frequently overlying reworked or undisturbed former topsoil comprising firm brown friable structureless slightly sandy very silty CLAY often with fragments of brick, stone, ash, concrete, etc.	0.30 – 0.80	G.L.
Occasionally firm generally stiff to very stiff red brown becoming brownish red occasionally mottled grey green closely fissured slightly sandy very silty medium to high strength CLAY with intact mudstone lithorelicts. Moderate to strong hydrocarbon odours noted in BH01, BH03 & BH05) (Distinctly Weathered Mercia Mudstone Group)	0.60 – 1.45	0.30 – 0.80
Extremely weak thinly bedded grey green SILTSTONE with pockets and interbeds of very stiff brownish red silty clay. (Partially Weathered Mercia Mudstone Group)	N/A Penetrated for a maximum thickness of 0.85m	1.15 – 1.95m

9.2 Made Ground

A horizon of Made Ground (Anthropogenic Ground) was encountered near surface in each of the exploratory holes extending to depths ranging between 0.30m (SA01) and 0.80m (BH03). Generally, the near surface Made Ground comprises of 'compact' sandy gravelly **HARDCORE** fill with ash, brick and concrete rubble, crushed aggregate, river gravel, clinker, etc. A slight hydrocarbon (diesel?) odour was noted in this material in borehole SA02 only.

The hardcore material frequently overlies reworked or undisturbed former topsoil comprising firm brown friable structureless slightly sandy very silty **CLAY** with fragments of brick, stone, ash, concrete, etc, when reworked.

No SPTs were carried out within the Made Ground.

9.3 Mercia Mudstone Group

Distinctly Weathered and Partially Weathered strata of the Mercia Mudstone Group, were encountered below the Made Ground deposits and were proven to the maximum depth of the investigation of 2.45m begl in BH01.

The stratum initially comprises of occasionally distinctly weathered material consisting of occasionally firm, generally stiff to very stiff red brown becoming brownish red occasionally mottled grey green closely fissured slightly sandy very silty medium to high strength CLAY with intact mudstone lithorelicts.

In three of the boreholes (BH01, BH03 & BH05) a moderate to strong hydrocarbon odour, considered likely to be diesel, was noted throughout the full depth of the distinctly weathered clay horizon.

A total of 7 no. SPTs (un-corrected) carried out wholly within the distinctly weathered clay horizon recorded 'N' values in the range 10 to 23, generally confirming the above strength descriptions.

Partially weathered strata of the Mercia Mudstone Group were encountered below the distinctly weathered material at depths of between 1.15m (SA02) and 1.95m (BH02) and were proven to the maximum depth of the investigation of 2.45m begl.

The partially weathered material generally comprises of thinly bedded grey green SILTSTONE with pockets and interbeds of very stiff brownish red silty clay.

SPTs (un-corrected) carried out in the partially weathered material recorded 'N' values of 50 and 50 blows for partial penetration (265mm to 285mm), generally confirming the above strength descriptions.

Nine (9 no.) hand shear vane tests were also undertaken within the weathered Mercia Mudstone Group deposits at depths ranging between 0.80m and 1.80m. These recorded undrained shear strengths (uncorrected) in the range 34kN/m² to 124kN/m², also generally confirming the above strength descriptions for these deposits.

9.4 Groundwater Observations

A summary of groundwater strikes encountered and subsequent observations recorded during the investigation is given in **Table 8** below.

TABLE 8: SUMMARY OF GROUNDWATER STRIKES			
<i>Location</i>	<i>Water Strikes during boring (m begl)</i>	<i>Stratum</i>	<i>Comments</i>
BH01	Not encountered	Mercia Mudstone	SWL at 0.50m 20 mins after completion
BH02	2.10	Mercia Mudstone	SWL at 0.65m 20 mins after completion
BH03	Not encountered	Mercia Mudstone	SWL at 1.50m 20 mins after completion
BH04	Not encountered	Mercia Mudstone	SWL at 1.50m 20 mins after completion
BH05	1.85	Mercia Mudstone	SWL at 0.40m 20 mins after completion
BH06	Not encountered	Mercia Mudstone	SWL at 0.85m 20 mins after completion.
BH07	Not encountered	Mercia Mudstone	SWL at 0.70m 20 mins after completion.
SA01	Not encountered	Mercia Mudstone	SWL at 1.80m on completion.
SA02	Not encountered	Mercia Mudstone	SWL at 1.20m on completion.

The comments on groundwater conditions are based on observations made at the time of the investigation.

Groundwater was not encountered during the advancement of any of the exploratory holes, with the exception of BH02 and possibly BH05, where groundwater seepages were recorded at depths of 2.10m (BH02) and 1.85m (BH05) and where a strong hydrocarbon odour and probable free product were recorded. Moderate to strong sub-artesian groundwater inflows were recorded on removal of the drilling tools from the boreholes and up to 20 minutes after completion of each of the boreholes, as detailed in **Table 8** (above) and on the individual borehole logs.

Subsequent monitoring of the wells installed in BH01, BH03 and BH04, carried out on four occasions between the 24th April and 6th June 2018 recorded groundwater at depths of between 0.50m in BH01 and 0.98m begl also in BH01.

It should be appreciated that groundwater levels are likely to fluctuate in response to seasonal, rainfall related effects and other changes.

9.5 Contamination Observations

Throughout the intrusive ground investigation, the soil arisings were examined by the Geo-Environmental Engineer for evidence of visual or olfactory evidence of volatile, mobile (e.g. hydrocarbons) or physical (e.g. suspected asbestos) of soil contamination.

A summary of all visual and/or olfactory evidence of contamination is given in **Table 9** below.

TABLE 9: VISUAL / OLFACTORY EVIDENCE OF CONTAMINATION		
<i>Location</i>	<i>Depth (m begl)</i>	<i>Comments</i>
BH01	0.70 – 1.80	Strong hydrocarbon odour (diesel), occasionally with free product on fissures
BH02	0.30 – 0.50	Pieces of black ash
BH03	0.00 – 0.50	Frequent pockets of black ash
	0.80 – 1.90	Moderate hydrocarbon odour (diesel)
BH05	0.40 – 1.85	Strong hydrocarbon odour (diesel) with some free product towards base
BH06	0.00 – 0.40	Pockets of black ash
BH07	0.00 – 0.40	Pockets of black ash
SA02	0.00 – 0.50	Slight hydrocarbon odour (diesel)

9.6 Obstructions / Structures

No underground obstructions or structures were encountered during the advancement of the boreholes other than occasional large pieces of concrete in the hardcore fill.

9.7 Chemical Contamination Laboratory Testing of Soil Samples

The results of the chemical laboratory testing undertaken on selected soil samples (see Section 8.1), have been compared, where possible, to the relevant industry guidance as detailed in the following sections.

Total Soils

In order to undertake a Generic Quantitative Risk Assessment (GQRA), CRG have adopted the Suitable for Use Levels (S4ULs) published by LQM/CIEH in their publication referenced: Nathanail, C.P., McCaffrey, C. Gillett, A.G., Ogden, R.C. and Nathanail, J.F., 2015. *'The LQM/CIEH S4ULs for Human Health Risk Assessment.'* Land Quality Press.

The LQM/CIEH S4ULs are derived from the Contaminated Land Exposure Assessment (CLEA) software produced by the Environment Agency (version 1.06 released in October 2009). The S4ULs supersede the previously published LQM/CIEH Generic Assessment Criteria (GAC), (2009).

S4ULs are based upon the concept of either 'tolerable' risk (where the relevant health criteria value is a tolerable daily intake), or 'minimal' risk (where the health criteria is an index dose). This is consistent with the previous GAC and also the Soil Guideline Values (SGVs) previously published by the Environment Agency.

S4ULs are set according to the proposed end use of the land. For the purpose of this report the results of the chemical analyses were compared against '*Residential with home-grown produce*' (*Plant uptake*) land use assessment criteria (two private garden areas proposed), assuming a conservative 1.0% Soil Organic Matter (SOM). The SOM values of the 9 no. samples tested ranged between 0.3% and 4.5%.

In the absence of a suitable S4UL values (such as lead), reference has been made to the relevant Category 4 Screening Levels – C4SL (March 2014) and based on a residential (with home-grown produce) end-use.

Soil chemical contamination results are presented in **Appendix V**.

The results of the Tier 1 GAC screening criteria assessment are summarised in **Tables 10** and **11** below:

TABLE 10: TIER 1 HUMAN HEALTH ASSESSEMENT – METALS, INORGANICS and PAH					
GENERIC ASSESSMENT CRITERIA (GAC) – RESIDENTIAL WITH HOME-GROWN PRODUCE AND (1% SOM)					
Determinant	Tier 1 GAC (mg/kg)	Concentration Range (mg/kg)	Exceedances / Number of Samples	Source	
INORGANICS					
Arsenic	37	6.2 – 18.0	0/9	LQM/CIEH S4UL	
Beryllium	1.7	<1.0 – 1.3	0/9		
Cadmium	11	<0.5	0/9		
Chromium III	910	16.3 – 64.6	0/9		
Chromium IV	6	<0.8	0/9		
Copper	2400	11.9 – 41.7	0/9		
Lead	200	6.9 – 150	0/9		C4SL
Mercury	1.2	<0.5	0/9		LQM/CIEH S4UL
Nickel	180	19.0 – 55.8	0/9		
Selenium	250	<1.0	0/9		
Vanadium	410	5.9 – 80.9	0/9		
Zinc	3700	13.7 – 165	0/9		
Other					
pH	<5	7.8 – 11.3	0/14		
Phenols	280	<6	0/9	LQM/CIEH S4UL	
Water Soluble Sulphate	2000	20 – 150	0/14	BRE (2005)	
PAH					
Naphthalene	2.3	<0.1 – 4.2	1/9	LQM/CIEH S4UL	
Acenaphthylene	170	<0.1 – 0.7	0/9		
Acenaphthene	210	<0.1 – 21.9	0/9		
Fluorene	170	<0.1 – 18.3	0/9		
Phenanthrene	95	0.3 – 221	1/9		
Anthracene	2400	<0.1 – 54.1	0/9		
Fluoranthene	280	1.7 – 300	1/9		
Pyrene	620	1.9 – 250	0/9		
Benzo(a)anthracene	7.2	<0.1 – 117	2/9		
Chrysene	15	<0.1 – 119	2/9		
Benzo(b)fluoranthene	2.6	<0.1 – 107	4/9		
Benzo(k)fluoranthene	77	<0.1 – 79	1/9		
Benzo(a)pyrene	2.2	<0.1 – 110	4/9		
Indeno(1,2,3-cd)pyrene	27	<0.1 – 61.4	1/9		
Dibenzo(a,h)anthracene	0.24	<0.1 – 14	5/9		
Benzo[g,h,i]perylene	320	<0.1 – 54.1	0/9		

TABLE 11: TIER 1 HUMAN HEALTH ASSESSEMENT – TPH and BTEX				
GENERIC ASSESSMENT CRITERIA (GAC) – RESIDENTIAL WITH HOME-GROWN PRODUCE AND (1% SOM)				
Determinant	Tier 1 GAC (mg/kg)	Concentration Range (mg/kg)	Exceedances / Number of Samples	Source
TPH				
Aliphatic >EC5-EC6	42	<0.01	0/9	LQM/CIEH S4UL
Aliphatic >EC6-EC8	100	<0.01	0/9	
Aliphatic >EC8-EC10	27	<1.0 – 120	1/9	
Aliphatic >EC10-EC12	130	<1.0 – 128	0/9	
Aliphatic >EC12-EC16	1100	<1.0 – 155	0/9	
Aliphatic >EC16-EC35	65000	<1.0 – 2724	0/9	
Aliphatic >EC35-EC44	65000	<1.0 – 1080	0/9	
Aromatic >EC5-EC7	70	<0.01	0/9	
Aromatic >EC7-EC8	130	<0.01	0/9	
Aromatic >EC8-EC10	34	<1.0 – 119	1/9	
Aromatic >EC10-EC12	74	<1.0 – 148	1/9	
Aromatic >EC12-EC16	140	<1.0 – 205	1/9	
Aromatic >EC16-EC21	260	<1.0 – 242	0/9	
Aromatic >EC21-EC35	1100	<1.0 – 4740	1/9	
Aromatic >EC35-EC44	1100	<1.0 – 1890	1/9	
BTEX				
Benzene	0.87 µg/kg	<0.01	0/9	LQM/CIEH S4UL
Toluene	130 µg/kg	<0.01	0/9	
Ethylbenzene	47 µg/kg	<0.01 – 56.5	0/9	
Xylene (assume p-xylene as precautionary)	56 µg/kg	<0.01 – 2100	0/9	

The contamination assessment for the soils at the site is summarised below.

Metals, Semi-Metals and Inorganic Compounds

Sampled materials were compliant with the adopted Tier 1 GAC screening criteria.

PAH

The PAH individual species concentrations were generally below the adopted Tier 1 screening criteria and with total PAH concentrations in the range of <0.4mg/kg to 1,530mg/kg (BH03/0.10 – 0.40m).

The following individual PAH species were present in excess of the Tier 1 GAC screening criteria:

- Naphthalene: BH03/0.10 – 0.40m.
- Phenanthrene: BH03/0.10 – 0.40m.
- Fluoranthene: BH03/0.10 – 0.40m.
- Benzo(a)anthracene: BH03/0.10 – 0.40m & BH06/0.20 – 0.40m.
- Chrysene: BH03/0.10 – 0.40m & BH06/0.20 – 0.40m.
- Benzo (b) fluoranthene: SA01/0.10 – 0.30m, BH03/0.10 – 0.40m, BH06/0.20 – 0.40m & BH07/0.10 – 0.40m.
- Benzo(k)fluoranthene: BH03/0.10 – 0.40m.
- Benzo (a) pyrene: SA01/0.10 – 0.30m, BH03/0.10 – 0.40m, BH06/0.20 – 0.40m & BH07/0.10 – 0.40m.
- Dibenzo(a,h)anthracene: SA01/0.10 – 0.30m, SA02/0.20 – 0.40m, BH03/0.10 – 0.40m, BH06/0.20 – 0.40m & BH07/0.10 – 0.40m.

Elevated PAH concentrations were associated with ‘ashy’ material in the hardcore fill Made Ground, with no elevated PAH being recorded in the underlying weathered Mercia Mudstone Group deposits.

TPH

Total petroleum hydrocarbon TPH CWG C₅ – C₄₀ aliphatic / aromatic concentrations were recorded in the range <1.0mg/kg to 10,800mg/kg, with the most elevated concentrations recorded from weathered Mercia Mudstone Group deposits. A strong hydrocarbon odour in BH01 at 0.90 – 1.00m depth (879mg/kg), and from the ashy hardcore Made Ground in BH03 at 0.10 – 0.40m. In addition, free phase hydrocarbon sheen/film was observed lining fissures in the weathered Mercia Mudstone Group deposits in BH01 between 0.70 – 1.80m bgl, and within a sandy band in the weathered Mercia Mudstone Group deposits between 0.40 – 1.85m in BH05.

There were exceedances of the TPH-CWG Tier 1 GAC screening criteria in BH01/0.90 – 1.00m for >C8-C10 Aliphatic (120mg/kg), >C8-C10 Aromatic (119mg/kg) >C10-C12 Aromatic (148mg/kg) and >C12-C16 Aromatic (205mg/kg). In borehole BH03/0.10 – 0.40m the exceedances were recorded for >C21-C35 Aromatic (4,740mg/kg) and >C35-C40 Aromatic (1,890mg/kg).

BTEX concentrations were generally below the laboratory limit of detection of 10µg/kg except for ethylbenzene and xylenes concentrations in BH01/0.90 – 1.00m of 0.0565mg/kg and 2.10mg/kg respectively. Whilst elevated, these concentrations were below the relevant adopted Tier 1 GAC screening criteria.

Asbestos

There is currently no published GAC for asbestos. Five samples were submitted to the laboratory for an asbestos presence screen.

All samples were free of asbestos with the exception of a single sample from the rubbly Made Ground at 0.10 – 0.40m at borehole location SA01 where chrysotile fibre bundles were detected with a total asbestos concentration of 0.484%. It is noted that no free asbestos fibres were detected in the soils, suggesting that while some ACM is present in the shallow Made Ground it is well bound and not releasing significant levels of free fibres.

pH

The pH values are generally near neutral to alkaline and range between between 7.8 and 11.3.

9.8 Geotechnical Testing of Soil Samples

Plasticity Index Analysis

Plasticity Index (PI) testing was undertaken on 5 no. samples recovered from the Mercia Mudstone Group deposits. The results recorded liquid limits (w_L) between 33% and 54%, plastic limits (w_P) between 15% and 21% and plasticity indices (I_P) between 18% and 31%.

The Mercia Mudstone Group clay soils present from depths ranging between 0.90m and 1.70m to be mainly high (CH) plasticity with one sample to be of low (CL) plasticity. These results classify the Mercia Mudstone Group clay soils to be of 'medium' volume change potential (as defined in the NHBC Standards, Chapter 4.2 'Building Near Trees').

Comparison of the recorded moisture content values to the Atterberg Limits indicates that the moisture content values of the fine soils do not generally identify the potential onset of desiccation.

Water Soluble Sulphate and pH

Water soluble sulphate testing has been undertaken on 6 no. samples of the near surface Made Ground and 8 no. samples of the underlying natural soils. The results indicate water soluble sulphate contents for these soils to range from <20mg/l to 150mg/l

Associated pH values recorded from the same 14 no. samples range between 7.8 and 11.3, indicating slightly alkaline to alkaline conditions to prevail across the site.

9.9 Ground Gas Monitoring Results

The results of the 4 no. ground gas and groundwater level monitoring visits carried out between 24th April and 6th June 2018 are presented in **Appendix VII** and are summarised in **Table 12** below:

TABLE 12: SUMMARY OF GAS MONITORING DATA		
<i>Parameter</i>	<i>Minimum % by volume (v/v)</i>	<i>Maximum % by volume (v/v)</i>
Methane	0.0	0.0
Carbon Dioxide	0.0	2.4
Oxygen	17.3	20.3
Flow (l/hr)	0.0	0.0

- Methane / Flammable Gas – No measurable levels of methane / flammable gas concentrations have been recorded in the monitoring wells.
- Carbon Dioxide – Steady carbon dioxide concentrations of between 0.0%v/v and 2.4%v/v have been recorded.
- Vapour (by PID) – Detectable volatile organic compound concentrations have been recorded in each of the monitoring wells. Steady concentrations in the range 2.1ppm in BH04 (6th June 2018) to 642ppm in BH01 (24th April 2018) have been recorded.
- Oxygen – Oxygen concentrations of between 17.3%v/v and 20.3%v/v have been recorded.
- Hydrogen Sulphide – No detectable hydrogen sulphide concentrations have been recorded.
- Carbon Monoxide – No detectable carbon monoxide concentrations have been recorded.
- Gas Flow – No detectable gas flow has been recorded in any of the monitoring wells at the time of the monitoring visits.
- Atmospheric Pressure – The atmospheric pressure at the time of the monitoring visits was recorded between 1011mb (falling) and 1017mb (falling). Atmospheric pressure was falling at the time of all four monitoring visits. None of the monitoring events were carried out when atmospheric pressure was <1000mb and falling, due to the prevalent high pressure conditions throughout the 6 week monitoring period
- Groundwater – Groundwater was encountered in each of the boreholes during each monitoring visit. Standing water levels were recorded at depths of between 0.50m (BH01, 24th April 2018) and 0.98m (BH01, 6th June 2018).

10.0 DISCUSSION AND RECOMMENDATIONS

10.1 General

A combined Phase I desk study and Phase II ground investigation was undertaken by CRG in order to assist with the proposed development comprising the construction of two detached dwellings with garages at the Priory Farm site at Retford Road, South Leverton, Nottinghamshire.

The purpose of the intrusive ground investigation was to produce an interpretative geo-environmental assessment of the ground conditions at the site with respect to geotechnical issues including preliminary foundation and drainage design, possible ground contamination and ground gas conditions.

10.2 Foundation Design

The near surface Made Ground is considered to be unsuitable to support the structural loadings likely to be associated with the proposed developments. Foundations should, therefore, be designed to transfer loads on to the Mercia Mudstone strata at a minimum depth of 0.90m begl, but deepened through any Made Ground encountered and keyed a minimum 0.30m into the Mercia Mudstone clay stratum.

The generally stiff clay which has been encountered across the site at envisaged foundation depths should provide suitable bearing strata for strip footings, trench fill and/or pad foundations. Foundations may be placed in the Mercia Mudstone strata, where a net allowable ground bearing pressure of 100kN/m² may be adopted at a depth of 1.00m. Loading to the above bearing capacity would result in settlements not exceeding 25mm and differential settlements of 1 in 500 for strips / trenches of maximum width 600mm. This is based on an assessment of all available data and represents a safe condition for soils encountered at the exploratory holes located below the footprint of the proposed development at the site.

For heavier structural loadings on similar foundations, the underlying extremely weak siltstone, encountered at depths of between 1.70m and 1.90m below the building footprints, may be assigned a presumed bearing value of 300kN/m².

10.3 Floor Slab Design

Given the nature of the development, the change in level across the site and the variable depth of Made Ground, suspended ground floor slabs are anticipated in general accordance with NHBC Standards. When building near recently remove or proposed trees, NHBC Standards Chapter 4.2 would also require the inclusion of heave precautions in foundation designs, in this case suspended floor slabs would also be required.

10.4 General Construction Advice

Ease of Excavation and Stability

Shallow excavations for foundations and services at this site should be readily achieved using conventional mechanical plant ('JCB 3CX' or similar). However, higher specification plant (i.e. tracked 360° and/or hydraulic breaker) may be required for deeper excavations, for drainage (for example). It is considered that generally, shallow excavations in natural soils should remain relatively stable in the short term.

Even relatively shallow excavations may be affected by groundwater and the requirement for dewatering, probably via pumping from open sumps should be anticipated. It should be noted that groundwater may be encountered at shallow depths, particularly during wetter periods of the year.

Legislation on Personnel Entry into Excavations

The requirement for support will need to be evaluated under CDM Regulations and support will be essential for any excavations in excess of 1.20m where man entry is required. All excavations should be carried out in accordance with CIRIA Report 97 '*Trenching Practice*' (2001).

10.5 Protection of Buried Concrete

The geology of the site and the ground conditions have been considered in accordance with the guidelines contained in Part 1 of BRE Special Digest 1: *Concrete in aggressive ground* (2005) and on the basis of this the site has been categorised as a 'brownfield' site.

The results of the water-soluble sulphate analyses from the natural soils at the site fall within Design Sulphate (DS) Class DS-1. The groundwater conditions at the site can be considered to be mobile and on this basis and from consideration of the pH conditions at the site, the site has been assigned an ACEC (Aggressive Chemical Environment for Concrete) Class AC-1.

10.6 Soakaways / Drainage

Given the generally 'cohesive' nature of the near surface deposits, high groundwater levels and the negligible / non-existent infiltration rates recorded from the infiltration tests, it is considered that the ground conditions encountered render the site unsuitable for the disposal of surface waters via soakaways.

10.7 Environmental Risk Assessment

Human Health Risk Assessment

The preliminary conceptual site model and environmental risk assessment in Section 6.0 of this report has been updated on the basis of the results of the Ground Investigation as follows:

Sources of Contamination [C]

The following sources of contamination have been identified on the site:

- Elevated PAH species concentrations in the ashy Made Ground in SA01, SA02, BH03, BH06 and BH07.
- Elevated TPH concentrations in the Made Ground in BH03.
- Elevated TPH concentrations and free phase hydrocarbons in the weathered Mercia Mudstone Group deposits in BH01 and free phase hydrocarbon in BH05.
- ACMs in the shallow Made Ground in SA01.

Receptors of Contamination [R]

The potential receptors of the identified contamination identified in the GI comprise:

Human Receptors

- Direct skin contact with the contaminated soils.
- Inhalation of soil dust, fugitive fibres and vapours.
- Direct ingestion of vegetables grown in contaminated soils.
- Ingestion of drinking water in compromised supply pipes.

Controlled Waters

- Leaching of soil contaminants to shallow groundwater.
- Vertical and lateral migration of contaminated shallow groundwater into the underlying Secondary B Aquifer.

Potential Receptors [R]

The potential receptors at the site are:

- The construction personnel (i.e. site workers including site investigation, construction and service workers in contact with contaminated soils/dust and/or groundwater) involved with the development of the site (typically short term (acute) exposure).
- The end users (i.e. residents - typically long term (chronic) exposure).
- Plants used in private gardens and soft landscaping.
- Controlled Waters in the underlying Secondary B Aquifer

Discussion of Pollutant Linkages and Proposed Mitigation

PAH Species in the Made Ground

Elevated PAH concentrations are present throughout the 'ashy' hardcore Made Ground beneath the site. Levels of the exceedances were significantly elevated at some locations and are thought to be representative of the quality of this Made Ground throughout the site.

These contaminants pose a potential risk to site personnel working in direct contact with the impacted materials through the pathways of direct dermal contact with impacted soils, inhalation of impacted dust and inadvertent ingestion of soil through smoking or eating after contact with impacted soil.

During the construction phase this risk can be mitigated by the use of appropriate personal protective equipment (PPE) and adherence to established best practice working methods, for example as stated in '*HSG 66 Protection of Workers and the General Public During Redevelopment of Contaminated Land*'. At a minimum this would require full protective clothing, gloves, eye protection and the restriction of eating and smoking to controlled locations away from any areas of potentially contaminated ground.

While these exposure pathways will be severed through the provision of hardcover in the form of the proposed building slabs, driveway and car parking post development, these elevated concentrations pose a potential Human Health risk through the pathways of direct contact, dust inhalation and the consumption of home grown vegetables grown in impacted soils in all areas of gardens and landscaping. As such it is recommended that the Made Ground hardcore be removed from all areas of gardens and landscaping and replaced with 'clean', uncontaminated materials. The grossly contaminated excavated materials from BH03 should be disposed of to an off-site soil treatment or disposal facility; the remaining Made Ground, subject to requirement, could be re-used beneath hardstanding (access drive and parking areas) in the final development.

Given the co-occurrence of the elevated PAH species and petroleum hydrocarbons in BH03 it is recommended that off-site disposal of the Made Ground represents the most practical option at this location.

TPH in Made Ground / Natural Strata

Elevated petroleum hydrocarbon concentrations are present in the Made Ground at BH03 and in the underlying weathered Mercia Mudstone deposits in BH01 and BH05. TPH composition is dominated by the higher chain aromatic fractions, particularly in BH03 and free phase hydrocarbon sheens have been observed in the natural strata in BH01 and BH05. In addition, elevated concentrations of ethylbenzene and xylene are also present in association with the elevated TPH in BH01.

These contaminants pose a potential risk to site personnel working in direct contact with the impacted materials through the pathways of direct dermal contact with impacted soils, inhalation of impacted dust and inadvertent ingestion of soil through smoking or eating after contact with impacted soil.

During the construction phase this risk can be mitigated by the use of appropriate personal protective equipment (PPE) and adherence to established best practice working methods, for example as stated in '*HSG 66 Protection of Workers and the General Public During Redevelopment of Contaminated Land*'. At a minimum this would require full protective clothing, gloves, eye protection and the restriction of eating and smoking to controlled locations away from any areas of potentially contaminated ground.

These elevated concentrations also pose a potential risk to site end-users post development through direct exposure pathways in areas of gardens and landscaping, as well as via the vapour inhalation pathway in enclosed spaces in the final development.

Risk to site end-users can be mitigated through excavation and off-site disposal of the gross hydrocarbon and PAH contamination in the shallow ground in BH03 and provision of a 300mm thick '*No-Dig*' contamination barrier beneath the imported clean subsoil and topsoil in all garden and landscape areas following removal of the Made Ground. This barrier would typically comprise a minimum 300mm layer of crushed and compacted stone with a warning geotextile barrier.

Risks posed by hydrocarbon vapours in enclosed spaces in the final development can be mitigated through the provision of a suitable hydrocarbon vapour proof membrane beneath all buildings in the final development.

Risk From Asbestos in Soils to Human Health

While no visible asbestos containing materials (ACMs) were observed during the ground investigation, analytical testing result confirmed the presence of chrysotile bundles with a quantification of 0.484% in the Made Ground in SA01 at one location. No free fibres were detected in the site soils, indicating that the bundles encountered were tightly bound.

The presence of such material does not preclude the on-site re-use of the Made Ground beneath area of hardstanding and associated access and parking infrastructure in the final development, or beneath the 'No-Dig' barrier as these features will sever any potential inhalation exposure pathways.

However, disturbance of the ground through excavation and processing during the construction phase has the potential to release fibres that could be inhaled by site operatives and/or neighbouring residents. Once inhaled asbestos fibres can accumulate in the lung tissue where they can result in chronic or even fatal damage such as mesothelioma and asbestosis.

As such, any works in the Made Ground on site should be undertaken by asbestos aware personnel, working under controlled conditions with active dust suppression using water bowsers and jet washers to ensure that the release of fugitive fibres is avoided. Any temporary stockpiles of Made Ground should be doused down and covered if necessary.

Notwithstanding the above, should any suspected lagging asbestos or asbestos insulation board be observed, the disturbance of such materials would need to be undertaken by licensed asbestos sub-contractor with full HSE notification.

A comprehensive asbestos survey and if necessary asbestos strip, by suitably licensed contractors must be undertaken prior to the demolition of the existing agricultural building.

Risk from Organic Concentrations in Soils to Plants in Landscaping and Gardens

There is a risk to plants used in gardens and landscaping areas in the final development from the elevated organic contaminant concentrations in the Made Ground. It is also considered that the Made Ground would not form a suitable rooting medium given its coarse texture and anthropogenic provenance.

This risk can be mitigated by the removal of all Made Ground from areas of gardens and landscaping and the provision of a suitable thickness of clean topsoil/subsoil above the underlying 'No-Dig' contamination barrier post development.

Risk from Contamination to Potable Water Supplies

Buried services, in particular plastic water pipes, may be subject to attack by chemicals such as hydrocarbons. This risk could be mitigated through a more detailed assessment of the chemical characteristics along the lines of any services to be installed and provision of this data to the utilities provider to ensure that a suitable pipe material is used.

Alternatively the use of an approved contamination resistant barrier pipe such as *Protecta-pipe* would be sufficient to mitigate any potential risk, and given the widespread distribution of elevated PAH and TPH encountered in the ground investigation, this is considered the most practical option.

Controlled Waters Risk Assessment

The ground investigation has confirmed that Made Ground is present across the site extending to depths of between 0.30 and 0.80m and that the natural underlying shallow soils / geology are 'cohesive' in nature. There are no surface or groundwater abstractions within 1km of the site and the site is not located in a Groundwater Source Protection Zone.

The Mercia Mudstone Group deposits have a high attenuation capacity as demonstrated by the limited vertical spread of contamination observed in boreholes BH01 and BH05, and there are no active sources of contamination on the site.

As such it is considered that following removal of the gross shallow contamination in BH03, the residual TPH contamination and localised free phase sheens in BH01 and BH05 are unlikely to pose a significant risk to Controlled Waters.

Based on the above there are no specific remediation requirements for the protection of Controlled Waters.

Updated Conceptual Site Model

The Preliminary Conceptual Site Model has been refined and updated based on the findings of this investigation and is summarised in **Table 13** (below).

TABLE 13: UPDATED CONCEPTUAL SITE MODEL				
Source / Medium	Receptor	Potential Exposure Route	Mitigation / Comment	Residual Risk Rating
Contaminants - PAH, TPH and asbestos within soils	Site / Construction Workers	Direct ingestion of soil & dust, inhalation of particulates & vapour, indirect ingestion by means of dermal contact	PPE and Best Practice	Low
	Site End Users		Severance of exposure pathways using hardstanding and clean soils, excavation and off-site disposal of shallow gross PAH/TPH in BH03, provision of a barrier system beneath garden and landscaping areas and re-use of remaining Made Ground materials in less sensitive location beneath hardstanding.	Very Low Risk
	Buildings & Structures	Direct contact with concrete and water supply pipes	ACEC Class AC-1 concrete design. Precautionary barrier pipe solution for water supply pipes.	Very Low Risk
	Controlled Waters	Vertical migration of contaminants	Removal of gross shallow contamination in BH03. Limited vertical migration due to high attenuation capacity in the natural clay (MMG) / low environmental sensitivity of the site.	Low Risk
	Plants & Vegetation	Direct contact with phytotoxic contaminants	Off-site disposal of gross contamination in BH03 and removal of Made Ground from all garden and landscaping areas. Provision of clean subsoil & topsoil.	Very Low Risk
Ground Gases and Vapours	Site / Construction Workers	Inhalation of gases & vapours	Gas protection measures not required. However, a hydrocarbon vapour proof membrane is required beneath the dwellings due to TPH impacted materials in the underlying Mercia Mudstone Group deposits.	Very Low Risk
	Site End Users			Very Low Risk
	Current Site Users			Very Low Risk
	Buildings & Structures	Migration of gases through the surface and via permeable soils		Very Low Risk

Discovery Strategy / Unforeseen Circumstances

In addition to the areas of contamination encountered, it is possible that further areas of contamination may be present across the site in areas between exploratory hole locations.

Should any areas of potentially contaminated soil, odorous or visible, be encountered during site construction works, which appear significantly different from those encountered during the course of this investigation, immediate consultation with CRG is recommended, to ensure that the above recommendations would still apply. Any potentially contaminated soils should be left *in-situ* and subject to further assessment, to potentially include chemical testing and environmental risk assessment.

10.8 Ground Gas Risk Assessment

The results of the ground gas monitoring have been reviewed with reference to the following documentation:

- Construction Industry Research and Information Association (CIRIA) Report C665 entitled '*Assessing Risks Posed by Hazardous Ground Gases to Buildings*', (2007).
- British Standard BS 8485 '*Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*' (2015).

CIRIA Report C665 indicates that ground gas protection measures may be necessary in new buildings on sites where methane concentrations exceed a threshold value of 1%v/v and/or where carbon dioxide concentrations exceed a threshold value of 5%v/v. The gas flow rate is also considered in the required level of protection.

Maximum methane (CH₄) and carbon dioxide (CO₂) concentrations, as percentage volume in air (%v/v), minimum oxygen (O₂) concentrations (%v/v), maximum carbon monoxide (CO) and hydrogen sulphide (H₂S) concentrations, in parts per million (ppm), and gas flow rates in litres per hour (l/hr) have been monitored in the wells during the four monitoring visits.

The results of the gas monitoring results are presented in **Appendix VII** and summarised in **Table 12** (see Section 9.9 - above).

CIRIA Report C665 recommends a risk-based methodology to ground gas assessment, which includes the calculation of a site-specific Gas Screening Value (GSV). The GSV of a particular ground gas regime equates to:

- **GSV (l/hr) = Maximum Gas Concentration/100 x Flow Rate**

The GSV should be used to assess the risks posed by gassing sites for low-rise residential dwellings, residential apartments and commercial/industrial developments.

The GSV should be calculated for both methane and carbon dioxide and the worst case adopted in order to establish the appropriate protection measures for the site. The higher the classification the greater the risk posed by the presence of ground gas. The above guidance documents note that '*...the GSV is a guidance value and not an absolute threshold*'.

The programme of ground gas monitoring undertaken to date has not identified any methane and has identified a maximum steady carbon dioxide concentration of 2.4% v/v (expressed as 0.001 as a fraction) with no measurable flow rate. The maximum carbon dioxide concentration has been selected to calculate an initial Gas Screening Value (GSV) for the site in accordance with CIRIA Report C665 and BS 8485:2015 to determine the required level of carbon dioxide and methane protection measures for the proposed future site development.

In accordance with CIRIA C665, Table 8.5 '*Modified Wilson & Card Classification*', the limit of detection of the gas monitoring instrument (0.1l/hr) should be utilised when there is no detectable flow rate.

The Gas Screening Value (GSV) for the site may be calculated as follows:

- Carbon dioxide - $0.001 \times 2.4 = 0.0024$ l/hr

It is, therefore, considered that the gas regime at the site corresponds with Modified Wilson & Card Characteristic Situation CS1 (very low risk).

However, detectable volatile organic compound concentrations have been recorded associated with TPH impacted soils within the underlying weathered Mercia Mudstone Group deposits. As such it is recommended that a precautionary hydrocarbon vapour proof membrane be provided beneath all buildings in the final development.

Radon protective measures are not required.

This assessment should be submitted to the Local Authority Environmental Health Officer (EHO) for comment and approval.

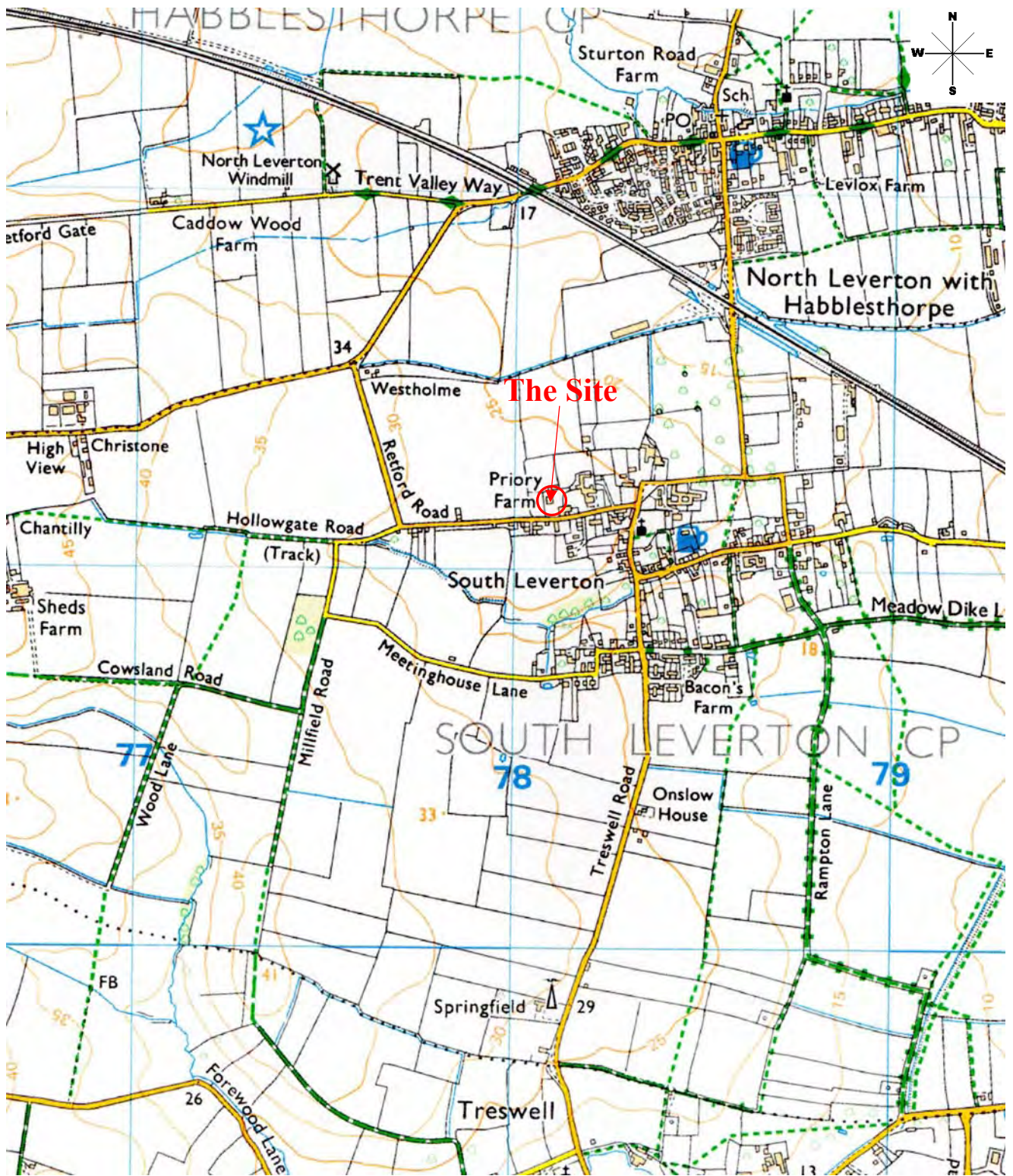
10.9 Further Works

The following further works are considered to be necessary at the site based on the findings of this report:-

- Issue a copy of this report to the Local Planning Authority (Bassetlaw District Council) for review/comment and approval (CRG assume this will be undertaken by the Client);
- Compilation of a Remediation Strategy based on the findings of the investigation.

FIGURE 1

Site Location Plans



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Tel / fax: 0115 9799228
Tel: 0115 9827060
Email: enquiry@crgeo.co.uk
www.crgeo.co.uk



Project: LAND AT PRIORY FARM,
RET FORD ROAD, SOUTH LEVERTON,
NOTTS.

Title: SITE LOCATION PLAN

Project No. 180401N

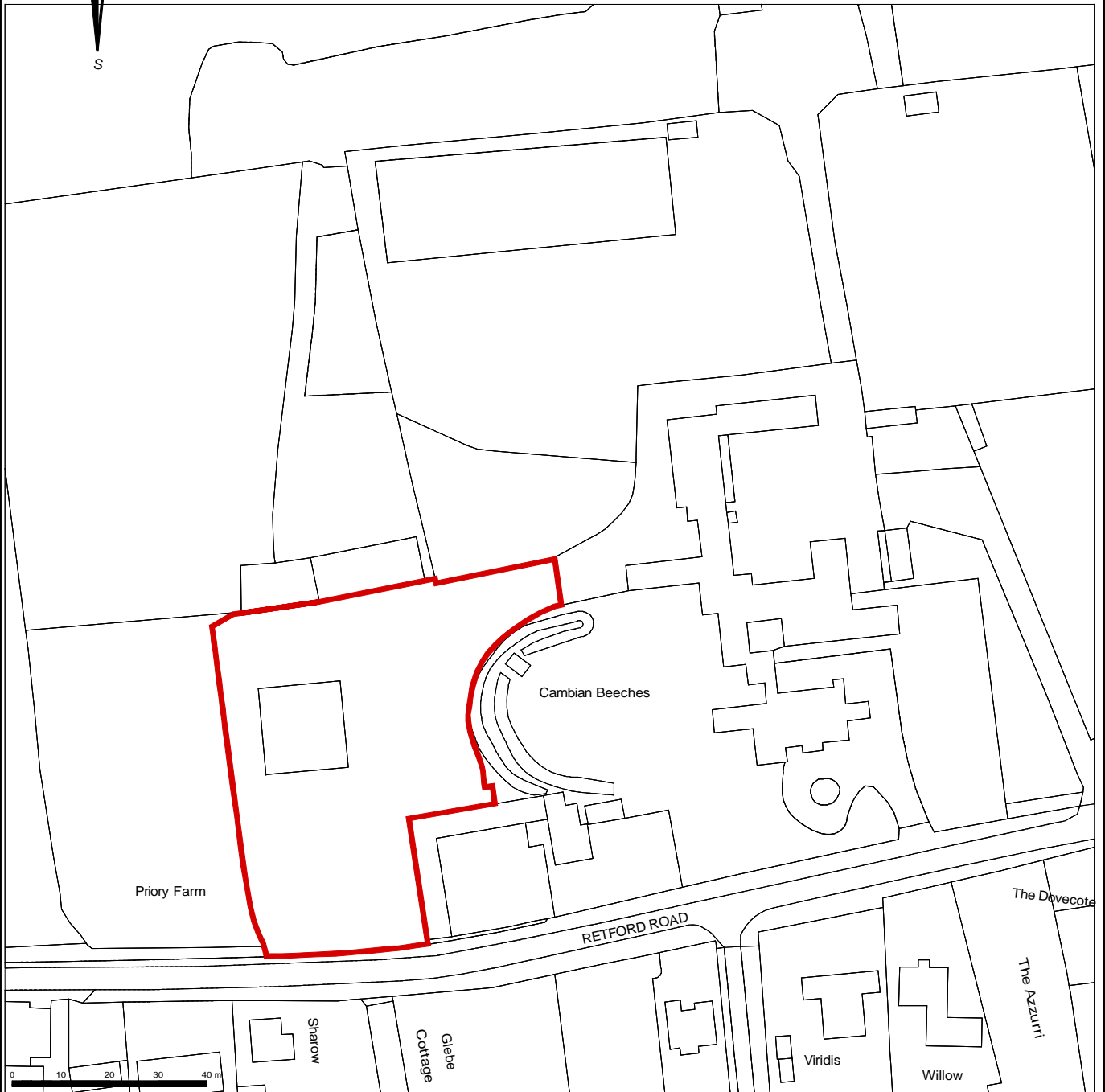
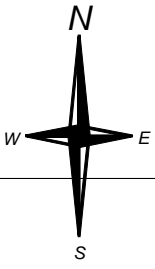
Date: April 2018

Scale: NTS

Figure 1 (1)

Client: Mr & Mrs. W. Tompkins

LOCATION PLAN



20 METRES

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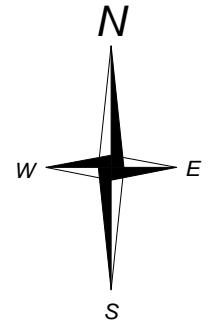
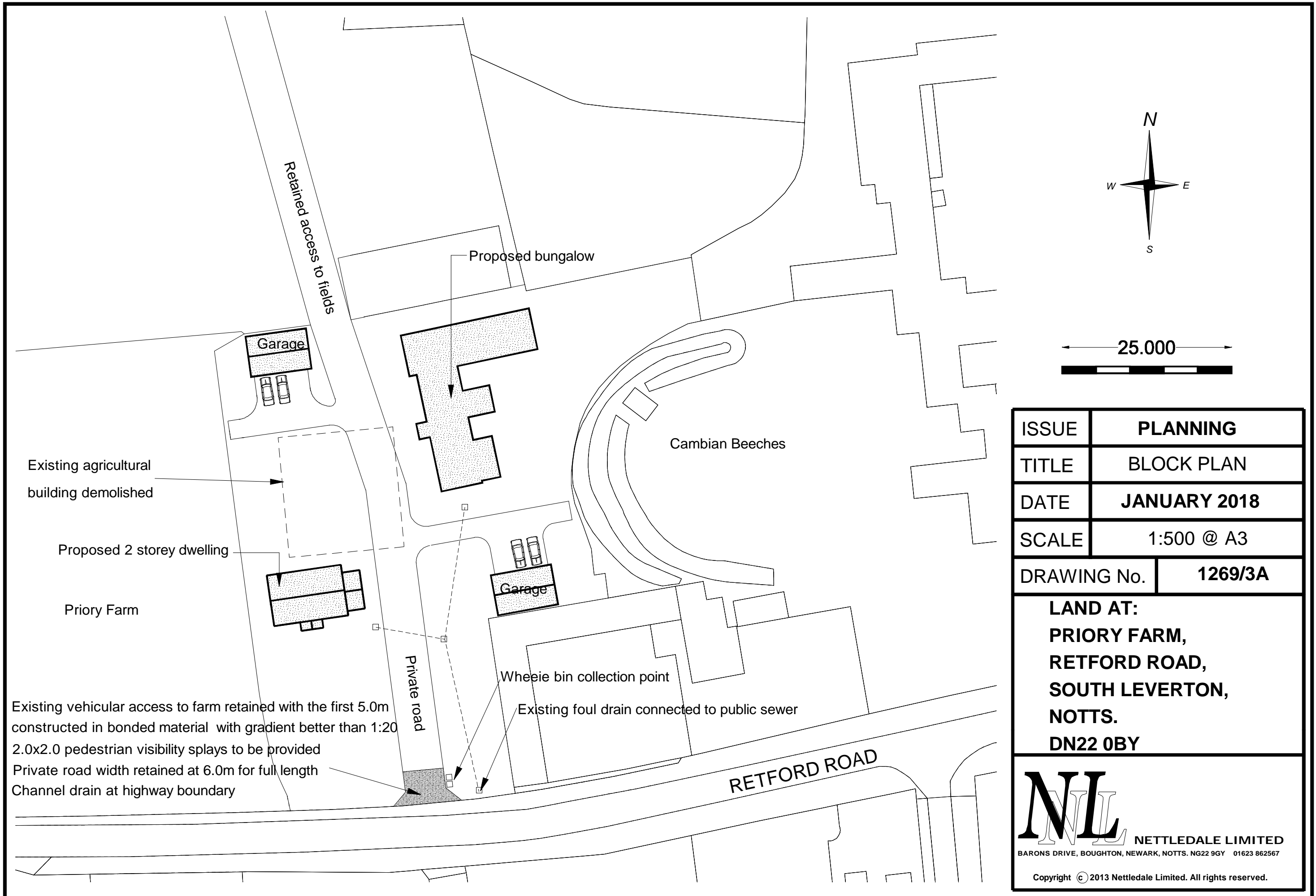
SCALE 1:1250	DRAWING No. 1269/4	DATE OCTOBER 2017
 NETTLEDALE LIMITED BARONS DRIVE, BOUGHTON, NEWARK, NOTTS. NG22 9GY 01623 862567		LAND AT: PRIORY FARM, RETFORD ROAD, SOUTH LEVERTON, NOTTS. DN22 0BY

FIGURE 2

Block Plan



ISSUE	PLANNING
TITLE	BLOCK PLAN
DATE	JANUARY 2018
SCALE	1:500 @ A3
DRAWING No.	1269/3A

**LAND AT:
PRIORY FARM,
RETFORD ROAD,
SOUTH LEVERTON,
NOTTS.
DN22 0BY**

NL NETTLEDALE LIMITED
BARONS DRIVE, BOUGHTON, NEWARK, NOTTS. NG22 9GY 01623 862567

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Existing agricultural building demolished

Proposed 2 storey dwelling

Priory Farm

Existing vehicular access to farm retained with the first 5.0m constructed in bonded material with gradient better than 1:20
 2.0x2.0 pedestrian visibility splays to be provided
 Private road width retained at 6.0m for full length
 Channel drain at highway boundary

Retained access to fields

Proposed bungalow

Garage

Garage

Cambian Beeches

Private road

Wheelie bin collection point

Existing foul drain connected to public sewer

RETFORD ROAD

FIGURE 3

Exploratory Hole Location Plan



Key: BH / SA – Borehole 

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 NOTTS.**

Title: EXPLORATORY HOLE LOCATION PLAN

Project No. 180401N
Date: April 2018

Scale: NTS
Figure 3

Client: Mr & Mrs W. Tompkins

APPENDIX I

Historical County Series & Ordnance Survey Mapping

Site Details:

NEW STUD FARM, RETFORD ROAD, SOUTH LEVERTON, DN22 0BY

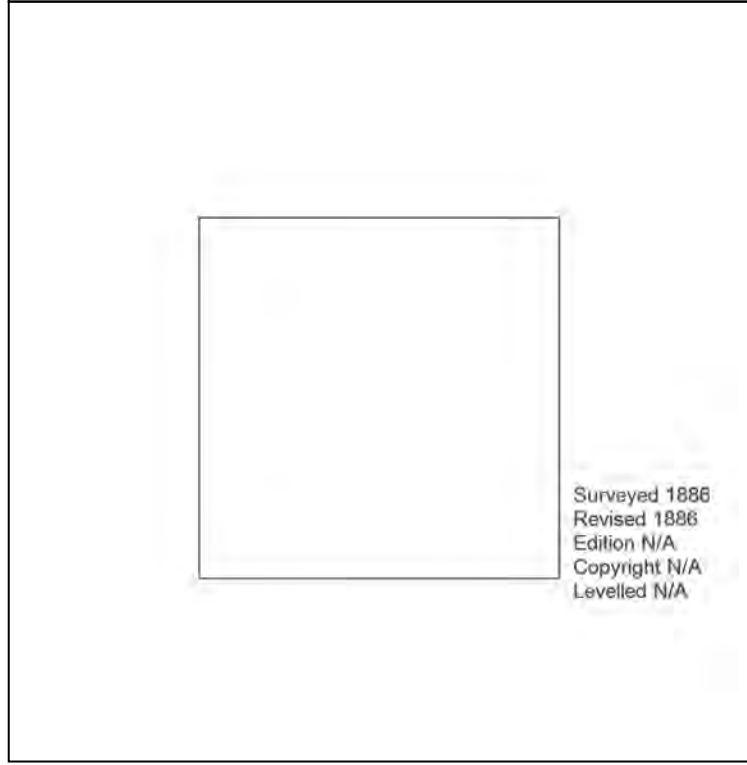
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 Report Ref: HMD-4866252
 Grid Ref: 478112, 381178

Map Name: County Series

Map date: 1886

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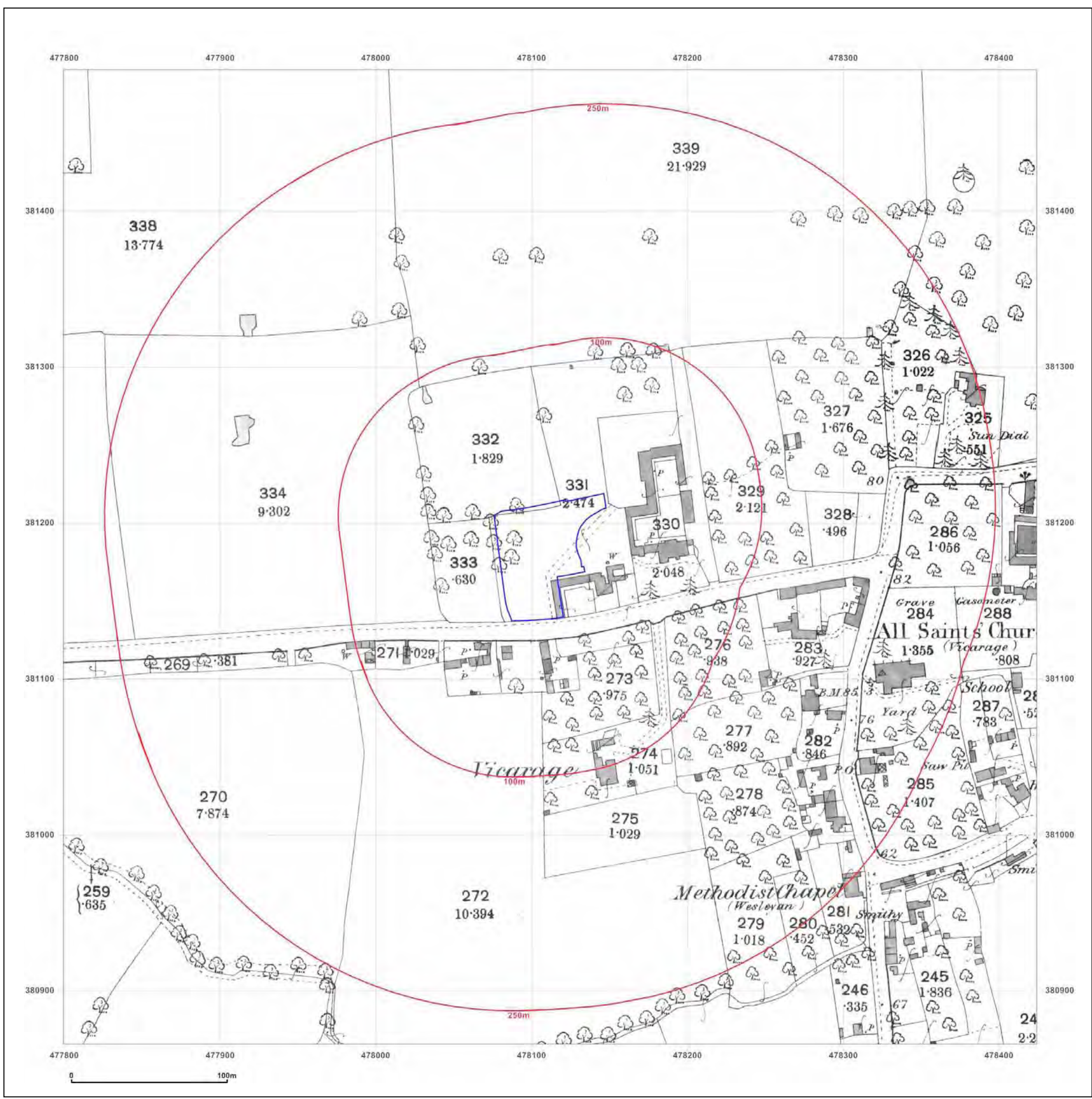


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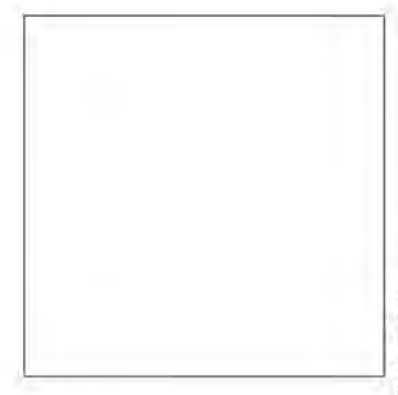
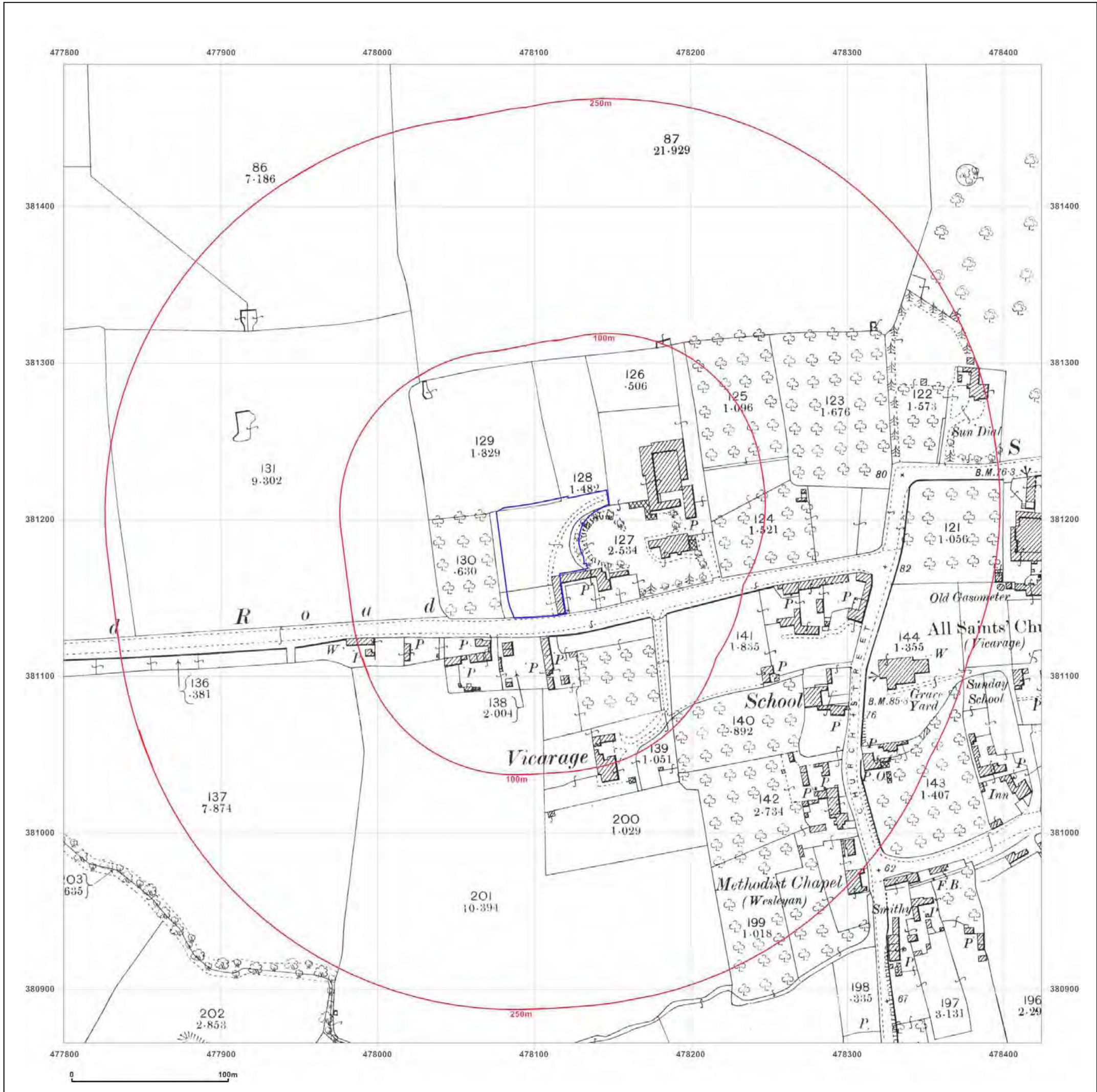
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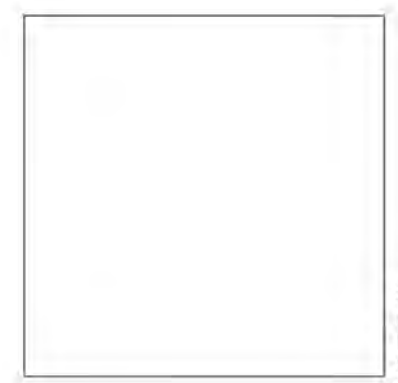
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Map Name: County Series

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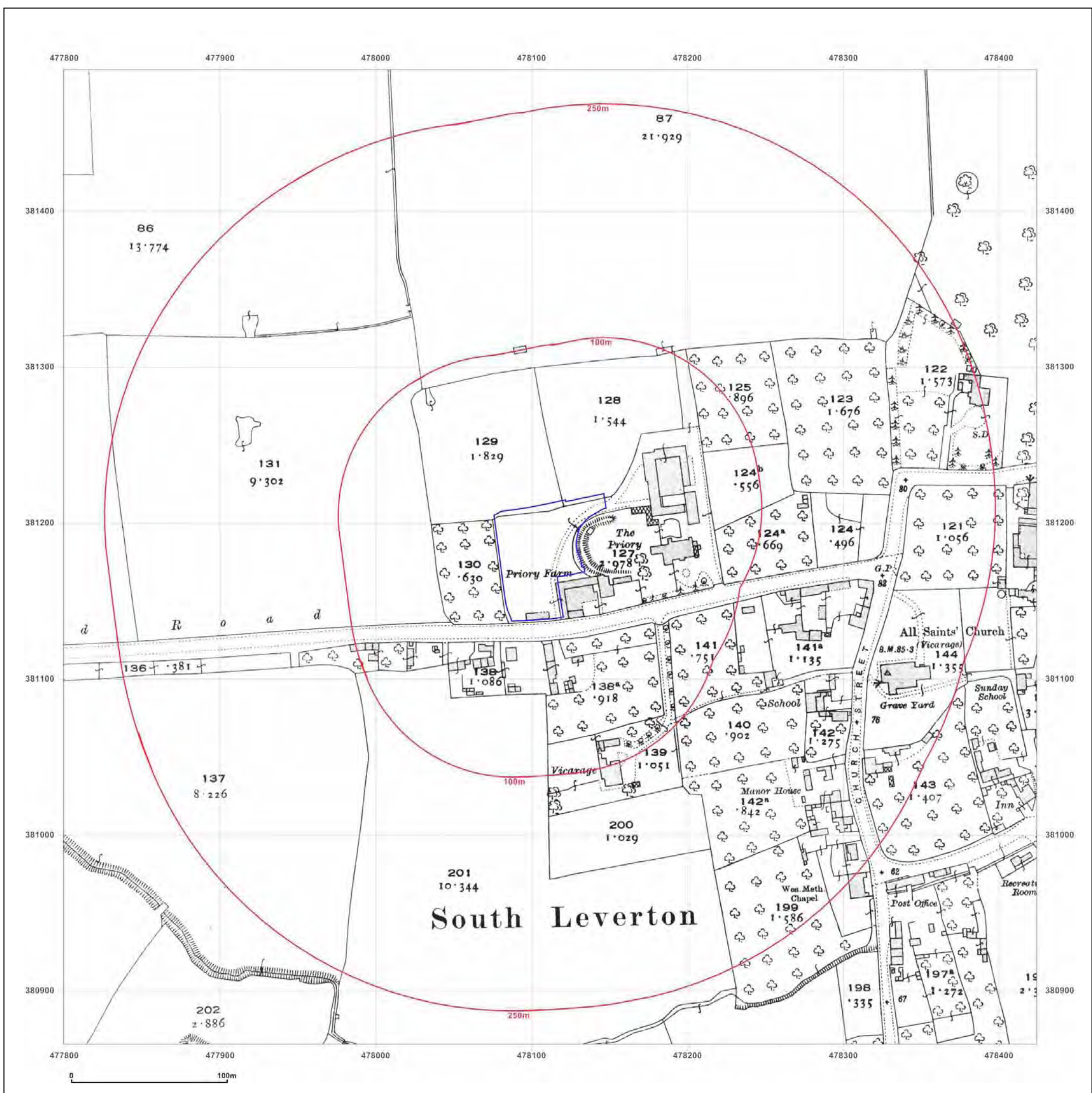


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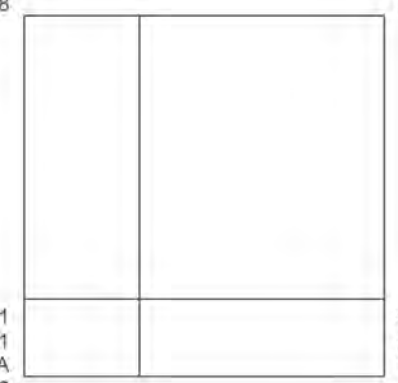
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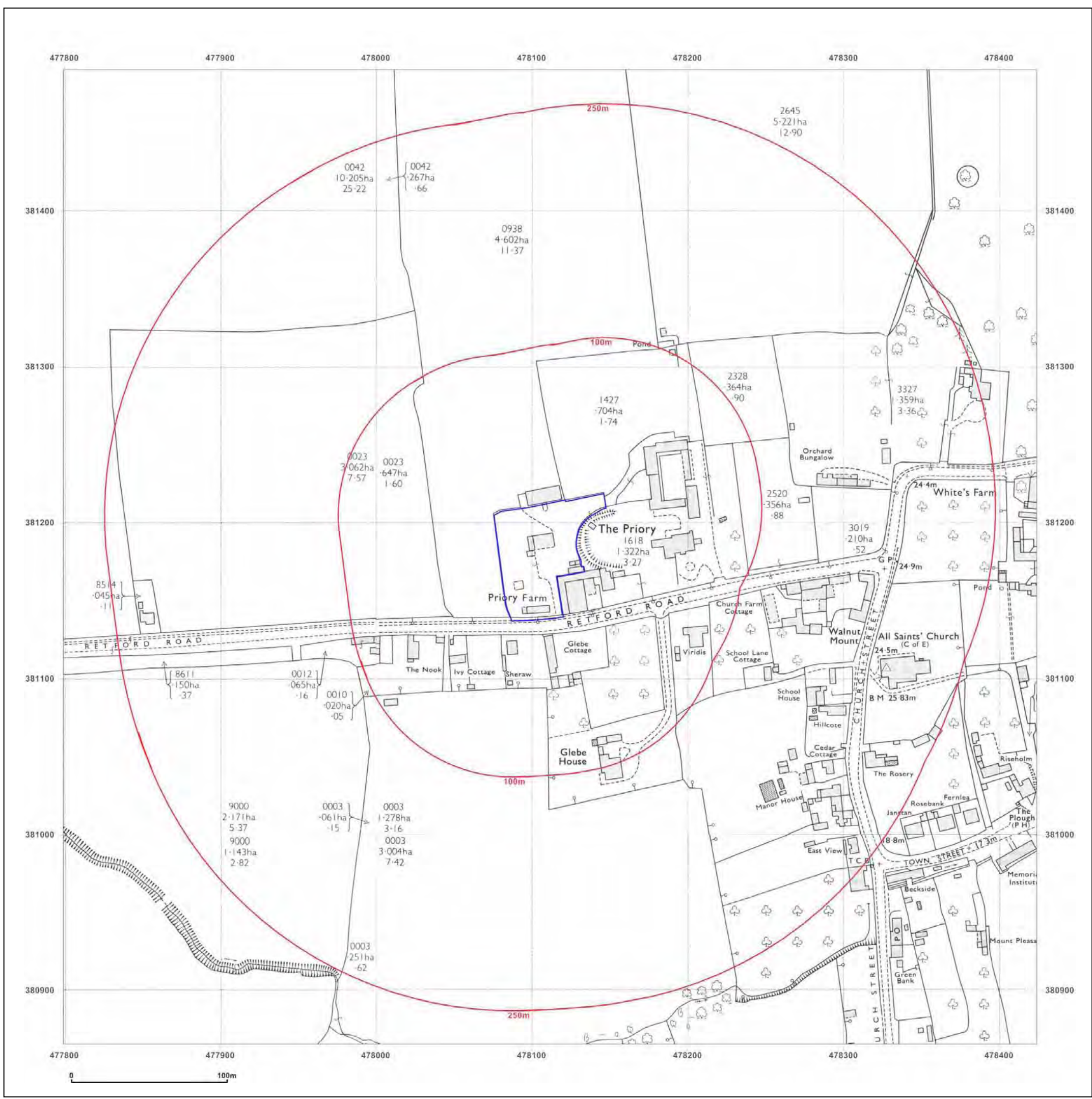


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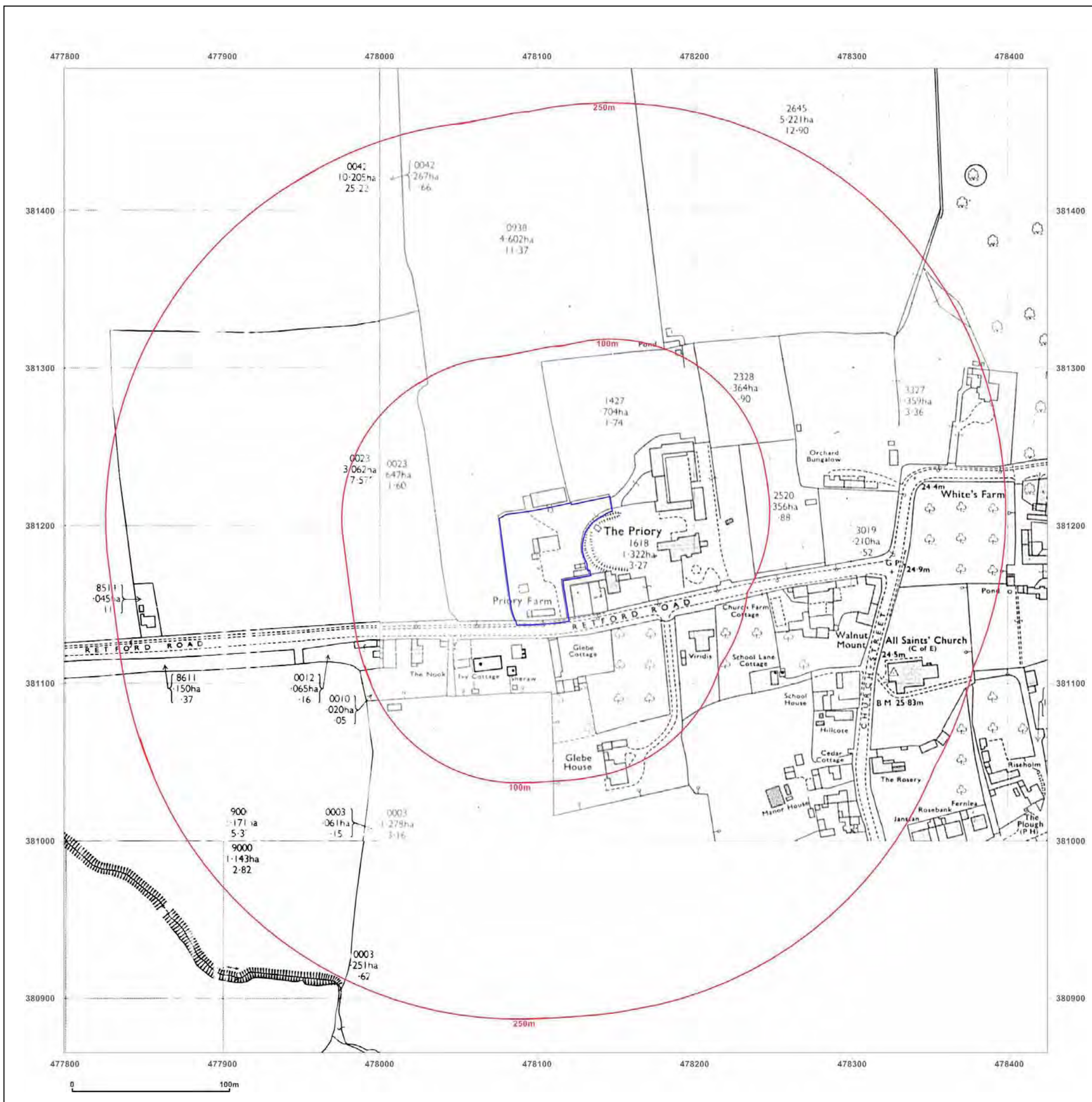


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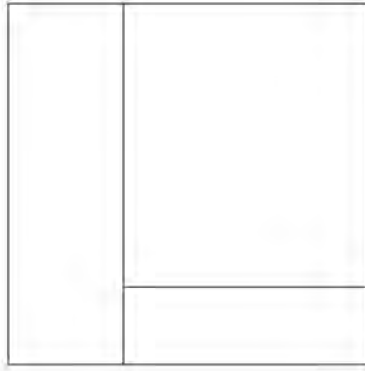
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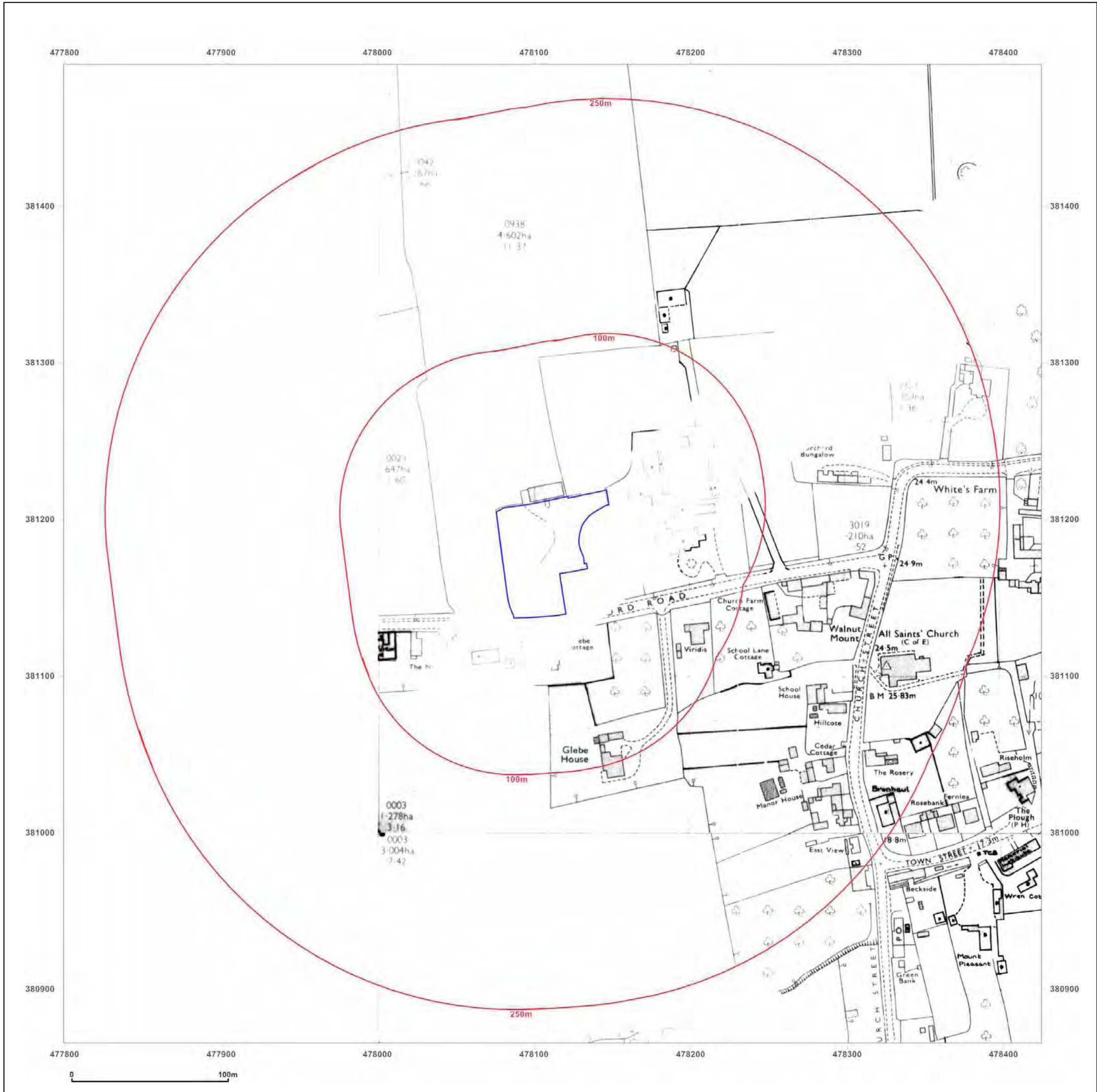
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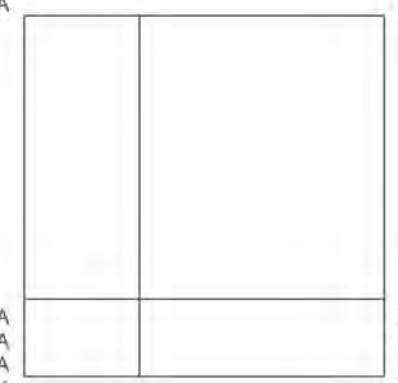
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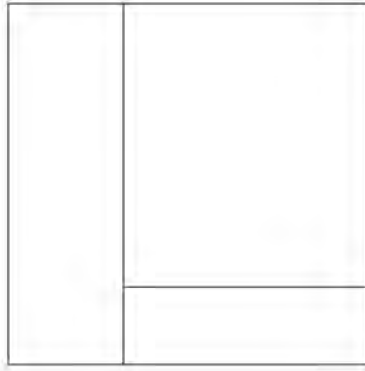
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Report Ref: HMD-4866252
Grid Ref: 478112, 381178

Map Name: County Series

Map date: 1884-1885

Scale: 1:10,560

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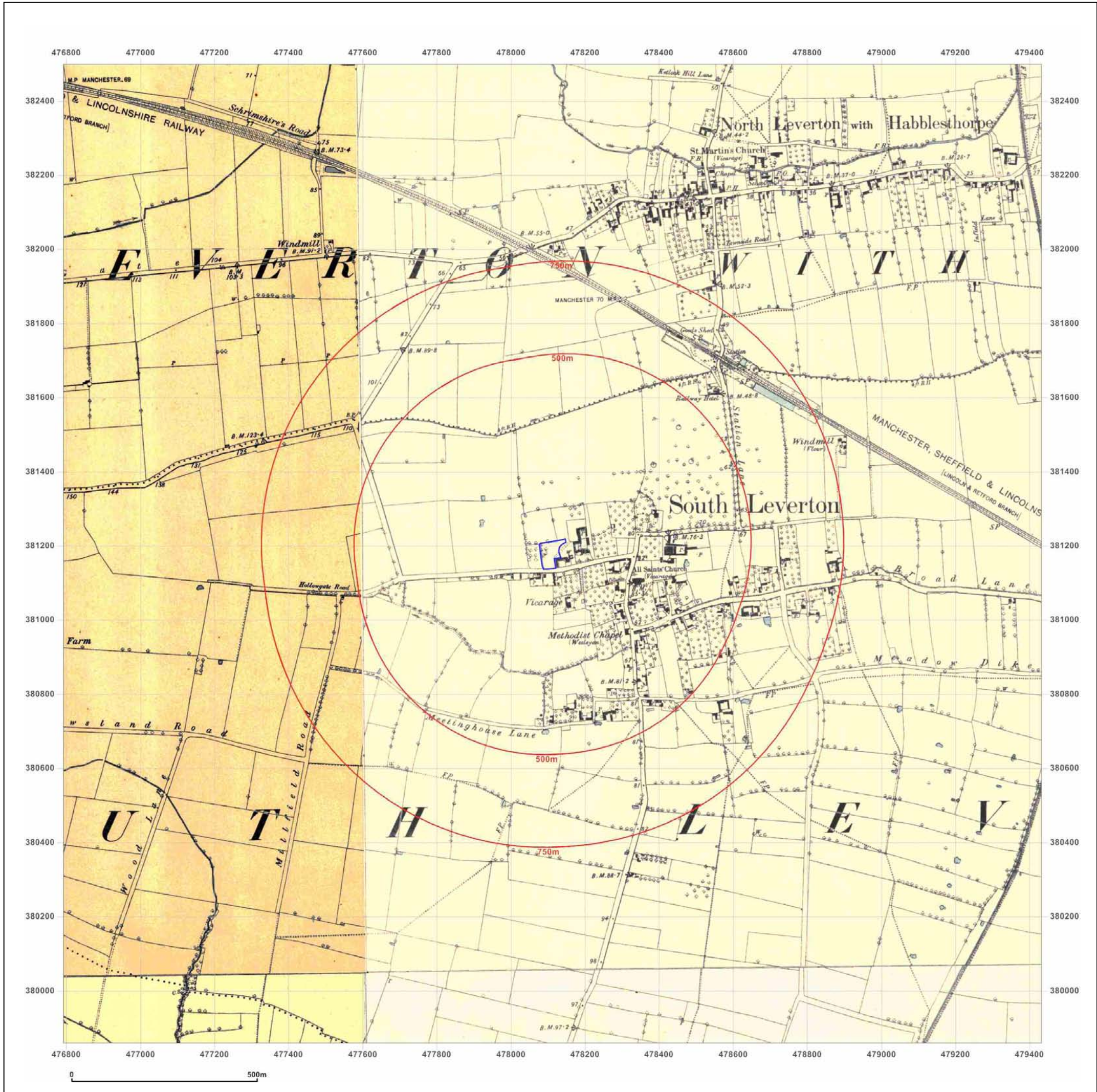


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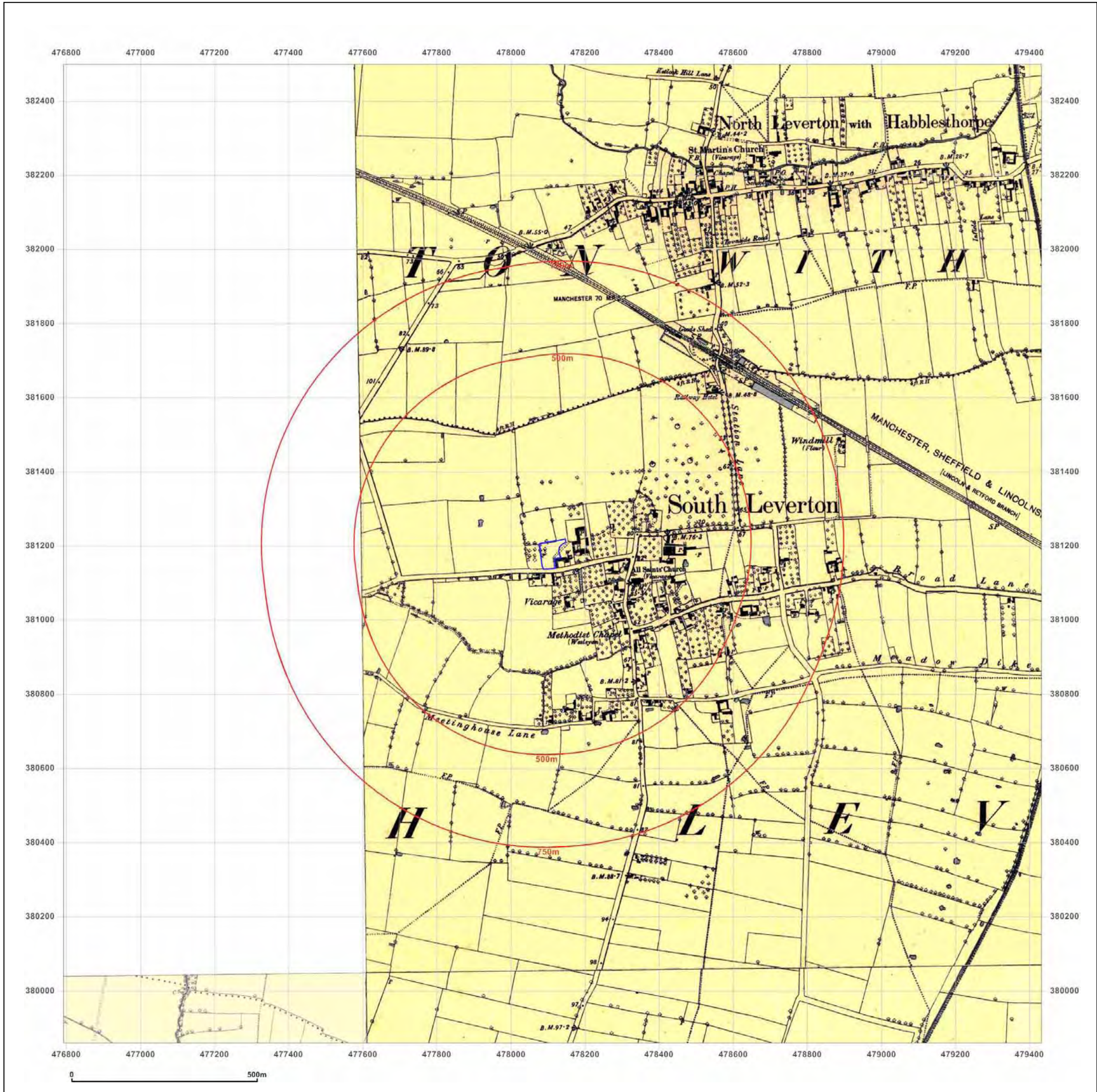


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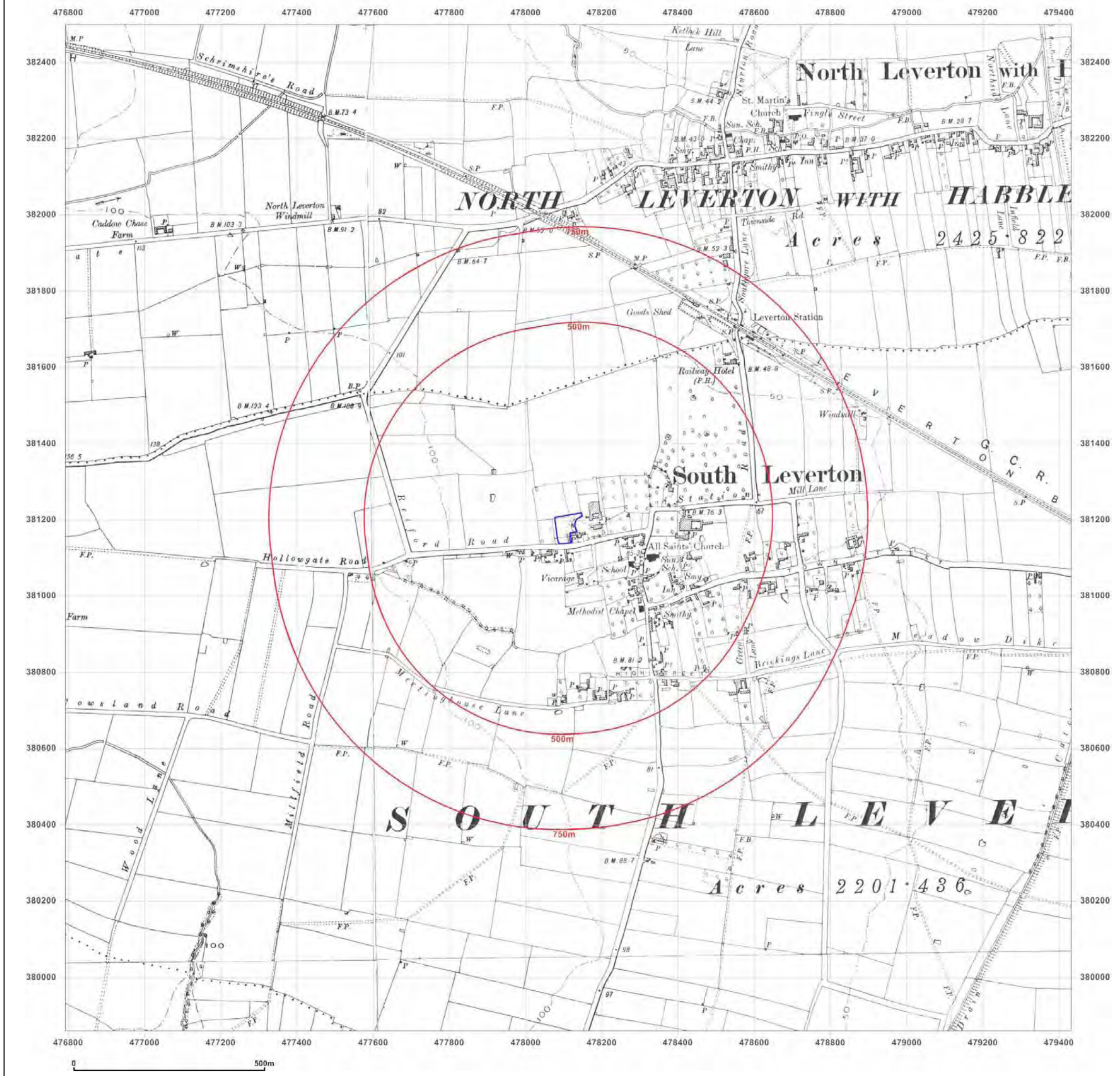
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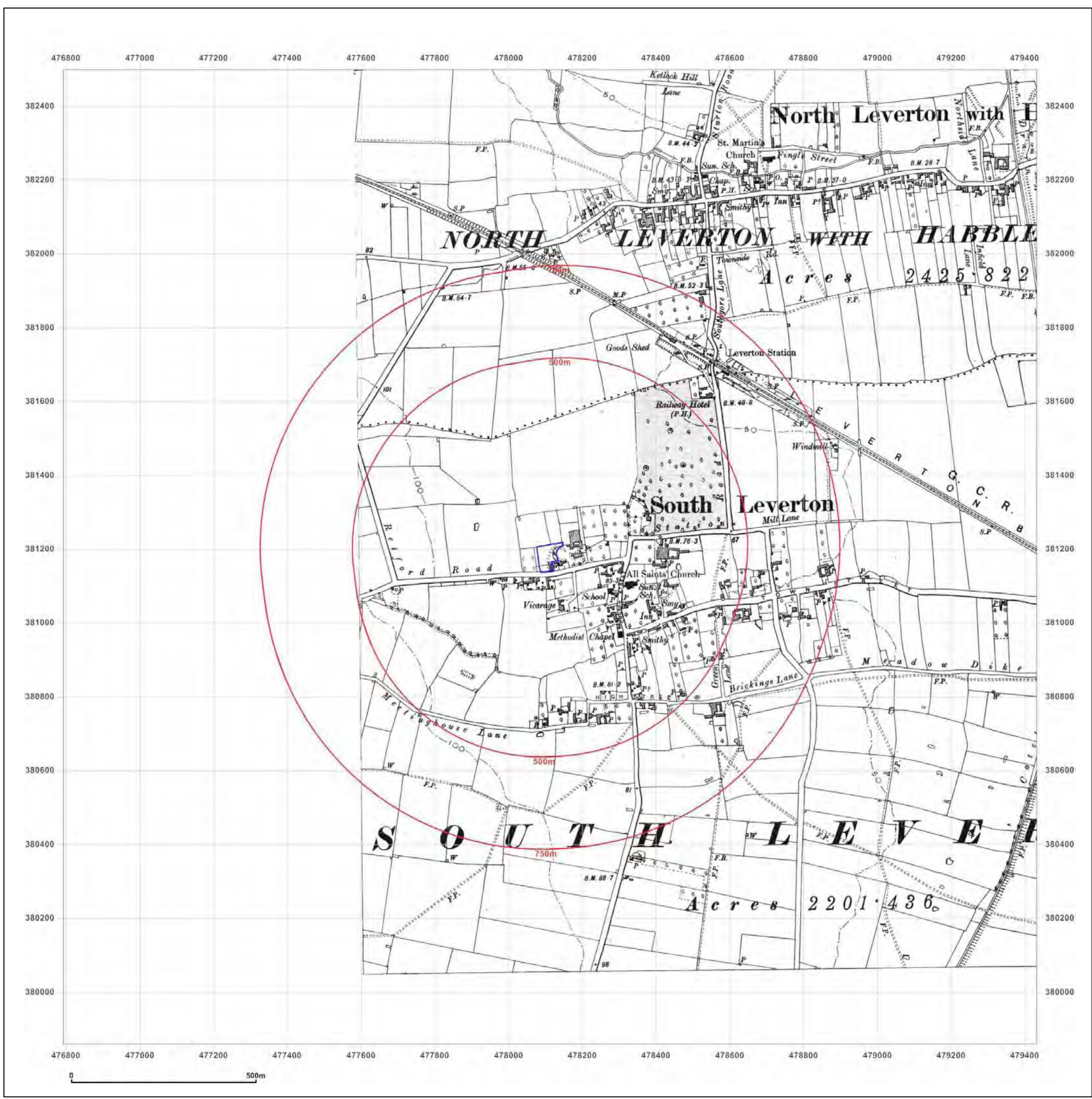


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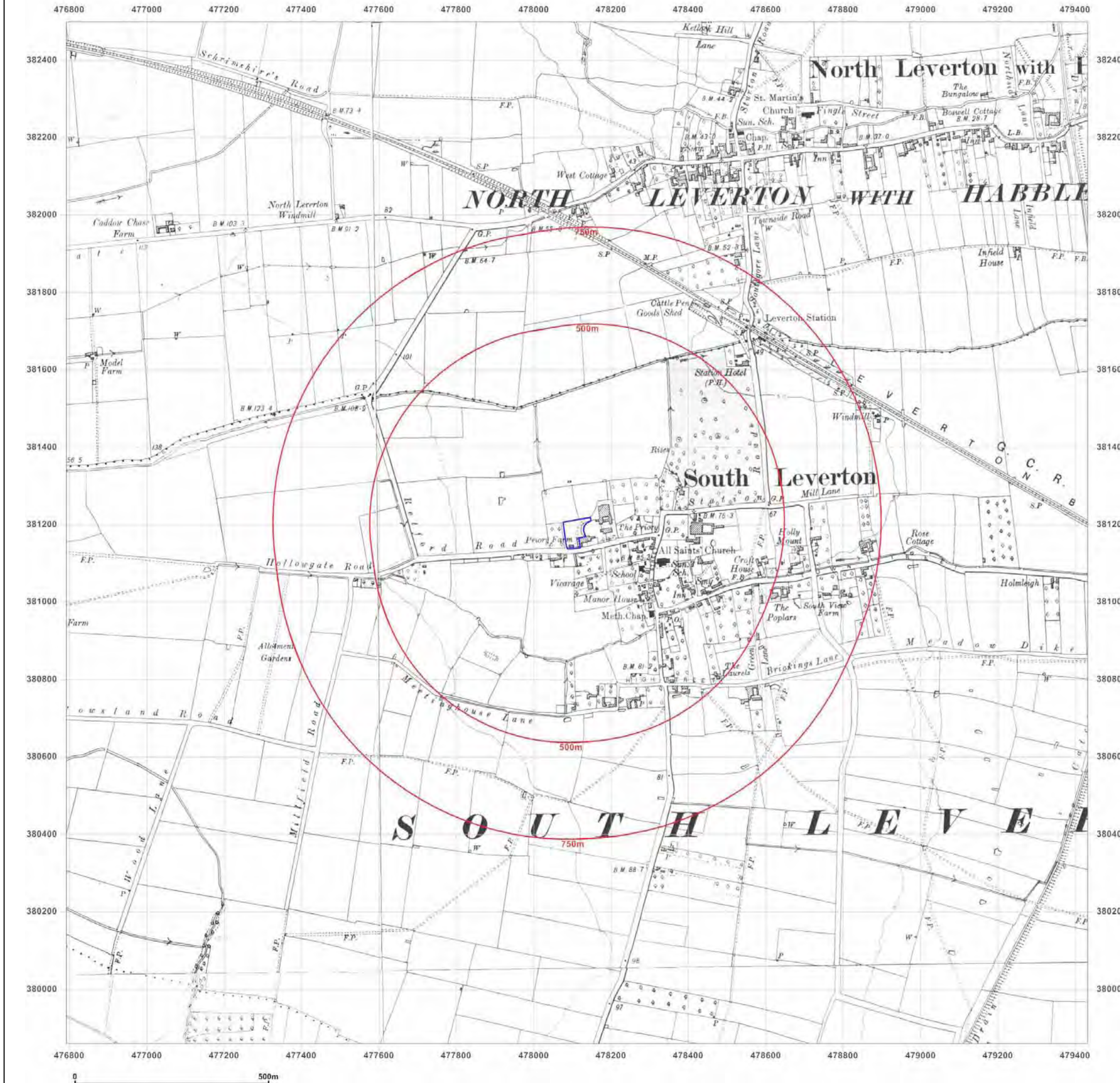
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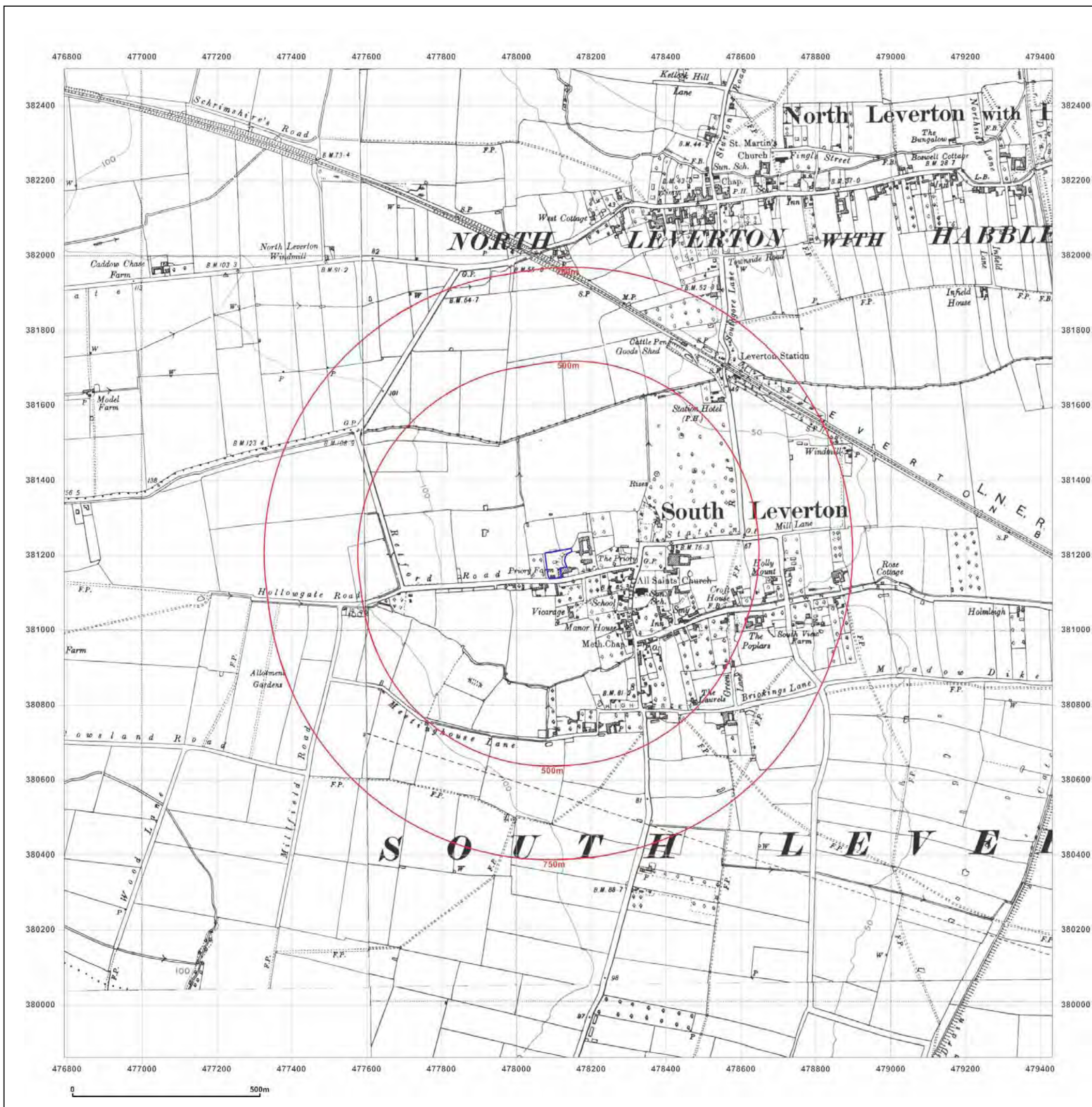


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Map Name: Provisional

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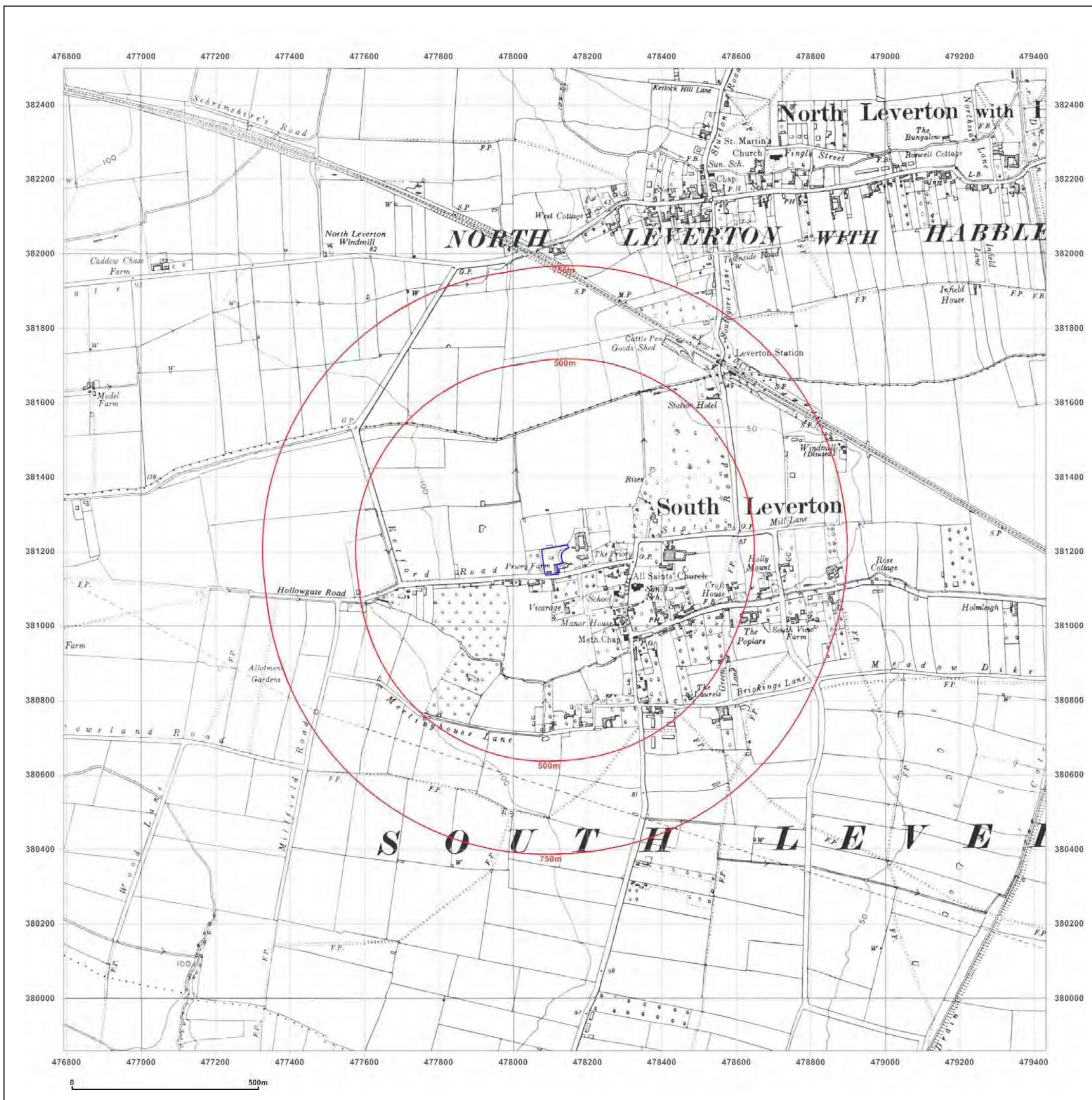


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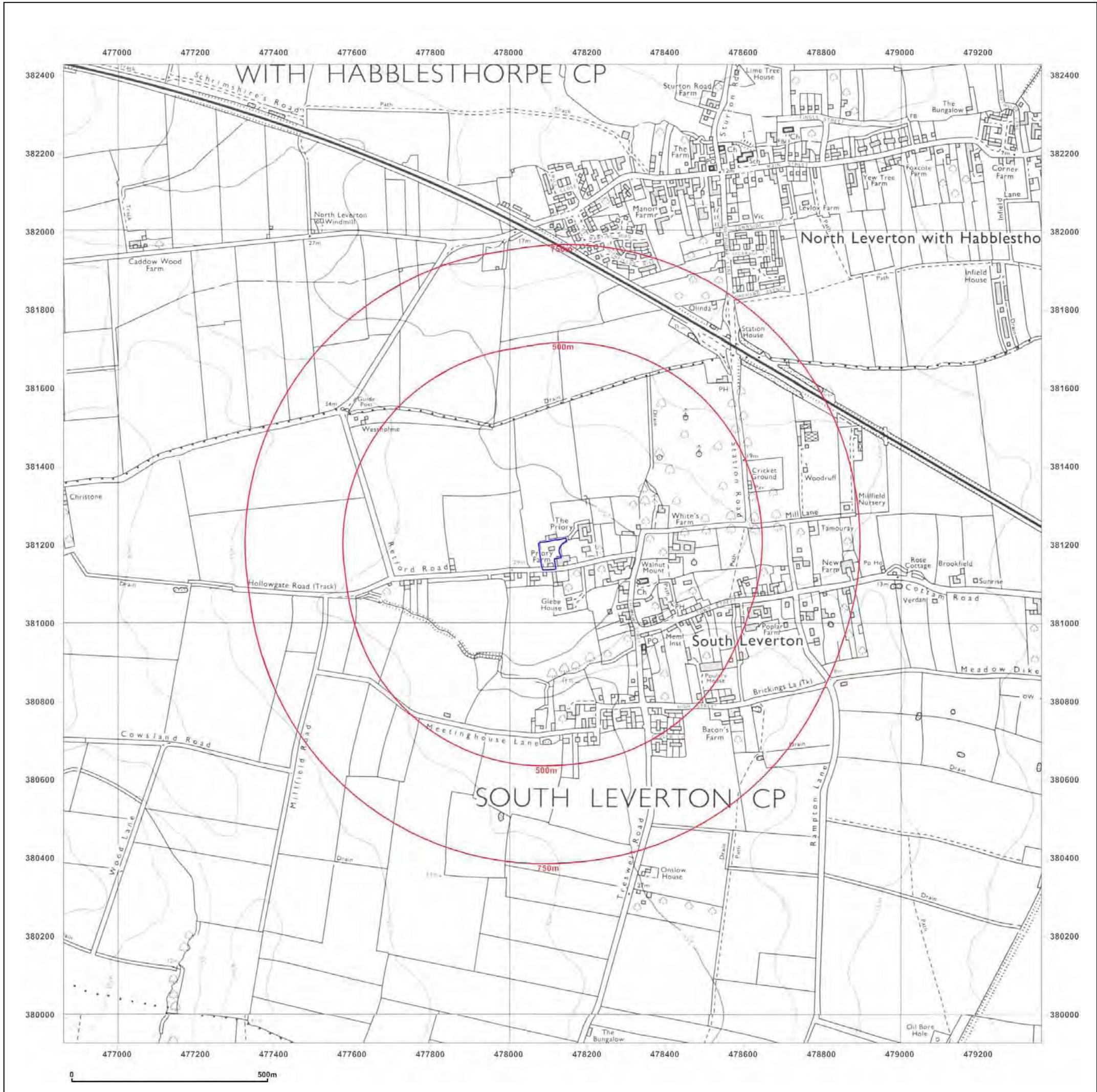
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Grid Ref: 478112, 381178

Map Name: 1:10,000 Raster

Map date: 2002

Scale: 1:10,000

Printed at: 1:10,000

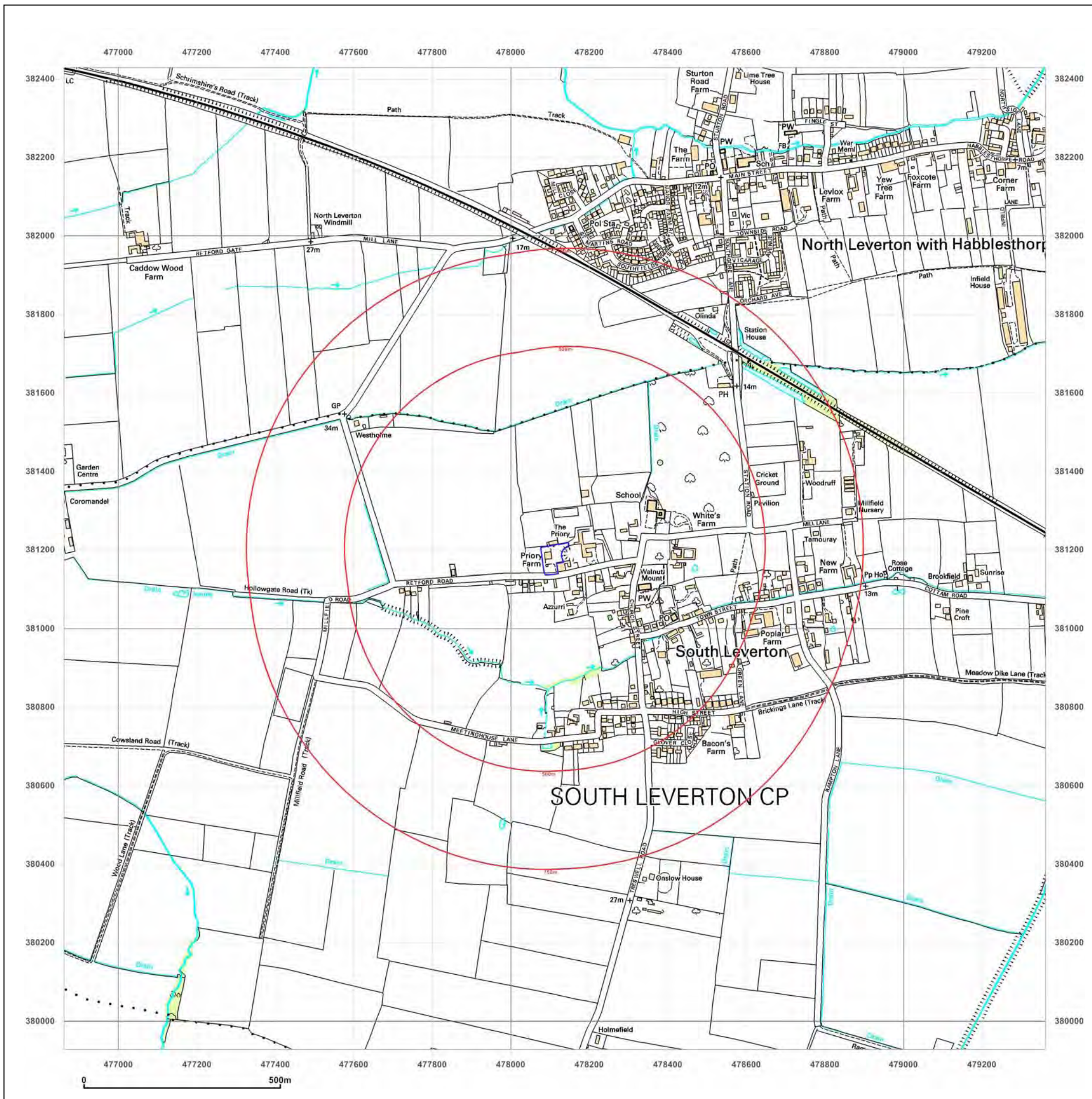


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Production date: 09 April 2018

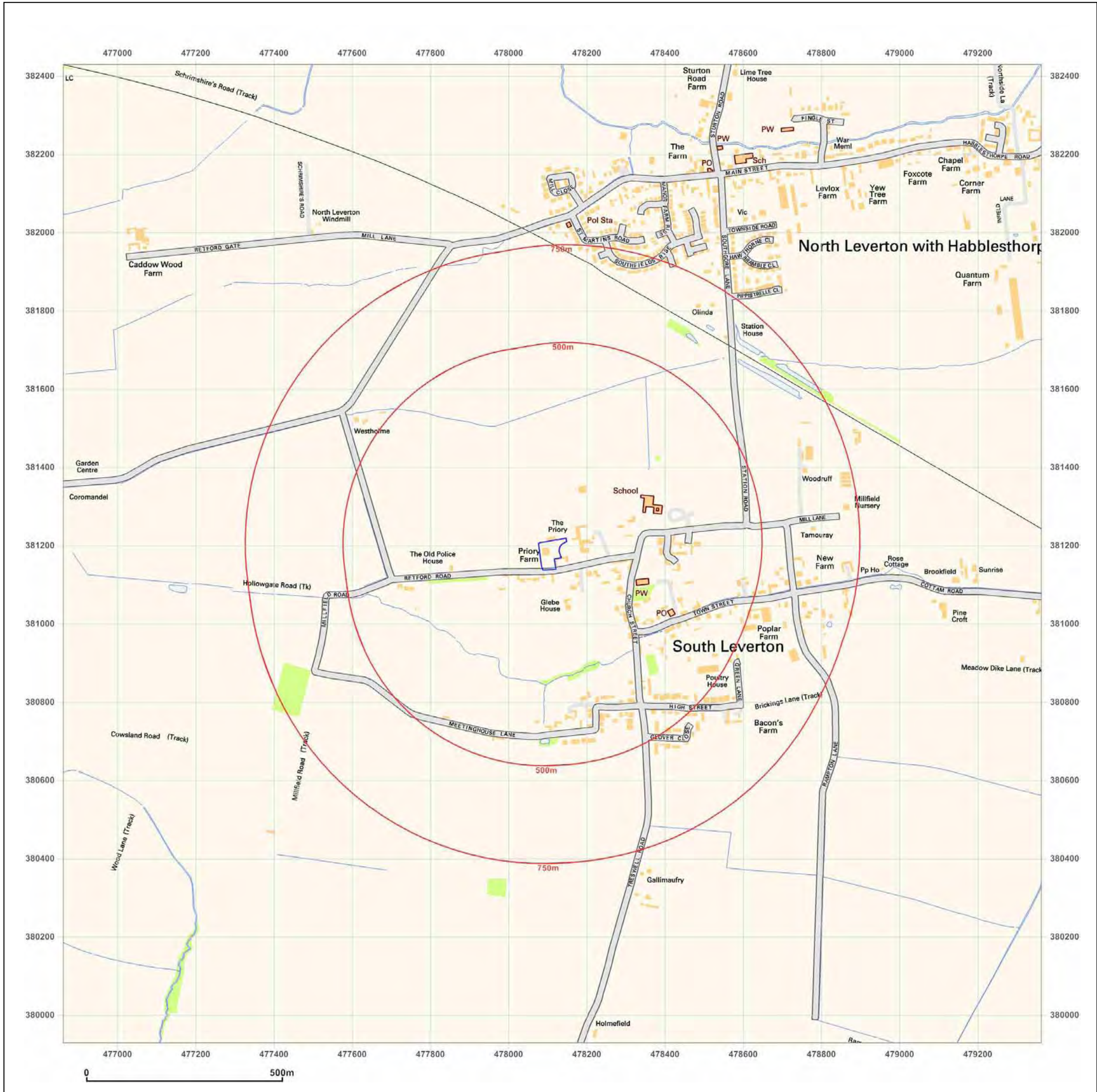
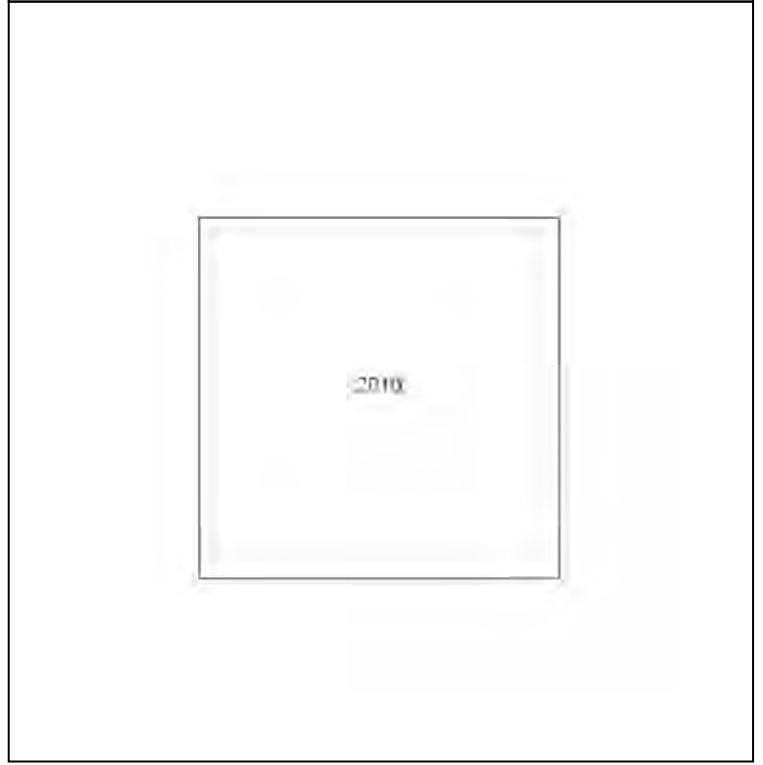
Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:
 NEW STUD FARM, RETFORD ROAD, SOUTH LEVERTON, DN22 0BY

Client Ref: 180401N
Report Ref: HMD-4866252
Grid Ref: 478112, 381178

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



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

Site Details:

NEW STUD FARM, RETFORD ROAD, SOUTH LEVERTON, DN22 0BY

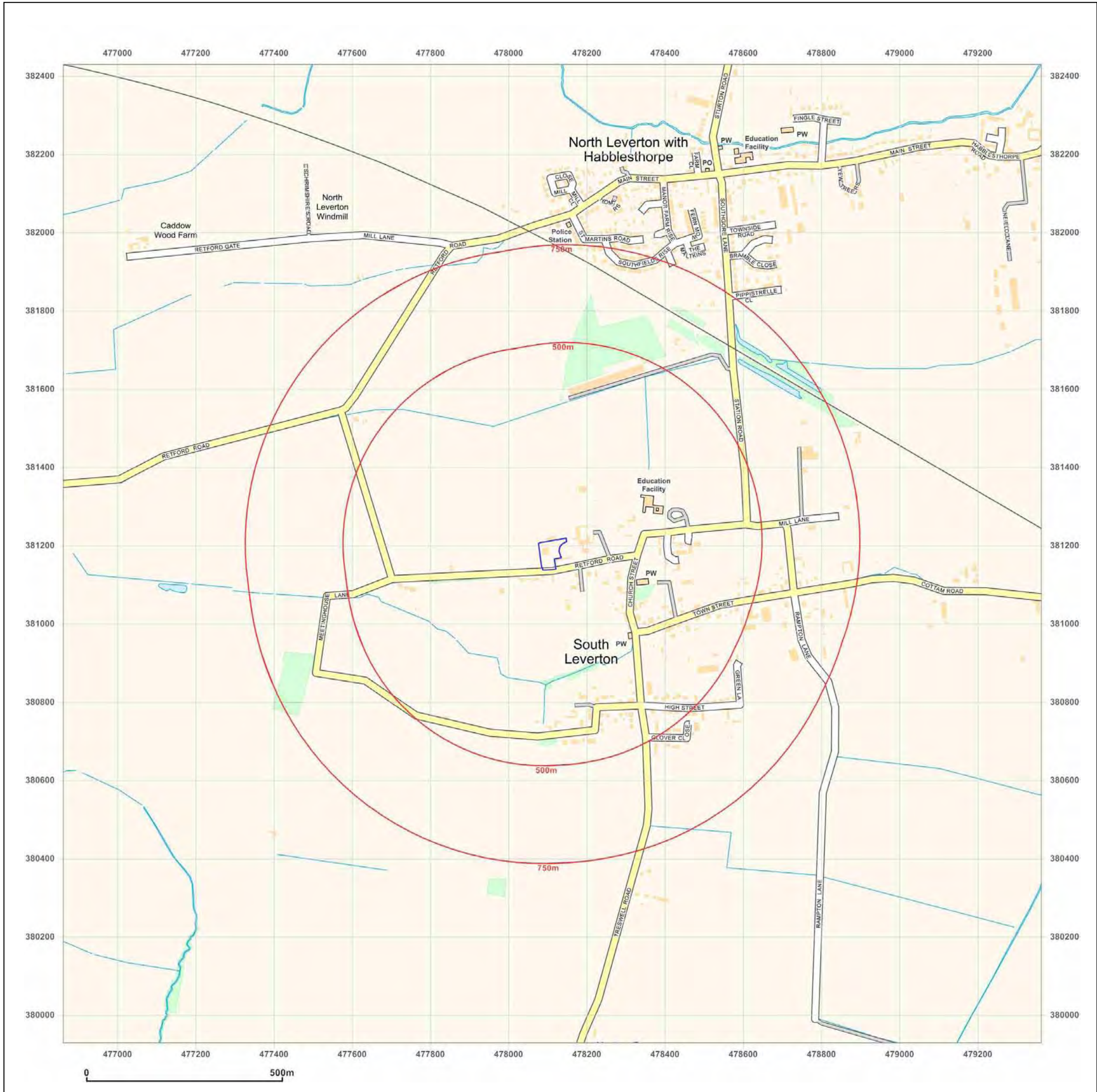
Client Ref: 180401N
Report Ref: HMD-4866252
Grid Ref: 478112, 381178

Map Name: National Grid

Map date: 2014

Scale: 1:10,000

Printed at: 1:10,000



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Production date: 09 April 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

APPENDIX II

Groundsure Geo Insight Report

Address: NEW STUD FARM, RETFORD ROAD, SOUTH LEVERTON, DN22 0BY
Date: 9 Apr 2018
Reference: HMD-4866251
Client: Castle Rock Geotech

NW N NE



SW S SE

Aerial Photograph Capture date: 23-Aug-2015
Grid Reference: 478103,381181
Site Size: 0.35ha

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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?	No
	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

3.1 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 property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

3.2 Radon Protection

No radon protective measures are necessary.

Section 4: Ground Workings

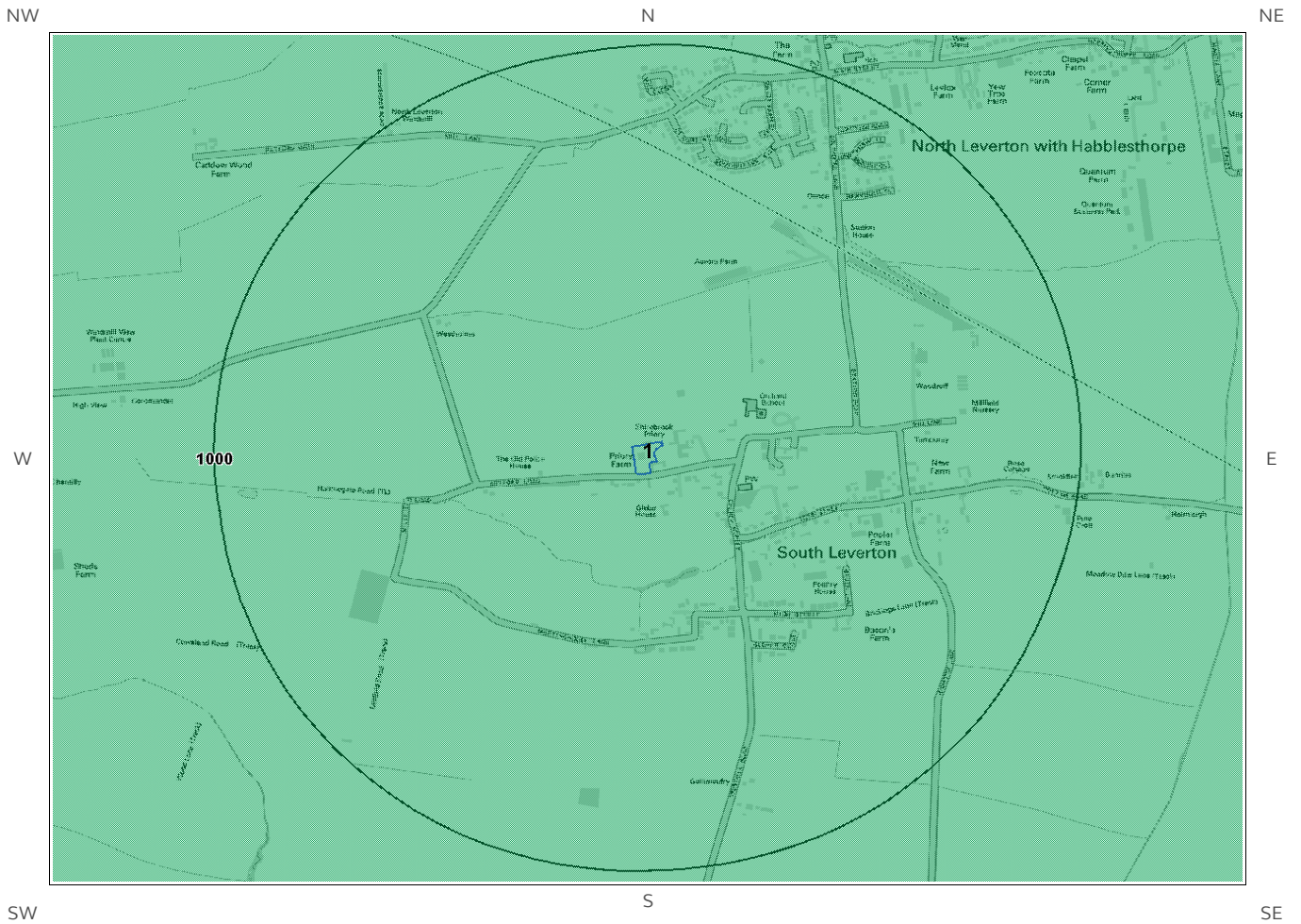
	On-site	0-50m	51-250	251-500	501-1000
4.1 Historical Surface Ground Working Features from Small Scale Mapping	0	0	0	Not Searched	Not Searched
4.2 Historical Underground Workings from Small Scale Mapping	0	0	0	0	0
4.3 Current Ground Workings	0	0	0	1	0

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	0	0	0
5.5 Non-Coal Mining Cavities	0	0	0	0	0
5.5 Natural Cavities	0	0	0	0	0

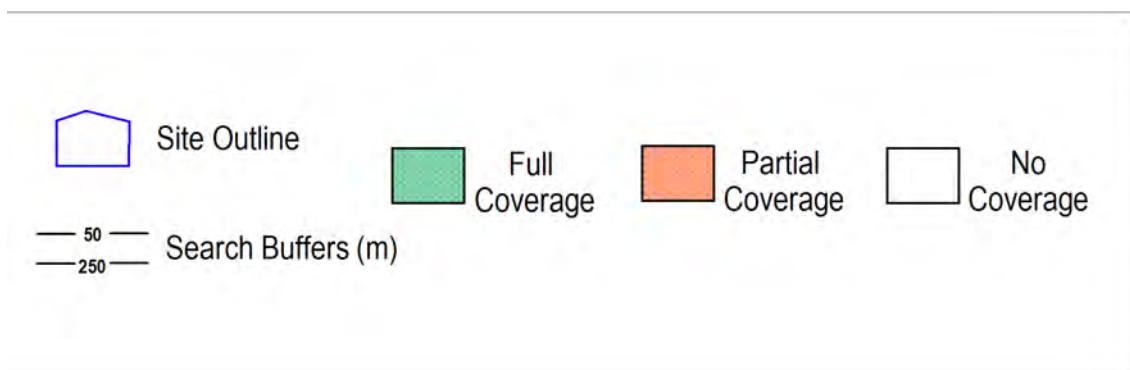
Section 5: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
5.6 Brine Extraction	0	0	0	0	0
5.7 Gypsum Extraction	0	0	0	0	0
5.8 Tin Mining	0	0	0	0	0
5.9 Clay Mining	0	0	0	0	0
Section 6: Natural Ground Subsidence	On-site				
6.1 Shrink-Swell Clay	Very Low				
6.2 Landslides	Very Low				
6.3 Ground Dissolution of Soluble Rocks	Negligible				
6.4 Compressible Deposits	Negligible				
6.5 Collapsible Deposits	Very Low				
6.5 Running Sand	Negligible				
Section 7: Borehole Records	On-site	0-50m	51-250		
7 BGS Recorded Boreholes	0	1	1		
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

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Availability of 1:10,000 Scale Geology Mapping

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

ID	Distance	Artificial Coverage	Superficial Coverage	Bedrock Coverage	Mass Movement Coverage
1	0.0	No deposits are mapped	Full	Full	No coverage
N2	1137.0	No deposits are mapped	Full	Full	No coverage
N3	1853.0	No deposits are mapped	Full	Full	No coverage

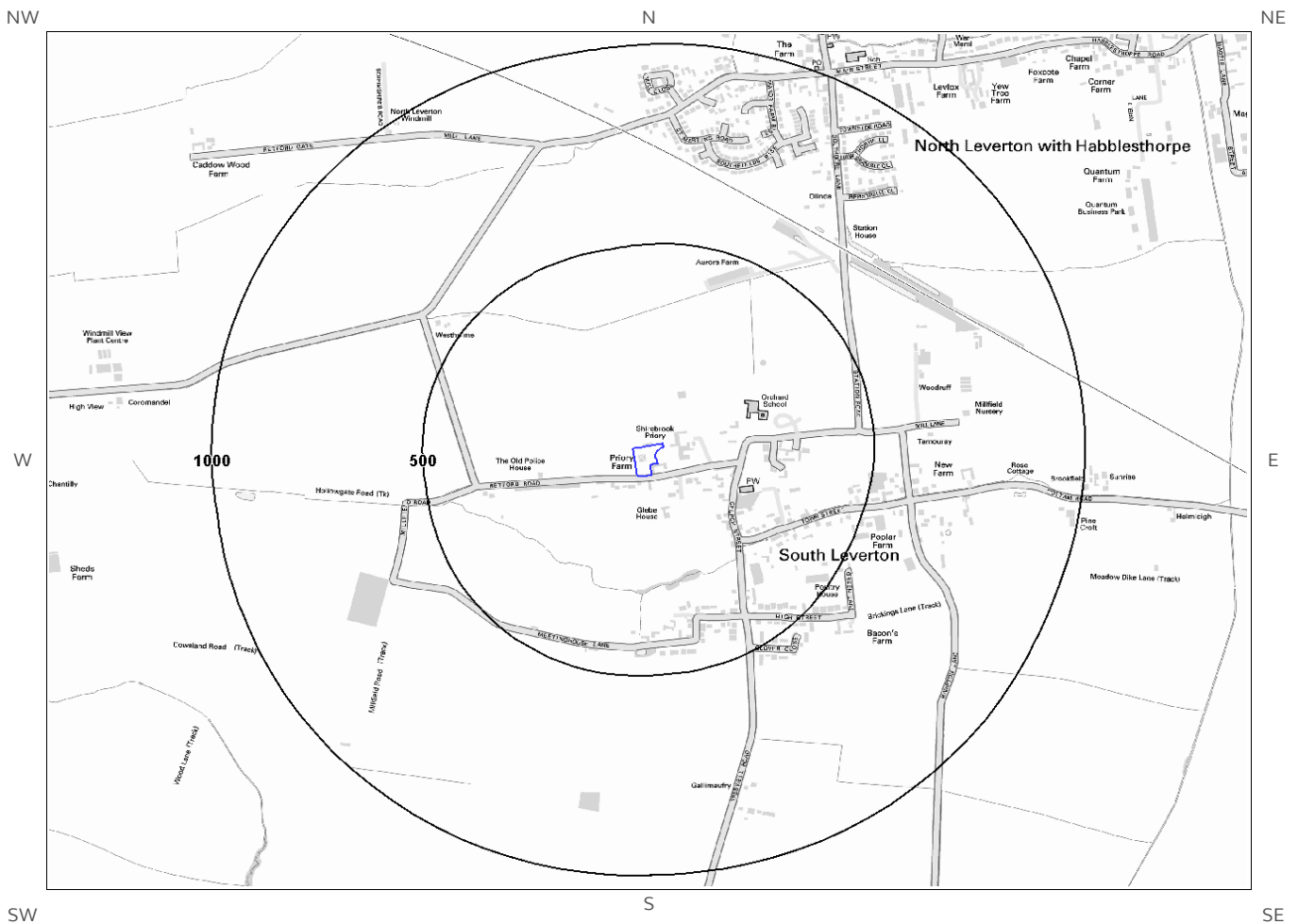
Guidance: The 1:10,000 scale geological interpretation is the most detailed generally available from BGS and is the scale at which most geological surveying is carried out in the field. The database is presented as four types of geology (artificial, mass movement, superficial and bedrock), although not 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

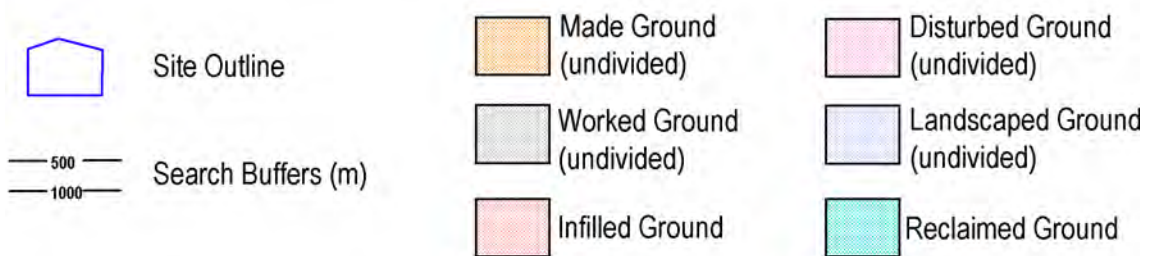
1 Geology (1:10,000 scale).

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



Artificial Ground Legend

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1. Geology 1:10,000 scale

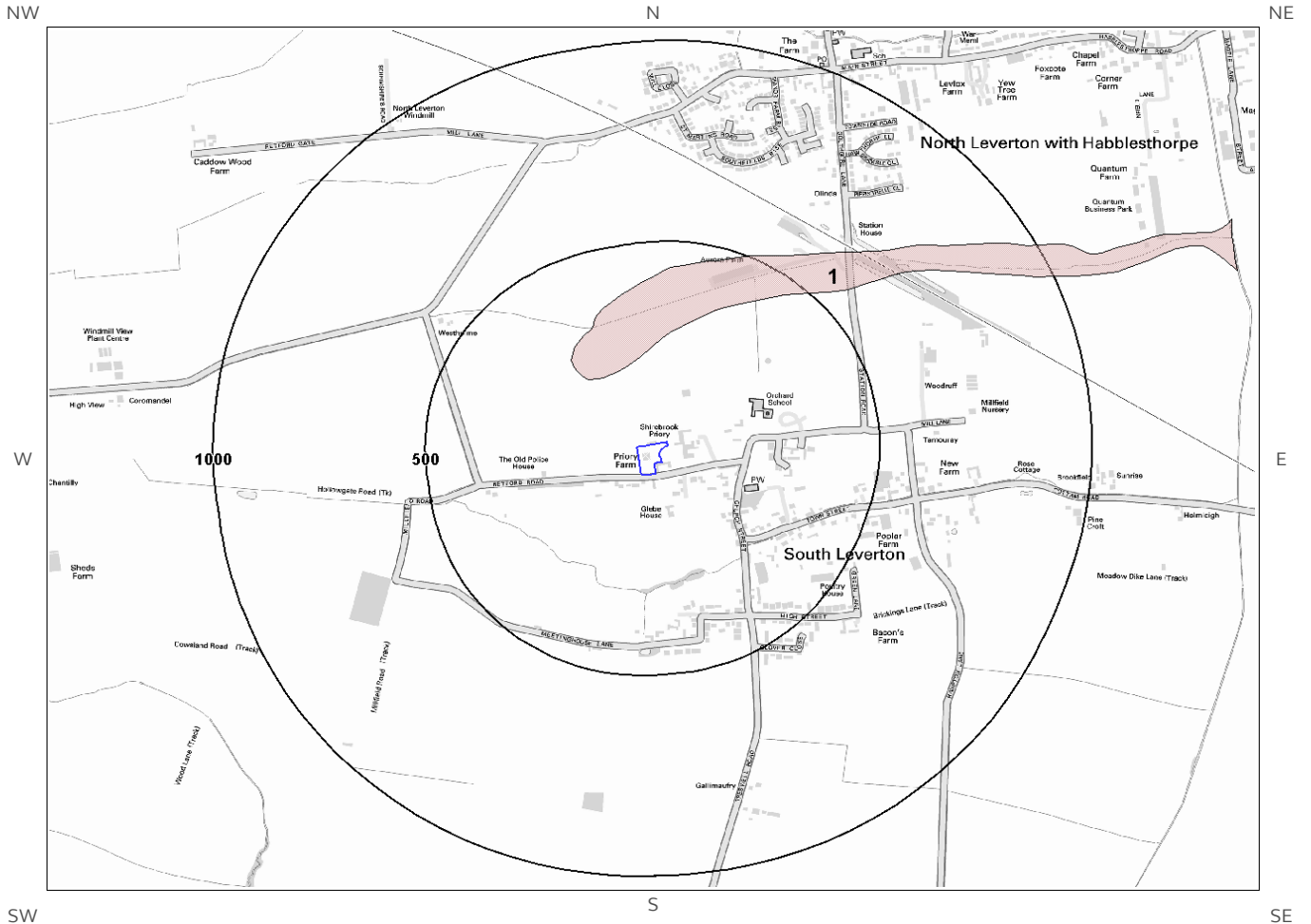
1.1 Artificial Ground

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)



Artificial Ground Legend

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

1.2.2 Landslip

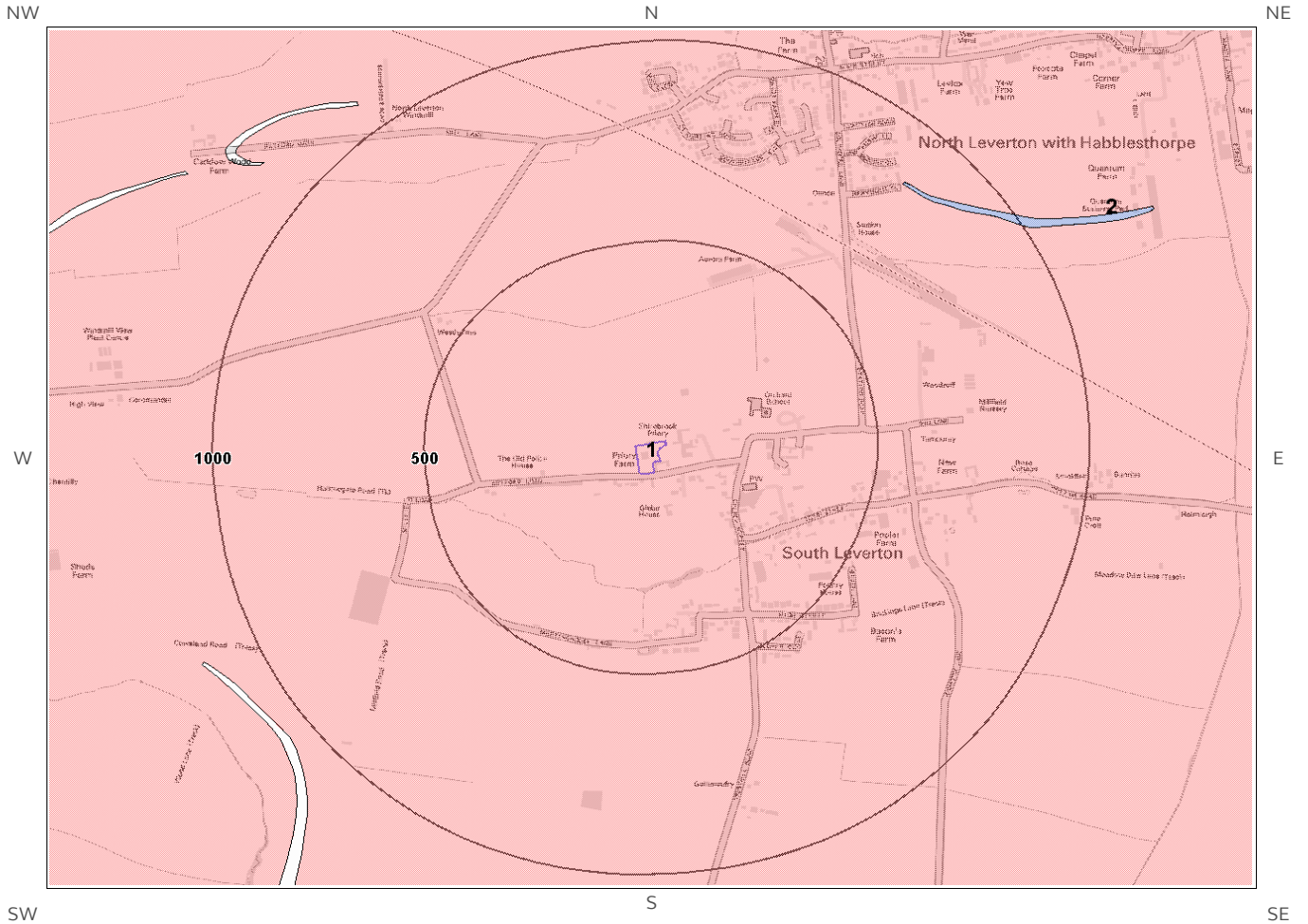
Are there any records of Landslip within 500m of the study site boundary at 1:10,000 scale? No

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

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-  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	MMG-MDST	Mercia Mudstone Group - Mudstone	Rhaetian Age - Early Triassic Epoch

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

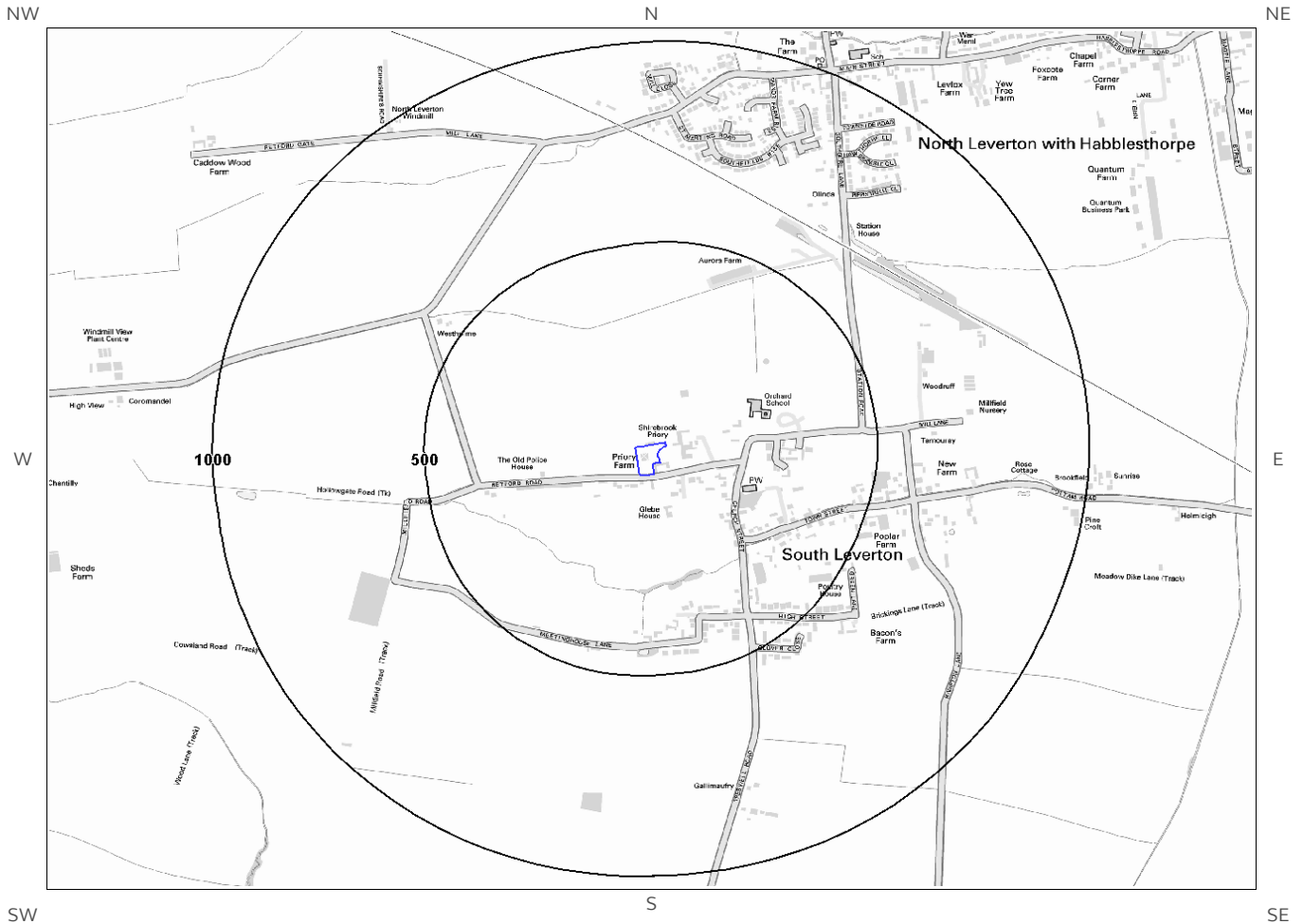
Database searched and no data found at this scale.

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.

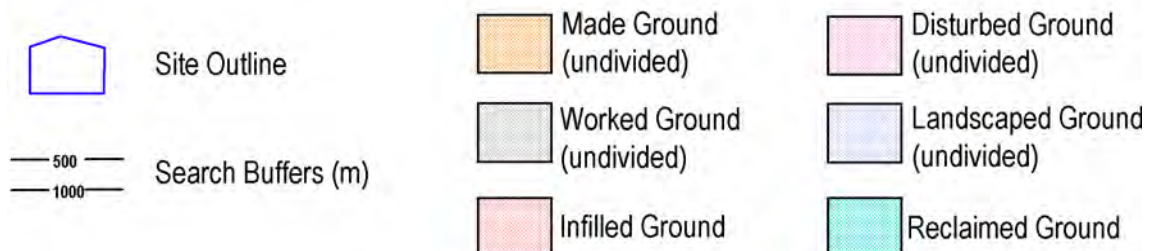
This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

2 Geology 1:50,000 Scale

2.1 Artificial Ground map



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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: 101

2.1.1 Artificial/ Made Ground

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

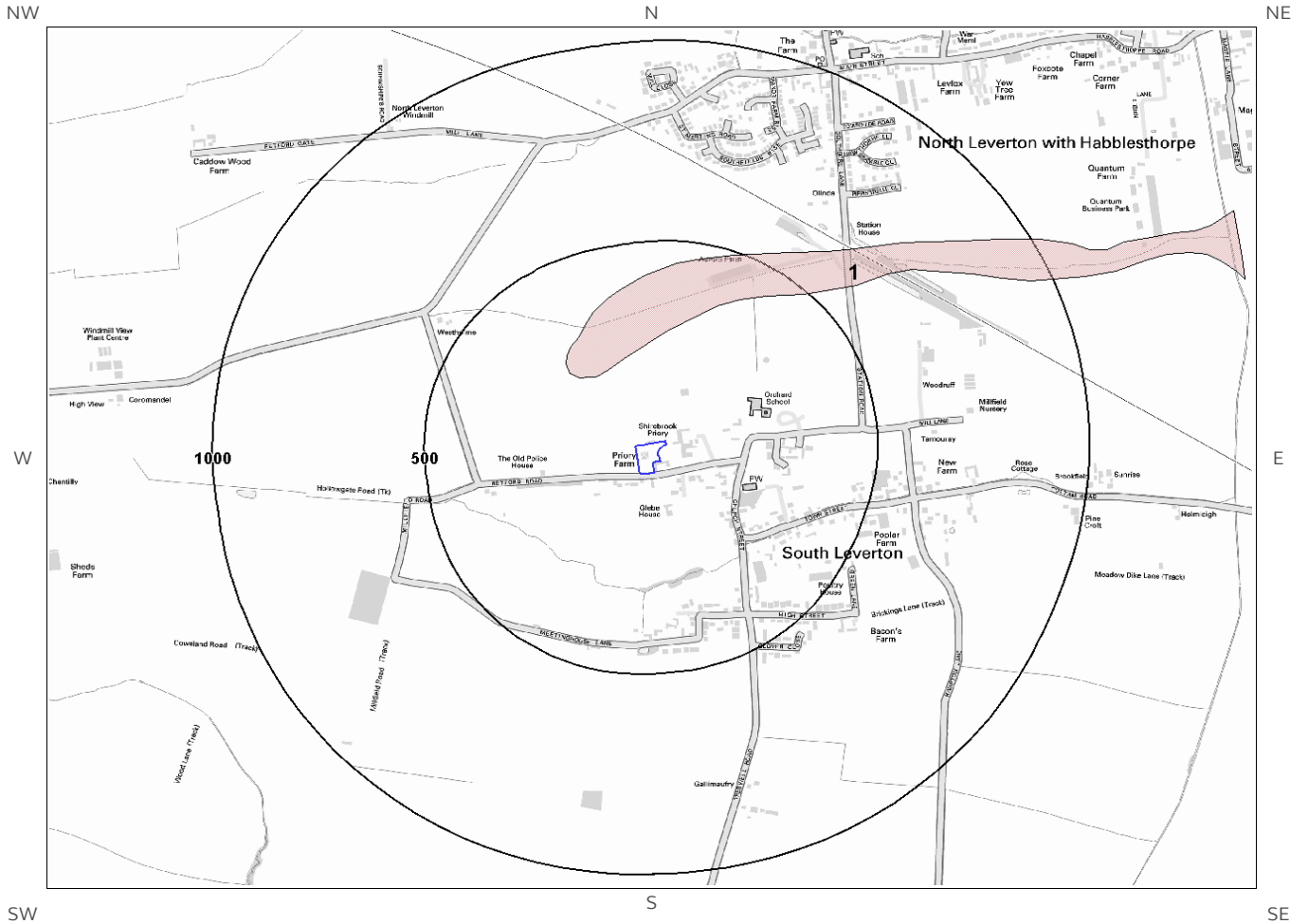
Database searched and no data found.

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.

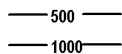
2.2 Superficial Deposits and Landslips map (1:50,000 scale)



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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	199.0	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? No

Database searched and no data found.

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.

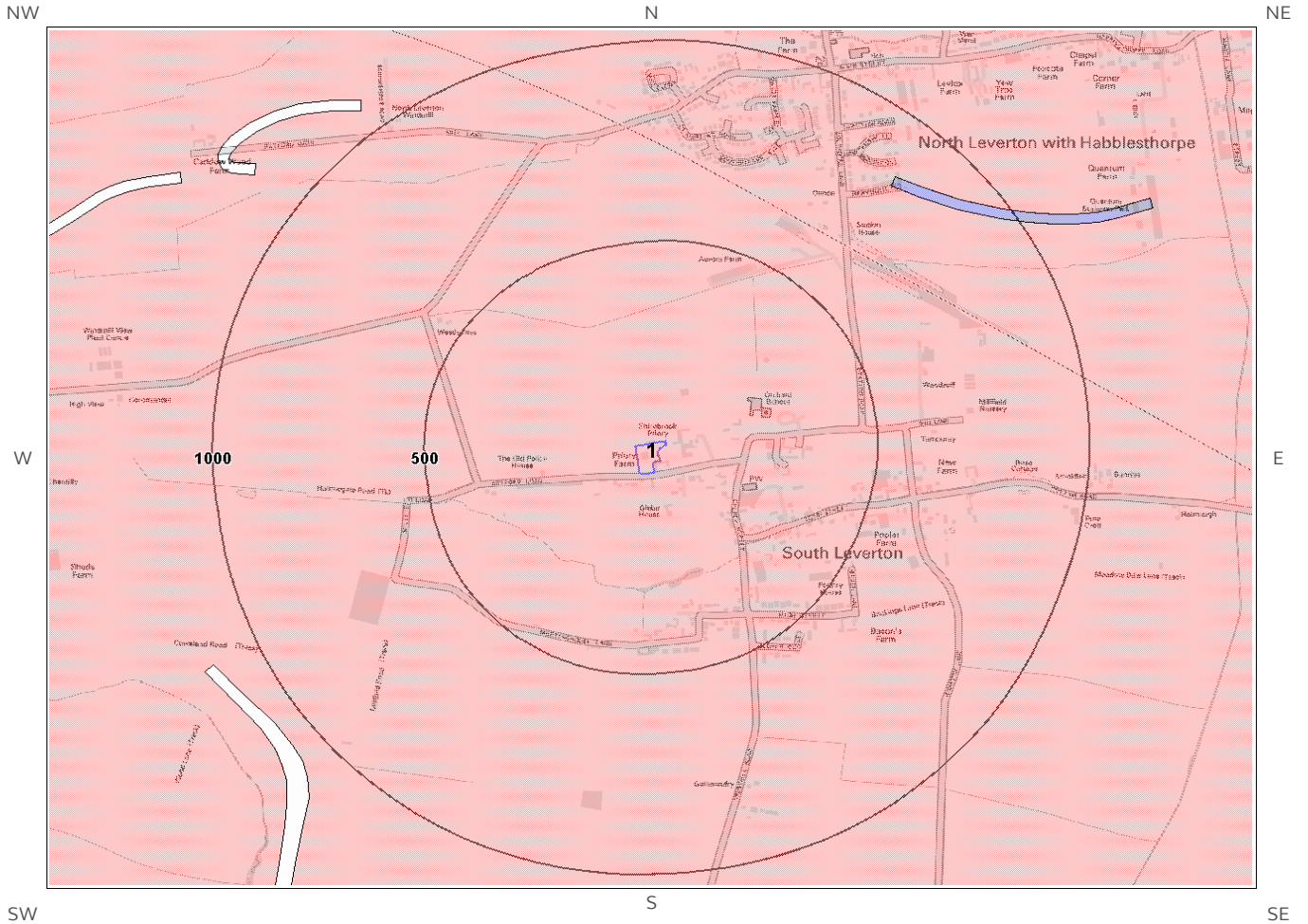
This Geology shows the main components as discrete layers, there are: Artificial/ Made Ground, Superficial/ Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

2.2.4 Landslip Permeability

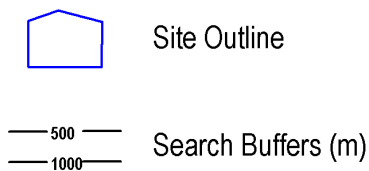
Are there any records relating to permeability of landslips within the study site boundary? No

Database searched and no data found.

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



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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: 101

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	MMG-MDST	MERCIA MUDSTONE GROUP - MUDSTONE	-

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	Fracture	Low	Low

2.3.3 Linear features

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

Database searched and no data found.

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

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

3 Radon Data

3.1 Radon Affected Areas

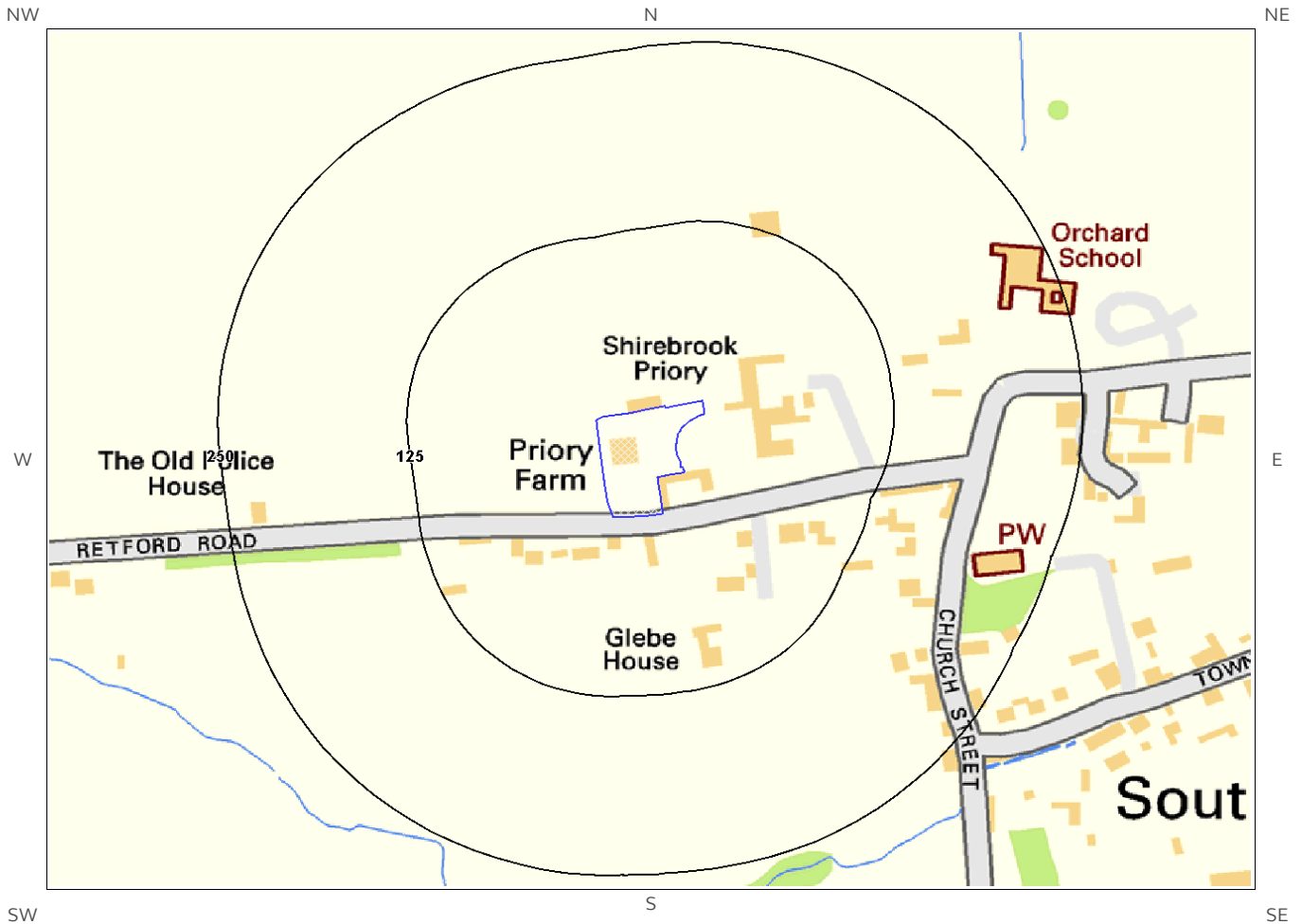
Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

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

3.2 Radon Protection



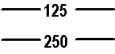


Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? No radon protective measures are necessary.

4 Ground Workings map



Ground Workings Legend

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-  Site Outline
-  Historic Surface Ground Workings
-  Search Buffers (m)
-  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

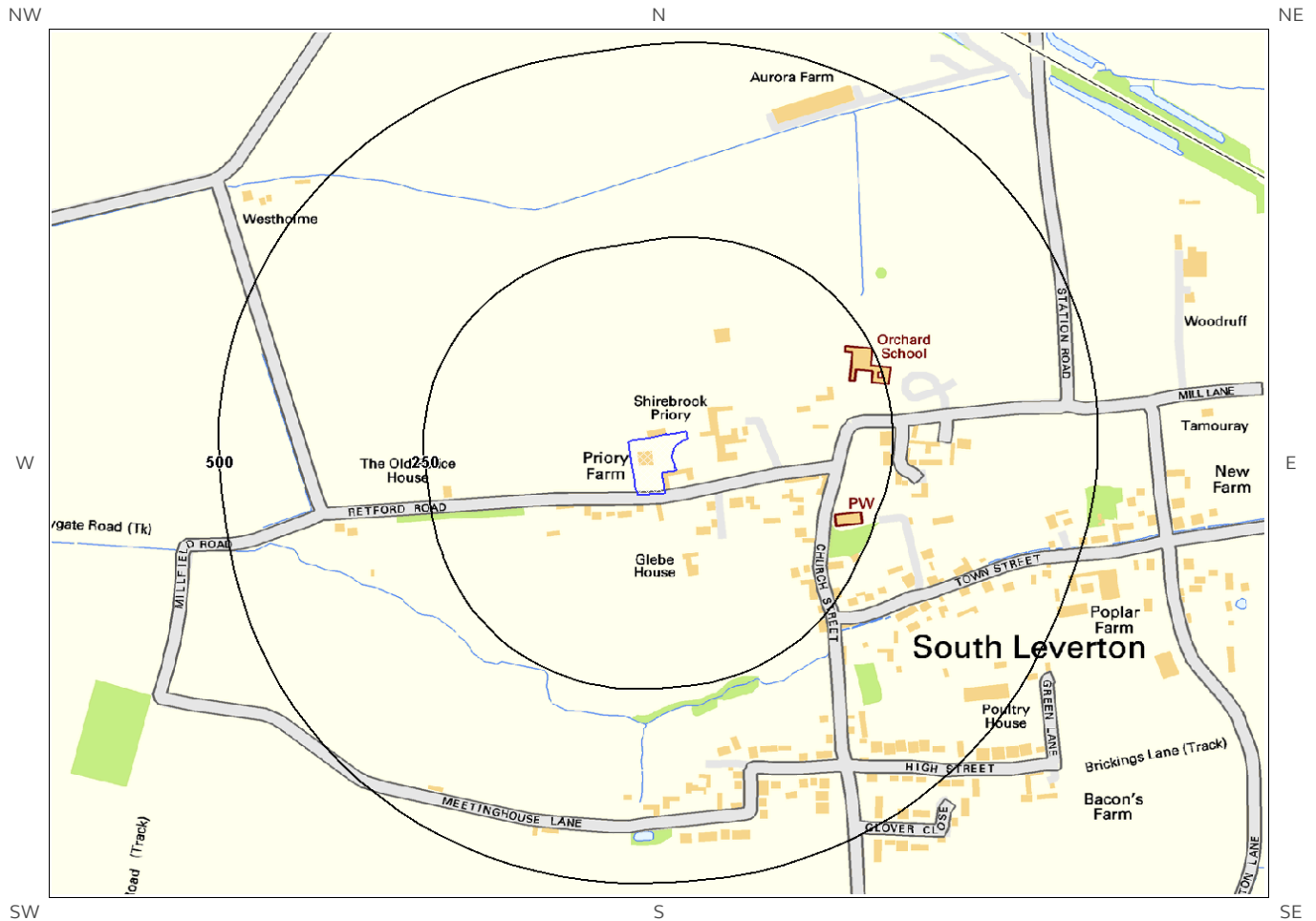
This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

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

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

ID	Distance (m)	Direction	NGR	Commodity Produced	Pit Name	Type of working	Status
Not shown	343.0	SW	477886 380859	Sandstone	Meetinghouse Lane Pit	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased

5 Mining, Extraction & Natural Cavities map



Mining, Extraction and Natural Cavities Legend

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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? No

Database searched and no data found.

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 Coal Authority issued on behalf of 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.

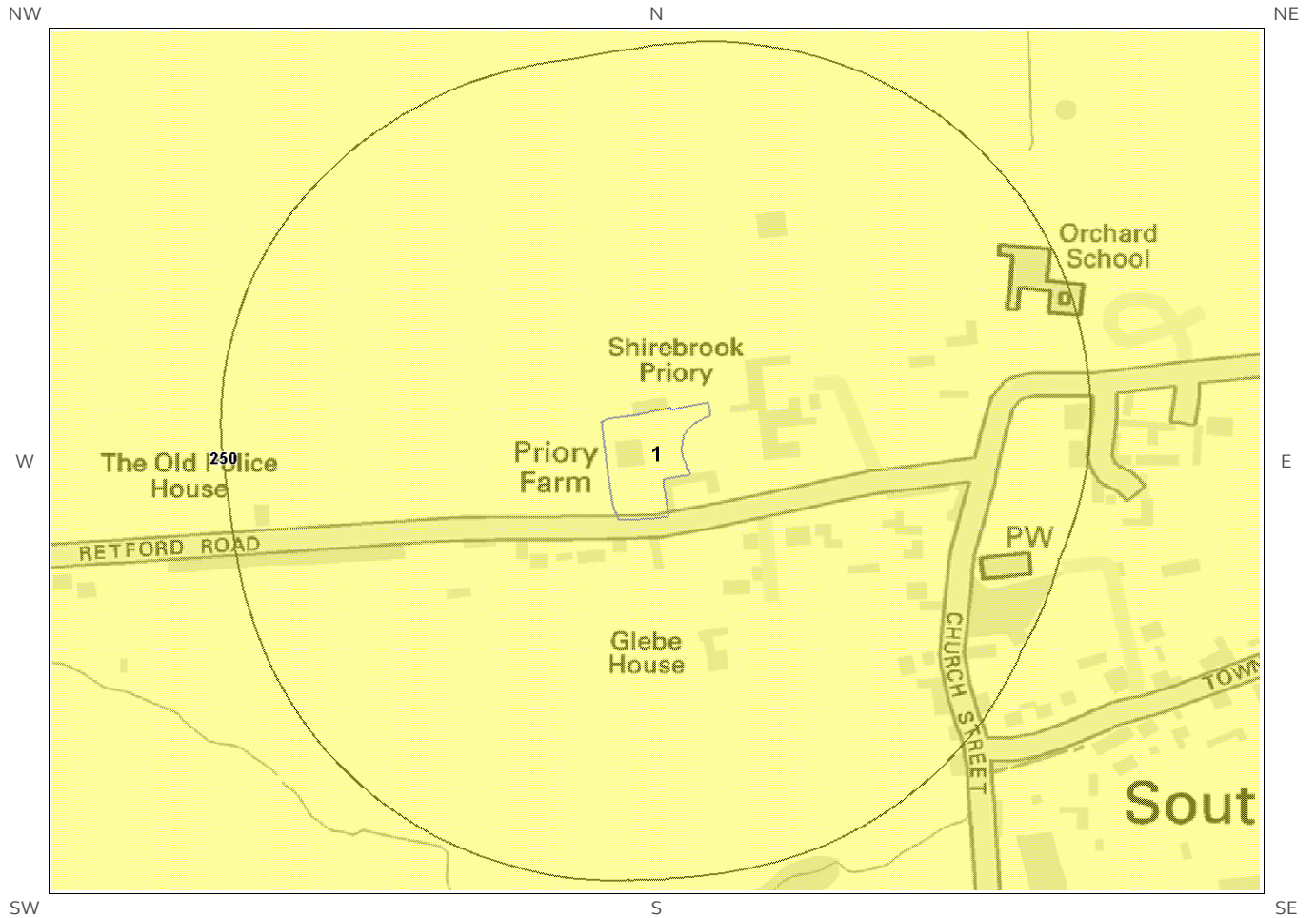
Are there any Clay Mining areas within 1000m of the study site boundary?

No

Database searched and no data found.

6 Natural Ground Subsidence

6.1 Shrink-Swell Clay map

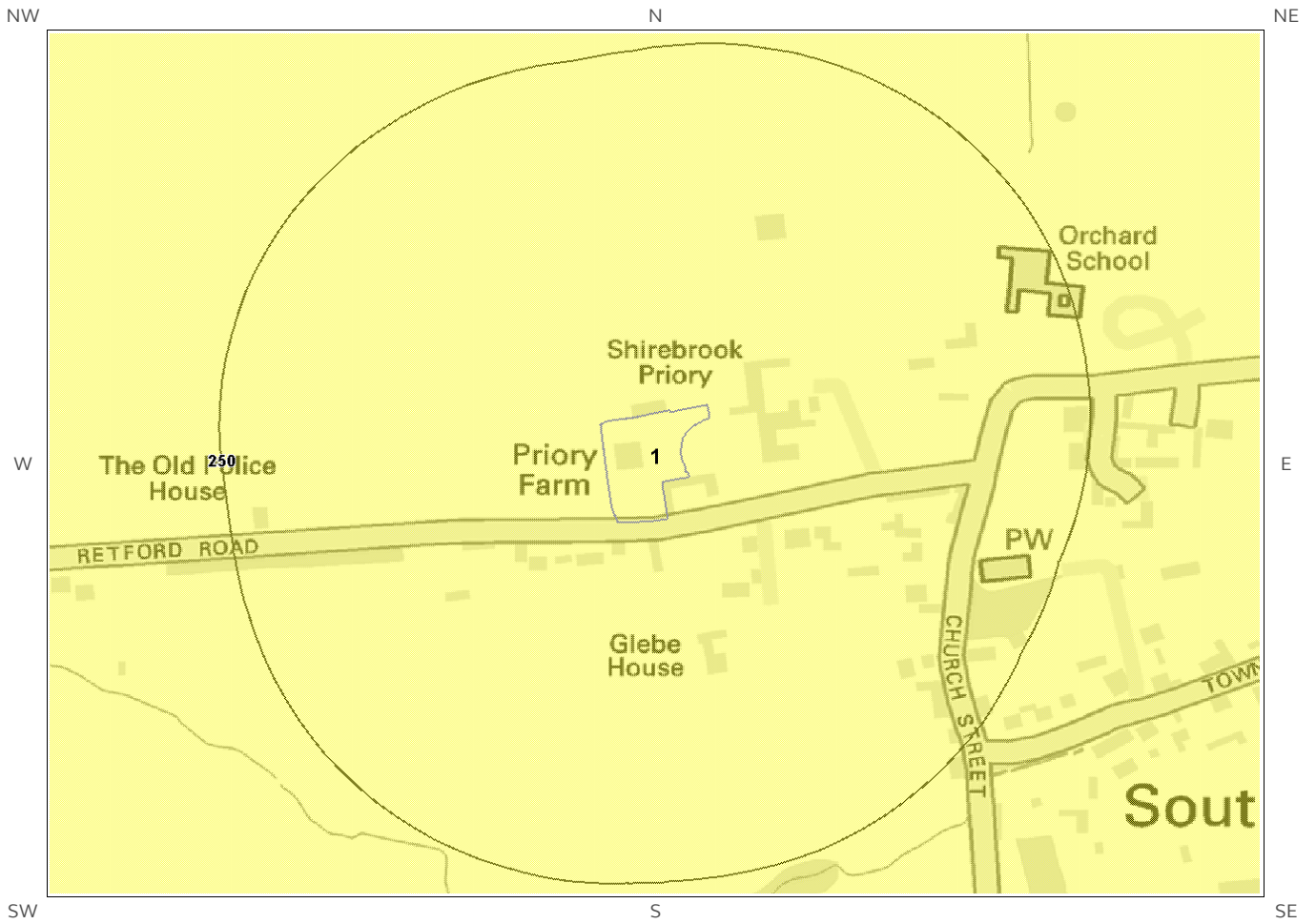


Shrink Swell Clay Legend

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6.2 Landslides map

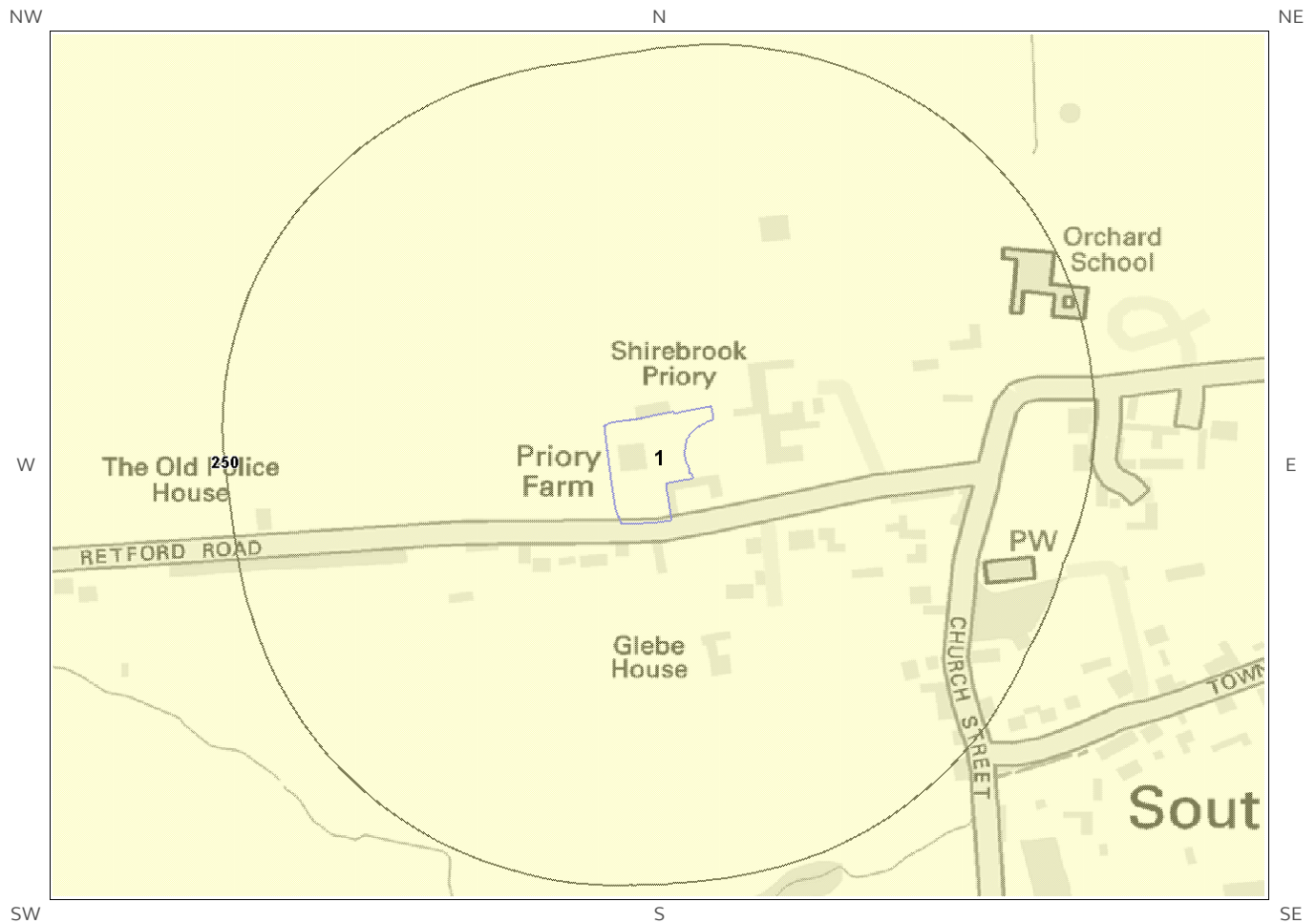


Landslides Legend

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6.3 Ground Dissolution of Soluble Rocks map

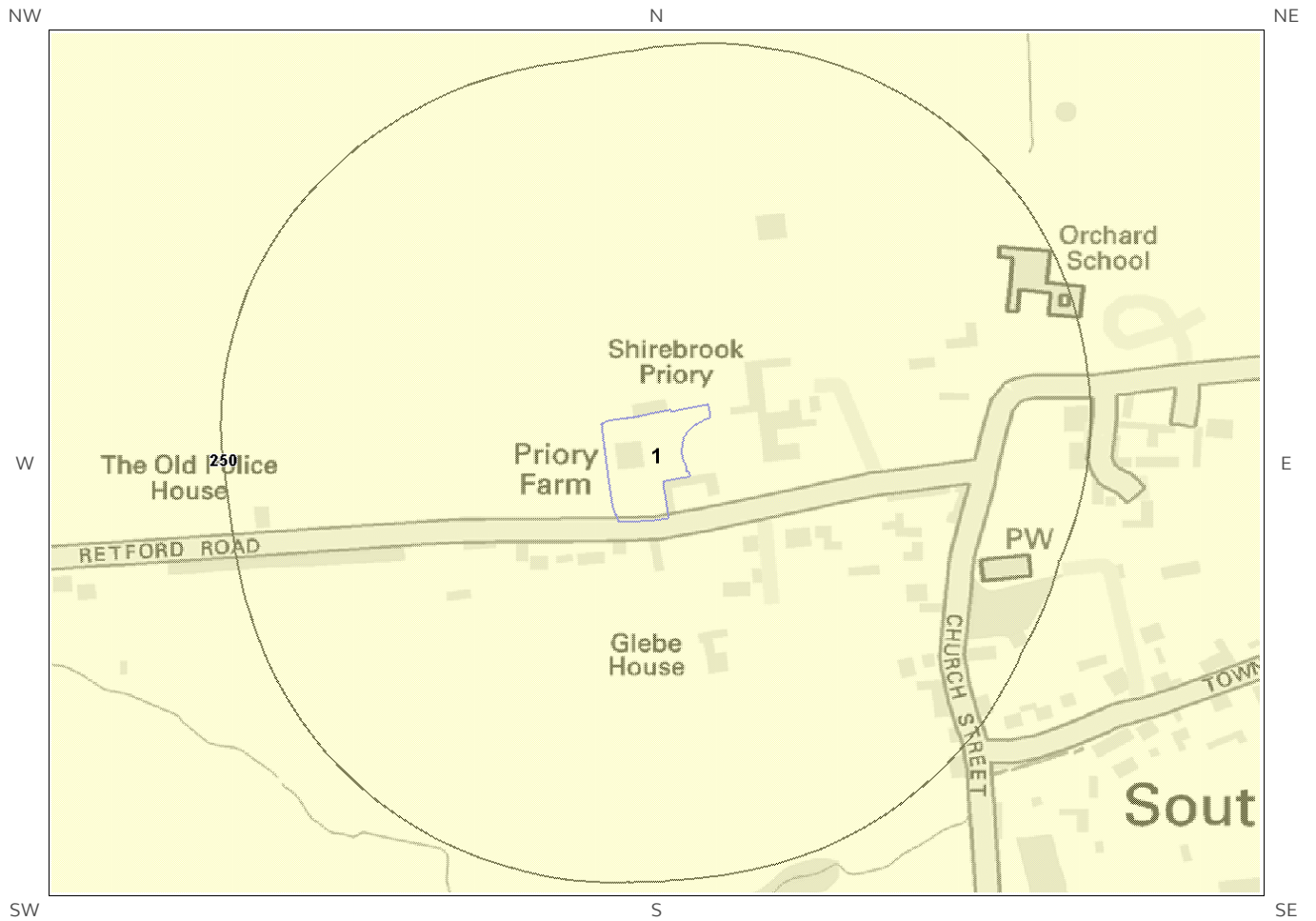


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Ground Dissolution Soluble Rocks Legend



6.4 Compressible Deposits map



Compressible Deposits Legend

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6.5 Collapsible Deposits map

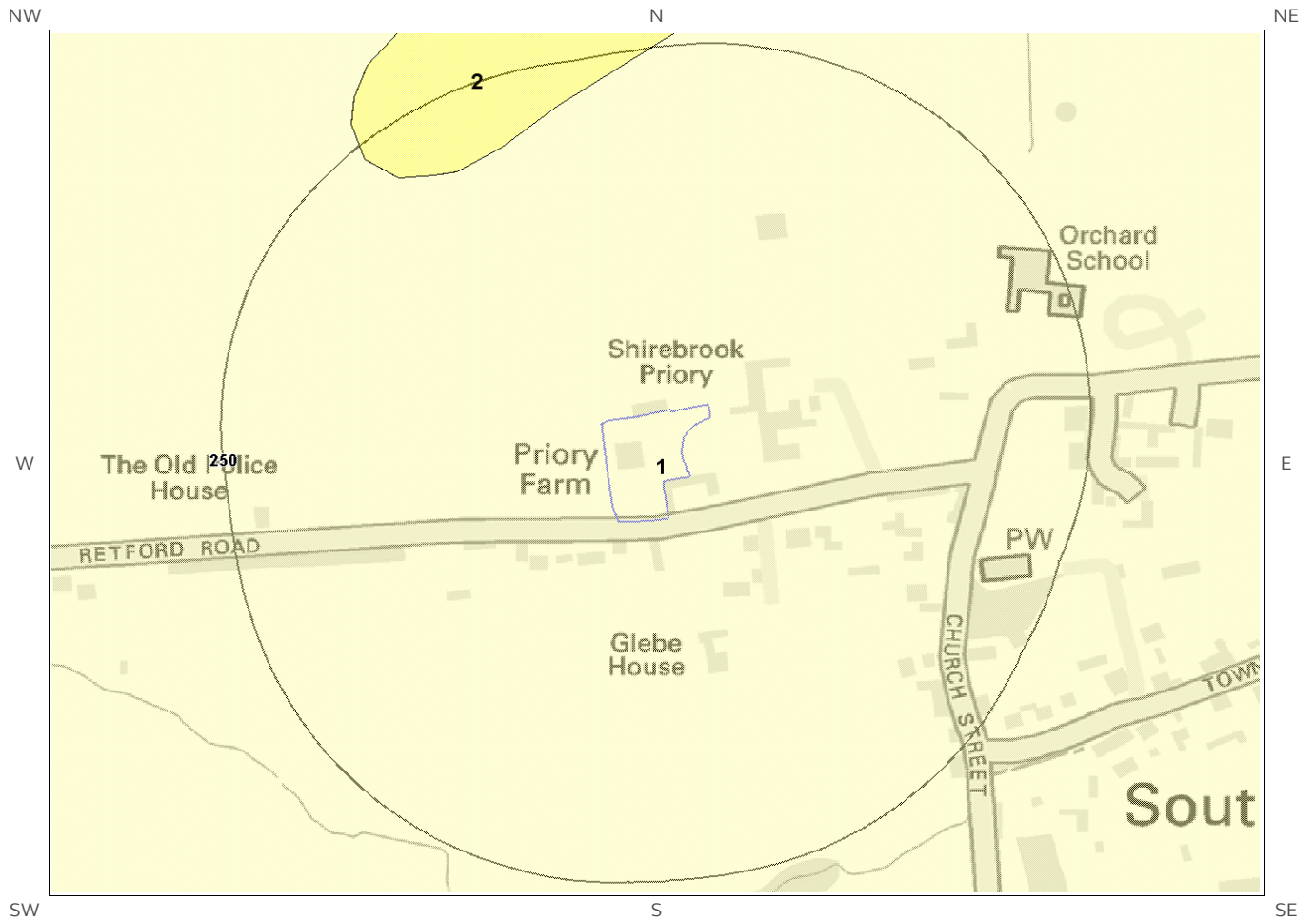


Collapsible Deposits Legend

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6.6 Running Sand map



Running Sand Legend

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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	Very Low	Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.

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:

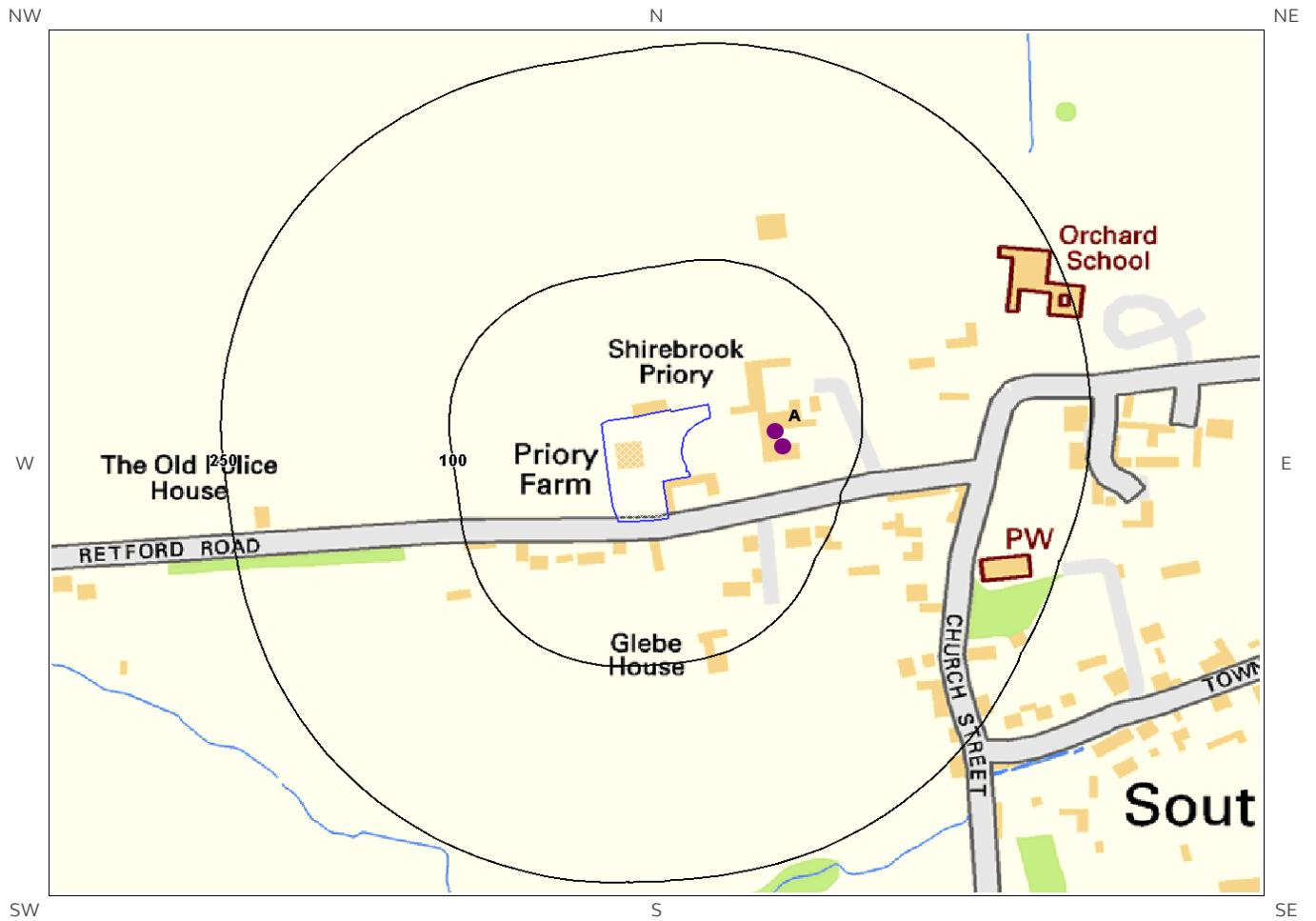
ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible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

6.6 Running Sands

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

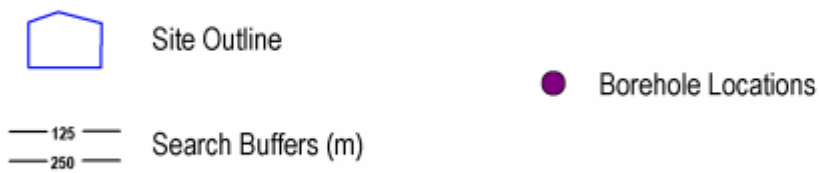
ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due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

7 Borehole Records map



Borehole Records Legend

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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:

2

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
1A	44.0	E	478190 381200	SK78SE43	10.67	RETFORD ROAD SOUTH LEVERTON
2A	52.0	SE	478195 381189	SK78SE2	-1.0	COL MORGANS HOUSE

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.

#1A: scans.bgs.ac.uk/sobi_scans/boreholes/239973

8 Estimated Background Soil Chemistry

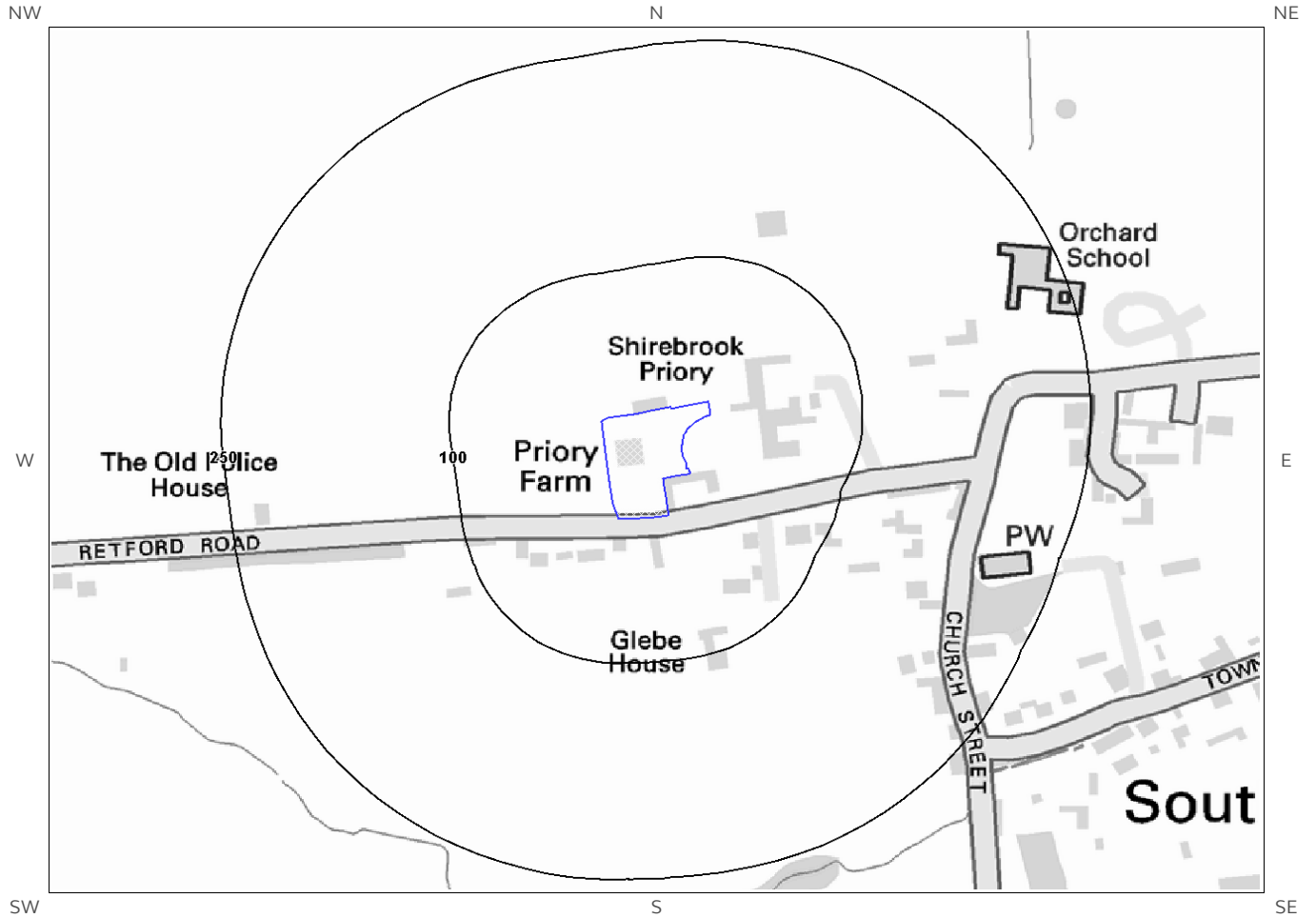
Records of background estimated soil chemistry within 250m of the study site boundary: 1

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	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	<100 mg/kg

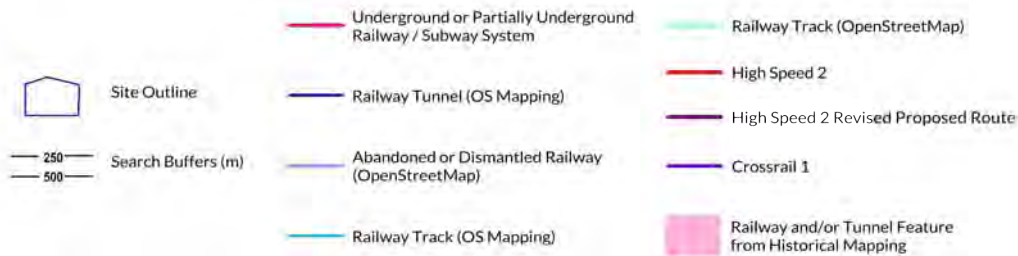
*As this data is based upon underlying 1:50,000 scale geological information, a 50m buffer has been added to the search radius.

9 Railways and Tunnels map



Railways and Tunnels Legend

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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.

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APPENDIX III

Groundsure Enviro Insight Report

Address: NEW STUD FARM, RETFORD ROAD, SOUTH LEVERTON, DN22 0BY
Date: 9 Apr 2018
Reference: HMD-4866250
Client: Castle Rock Geotech



Aerial Photograph Capture date: 23-Aug-2015
Grid Reference: 478103,381181
Site Size: 0.35ha

Report Reference: HMD-4866250
Client Reference: 180401N

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Overview of Findings

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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	10
1.2 Additional Information – Historical Tank Database	0	0	0	0
1.3 Additional Information – Historical Energy Features Database	0	0	0	1
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	4
1.6 Potentially Infilled Land	0	0	0	5
Section 2: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	0
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	0
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	0	0	0
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	0	0	0	1
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
2.1.8 Records of Licensed Discharge Consents	0	0	0	0
2.1.9 Records of Water Industry Referrals	0	0	0	0
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	0	0	0	0
2.2 Records of COMAH and NIHHS sites	0	0	0	0
2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents				
2.3.1 National Incidents Recording System, List 2	0	0	0	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	0	Not searched
4.2 Records of Petrol and Fuel Sites	0	0	0	1
4.3 National Grid Underground Electricity Cables	0	0	0	0
4.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 5: Geology	
5.1 Are there any records of Artificial Ground and Made Ground present beneath the study site?	None identified
5.2 Are there any 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 Are there any records of Strata Classification in the Superficial Geology within 500m of the study site?	Identified					
6.2 Are there any 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	2
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)	0	0	0	0	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 Is there any Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site?	No	No	No	No	No	Yes
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 Are there any Environment Agency Zone 2 floodplains within 250m of the study site?	None identified
7.2 Are there any Environment Agency/Natural Resources Wales Zone 3 floodplains within 250m of the study site	None identified
7.3 What is the Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site?	Very Low
7.4 Are there any Flood Defences within 250m of the study site?	None identified
7.5 Are there any areas benefiting from Flood Defences within 250m of the study site?	None identified
7.6 Are there any areas used for Flood Storage within 250m of the study site?	None identified
7.7 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Not Prone
7.8 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	Not Applicable

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	2
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	0
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	0	0	0	0
8.11 Records of National Parks	0	0	0	0	0	0
8.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
8.13 Records of Nitrate Vulnerable Zones	2	0	0	1	2	5
8.14 Records of Green Belt land	0	0	0	0	0	0

Section 9: Natural Hazards

9.1 What is the maximum risk of natural ground subsidence?

Very Low

9.1.1 What is the maximum Shrink-Swell hazard rating identified on the study site?

Very Low

9.1.2 What is the maximum Landslides hazard rating identified on the study site?

Very Low

9.1.3 What is the maximum Soluble Rocks hazard rating identified on the study site?

Negligible

9.1.4 What is the maximum Compressible Ground hazard rating identified on the study site?

Negligible

9.1.5 What is the maximum Collapsible Rocks hazard rating identified on the study site?

Very Low

9.1.6 What is the maximum Running Sand hazard rating identified on the study site?

Negligible

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 Are there any coal mining areas within 75m of the study site?

None identified

10.2 Are there any Non-Coal Mining areas within 50m of the study site boundary?

None identified

10.3 Are there any 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 licenses, 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.

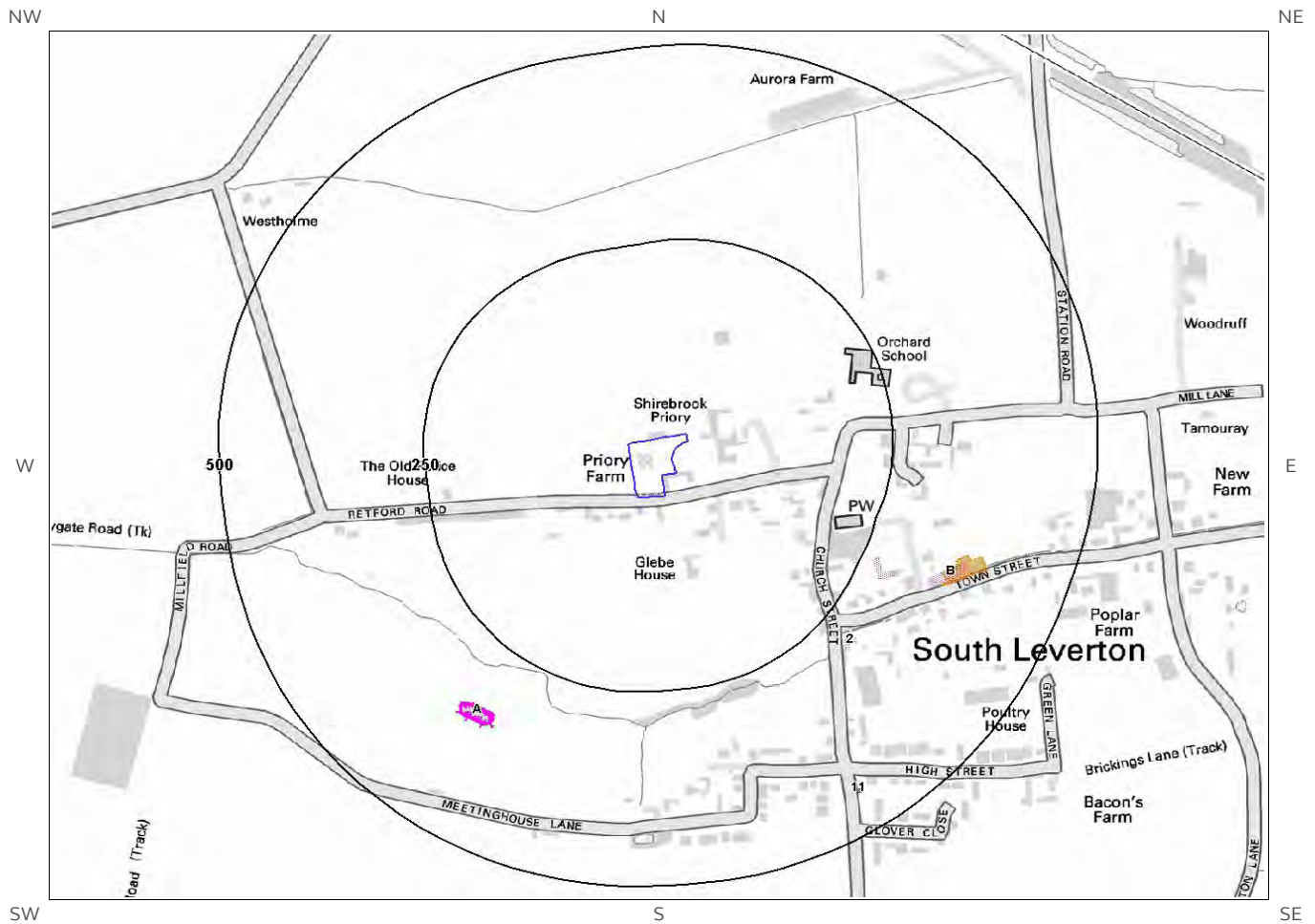
Note: Maps

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



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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: 10

ID	Distance [m]	Direction	Use	Date
1	264	SE	Smithy	1900
2	286	SE	Smithy	1900
3A	330	SW	Unspecified Pit	1951
4A	331	SW	Unspecified Pit	1916
5A	332	SW	Unspecified Pit	1947
6A	332	SW	Unspecified Pit	1947
7A	334	SW	Unspecified Pit	1900
8B	337	SE	Smithy	1916
9B	347	E	Smithy	1951
10B	349	E	Smithy	1947

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: 0

Database searched and no data found.

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: 1

ID	Distance (m)	Direction	Use	Date
11	443	SE	Electricity Substation	1989

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: 4

ID	Distance (m)	Direction	Use	Date
12B	348	E	Garage	1989
13B	348	E	Garage	1989
14B	348	E	Garage	1968
15B	349	E	Garage	1972

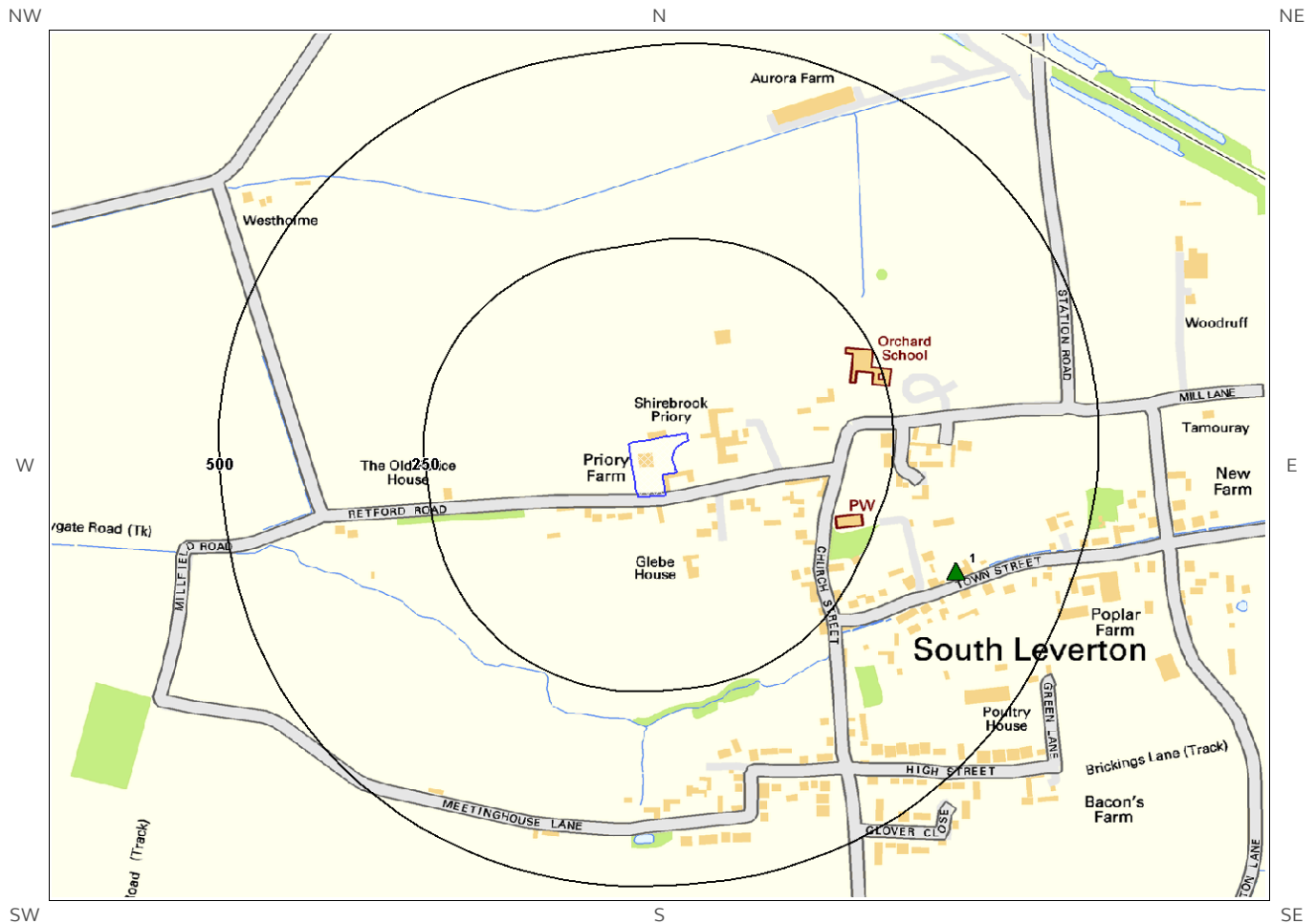
1.6 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 5

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

ID	Distance(m)	Direction	Use	Date
16A	330	SW	Unspecified Pit	1951
17A	331	SW	Unspecified Pit	1916
18A	332	SW	Unspecified Pit	1947
19A	332	SW	Unspecified Pit	1947
20A	334	SW	Unspecified Pit	1900

2. Environmental Permits, Incidents and Registers Map



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- | | | | | | |
|---|-------------------------------|---|--|---|---|
|  | Site Outline |  | Recorded Pollution Incident |  | RAS 3 & 4 Authorisations |
|  | Dangerous Substances (List 1) |  | Part A(1) Authorised Processes and Historic IPC Authorisations |  | Part A(2) and Part B Authorised Processes |
|  | Dangerous Substances (List 2) |  | Water Industry Referrals |  | COMAH / NIHHS Sites |
|  | Search Buffers (m) |  | Licenced Discharge Consents |  | Sites Determined as Contaminated Land |
|  | 250 |  | Red List Discharge Consents |  | Hazardous Substance Consents and Enforcements |
|  | 500 | | | | |

2. Environmental Permits, Incidents and Registers

2.1 Industrial Sites Holding Licences and/or Authorisations

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

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

0

Database searched and no data found.

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

0

Database searched and no data found.

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

0

Database searched and no data found.

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

0

Database searched and no data found.

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

0

Database searched and no data found.

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

1

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

ID	Distance (m)	Direction	NGR	Details
1	363	E	478474 381038	Address: CJ Bradley, The Garage, South Leverton, DN22 0BT Process: Waste Oil Burner Status: Historical Permit Permit Type: Part B Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified

2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:

0

Database searched and no data found.

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

0

Database searched and no data found.

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

0

Database searched and no data found.

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

0

Database searched and no data found.

2.2 Dangerous or Hazardous Sites

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

0

Database searched and no data found.

2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents

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

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.

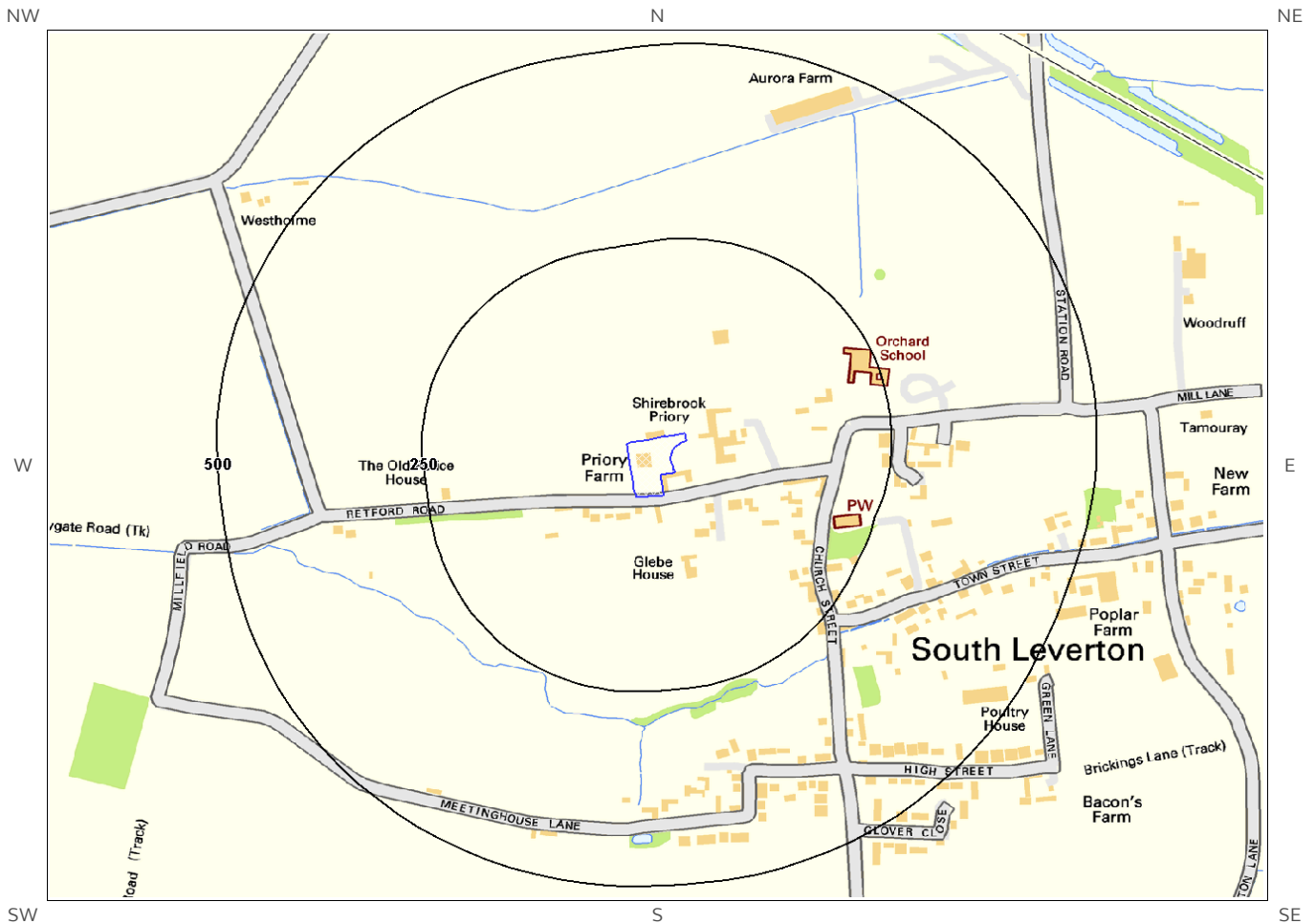
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

How many records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site?










0

Database searched and no data found.

3. Landfill and Other Waste Sites Map



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- | | | | | | |
|---|------------------------|---|---------------------------|---|---|
|  | Site Outline |  | EA/NRW Active Landfill |  | Historic and Planned Waste Sites |
|  | 250 Search Buffers (m) |  | EA/NRW Historic Landfill |  | EA/NRW Licensed Waste Site |
|  | 500 Search Buffers (m) |  | BGS / DoE Survey Landfill |  | 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

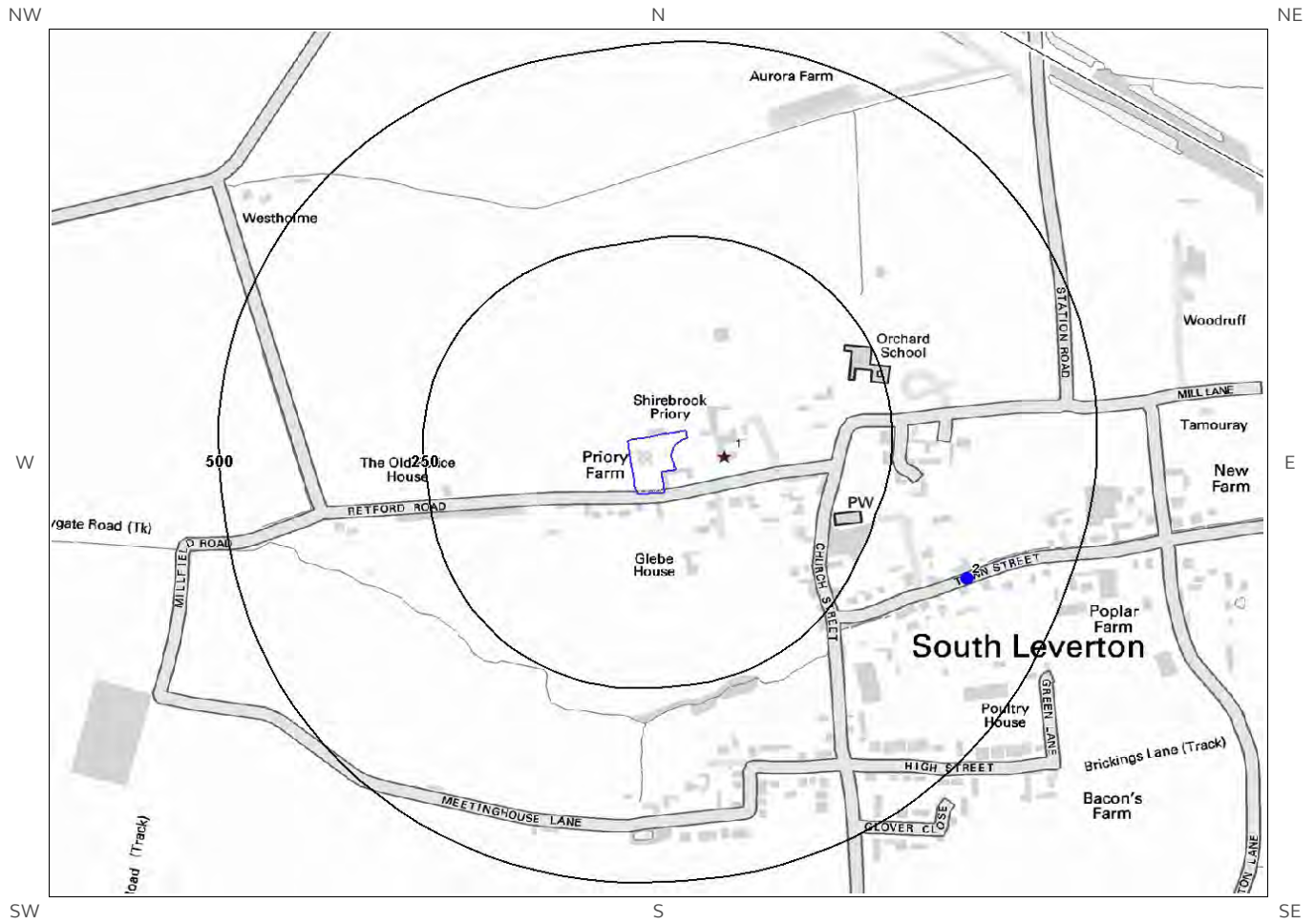
Database searched and no data found.

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



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-  Site Outline
-  Current Industrial Sites
-  Electricity Transmission Cables
-  Search Buffers (m)
-  Petrol & Fuel Sites
-  Gas Transmission Pipelines

4. Current Land Uses

4.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site: 1

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

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1	50	SE	Tompkins Transport Ltd	478192 381186	New Farm, Retford Road, South Leverton, Retford, DN22 0BY	Waste Storage, Processing and Disposal	Infrastructure and Facilities

4.2 Petrol and Fuel Sites

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

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

ID	Distance (m)	Direction	NGR	Company	Address	LPG	Status
2	381	E	478488 381029	Unbranded	The Garage, Town Street, Town Street, South Leverton, Retford, Nottinghamshire, DN22 0BT	No	Open

4.3 National Grid High Voltage Underground Electricity Transmission Cables

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

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

Database searched and no data found.

4.4 National Grid High Pressure Gas Transmission Pipelines

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

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

Database searched and no data found.

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

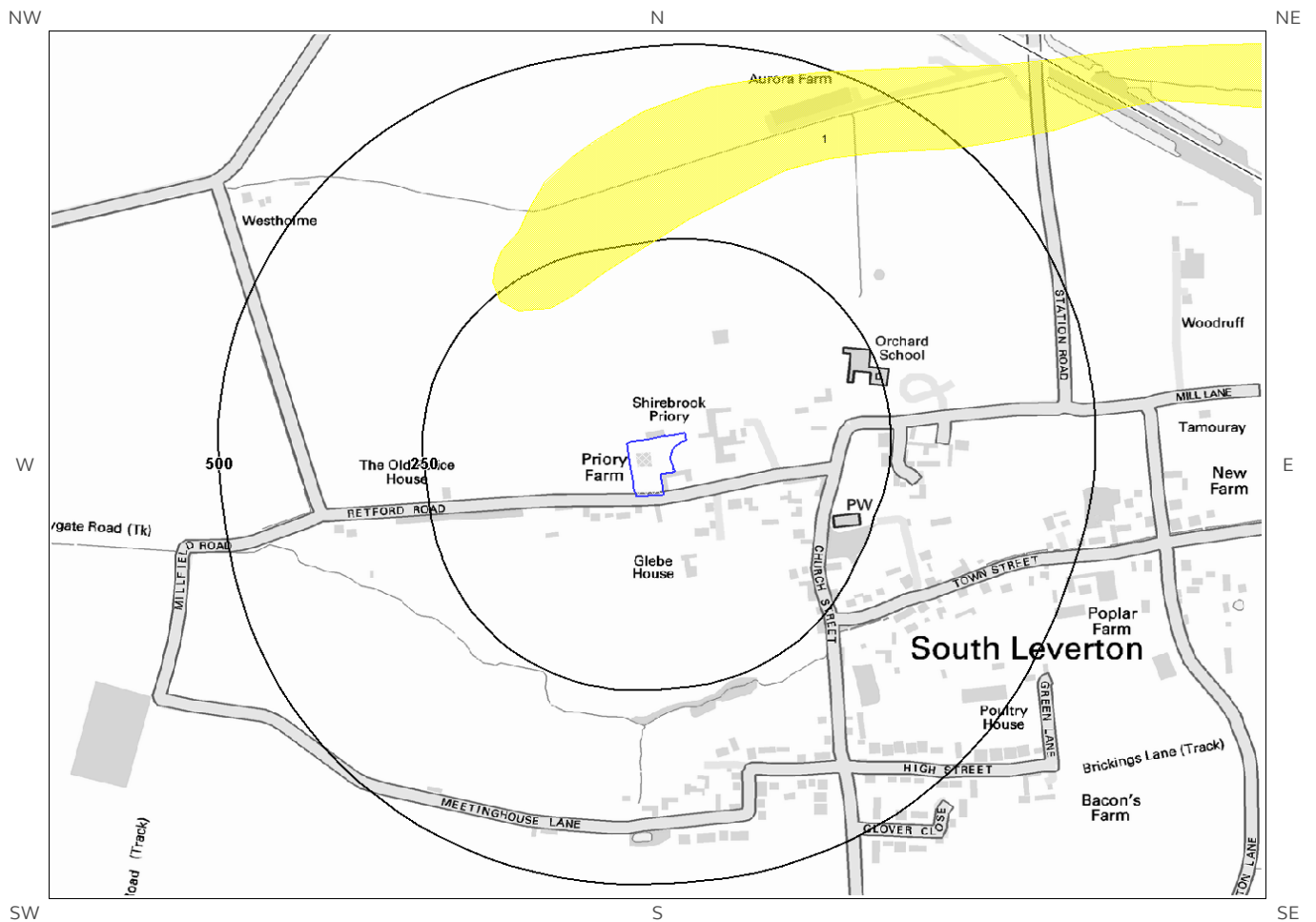
The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
MMG-MDST	MERCIA MUDSTONE GROUP	MUDSTONE

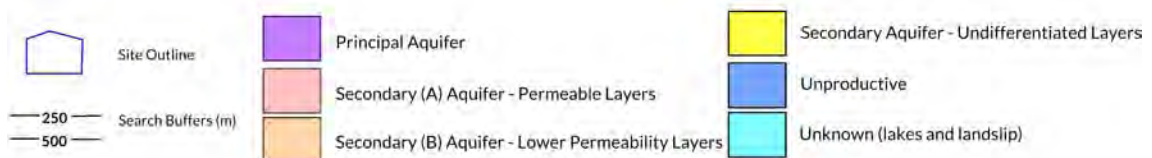
(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

6 Hydrogeology and Hydrology

6a. Aquifer Within Superficial Geology



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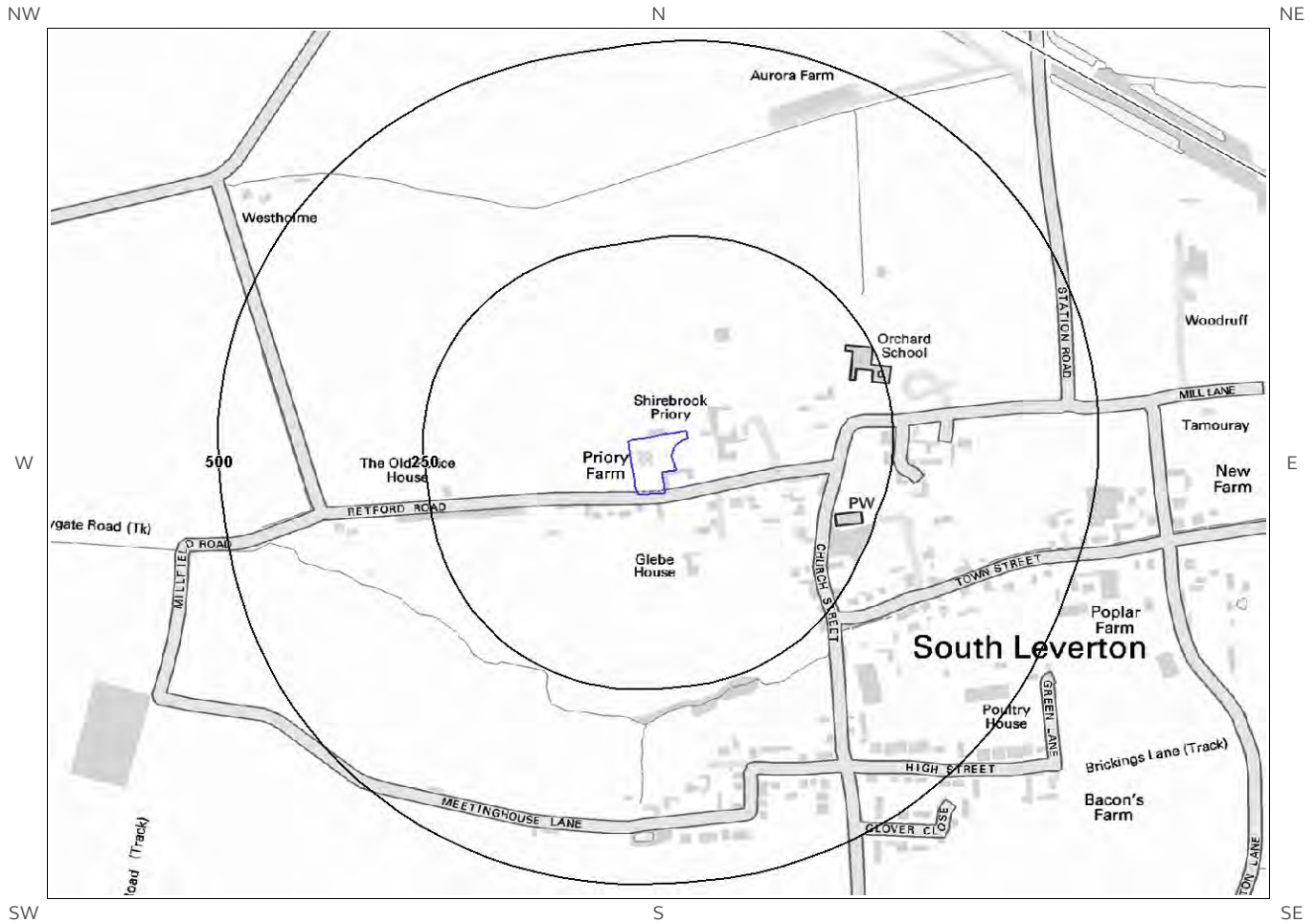
6b. Aquifer Within Bedrock Geology and Abstraction Licenses



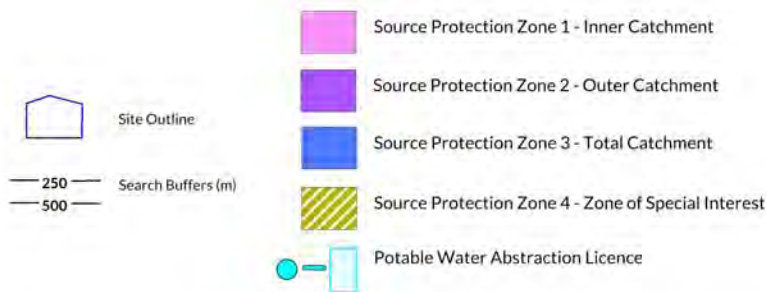
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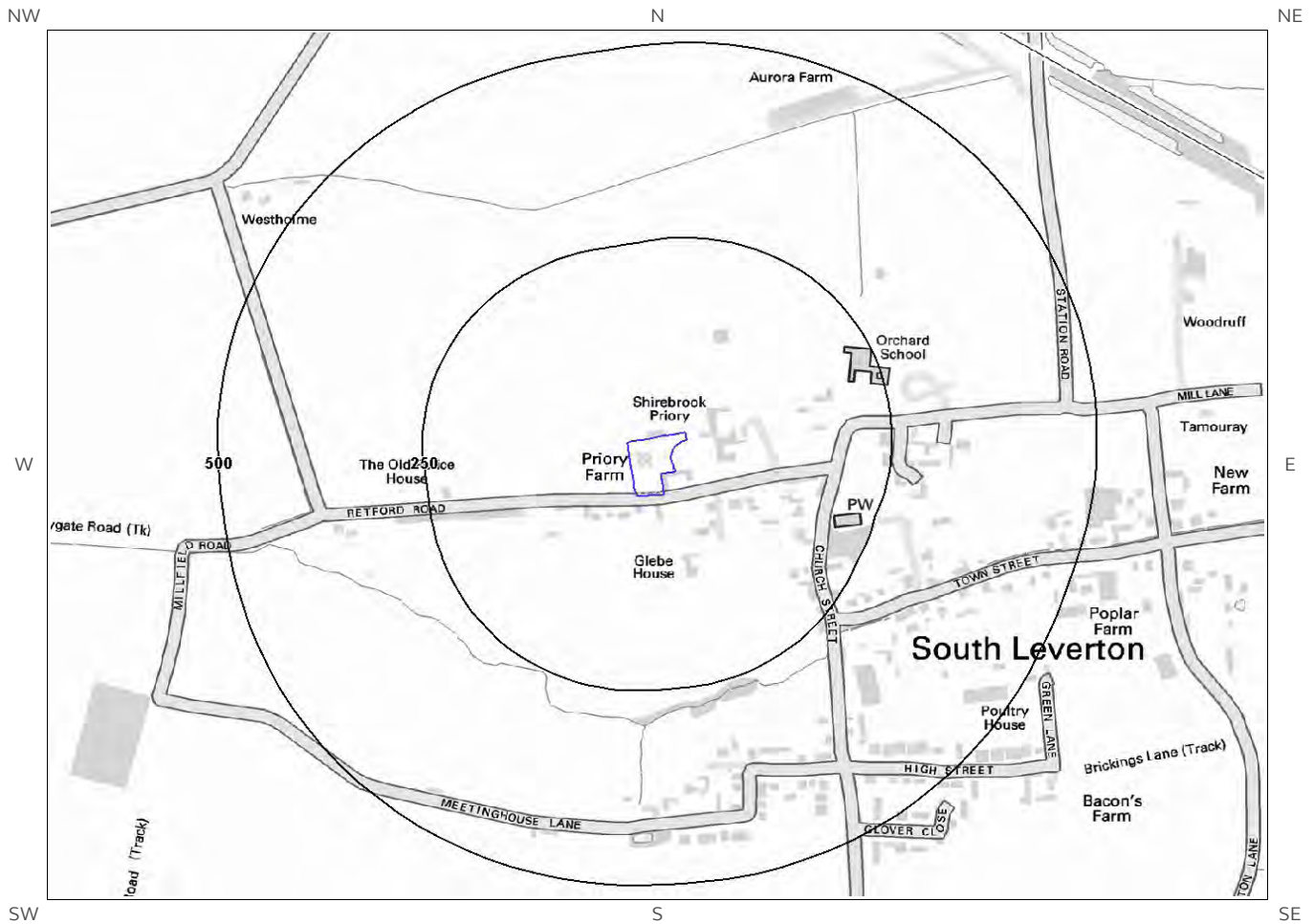
6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses



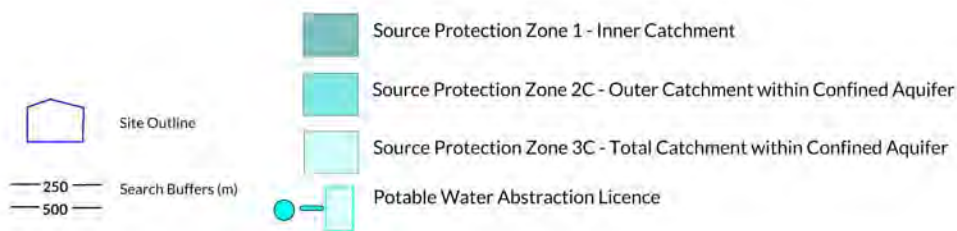
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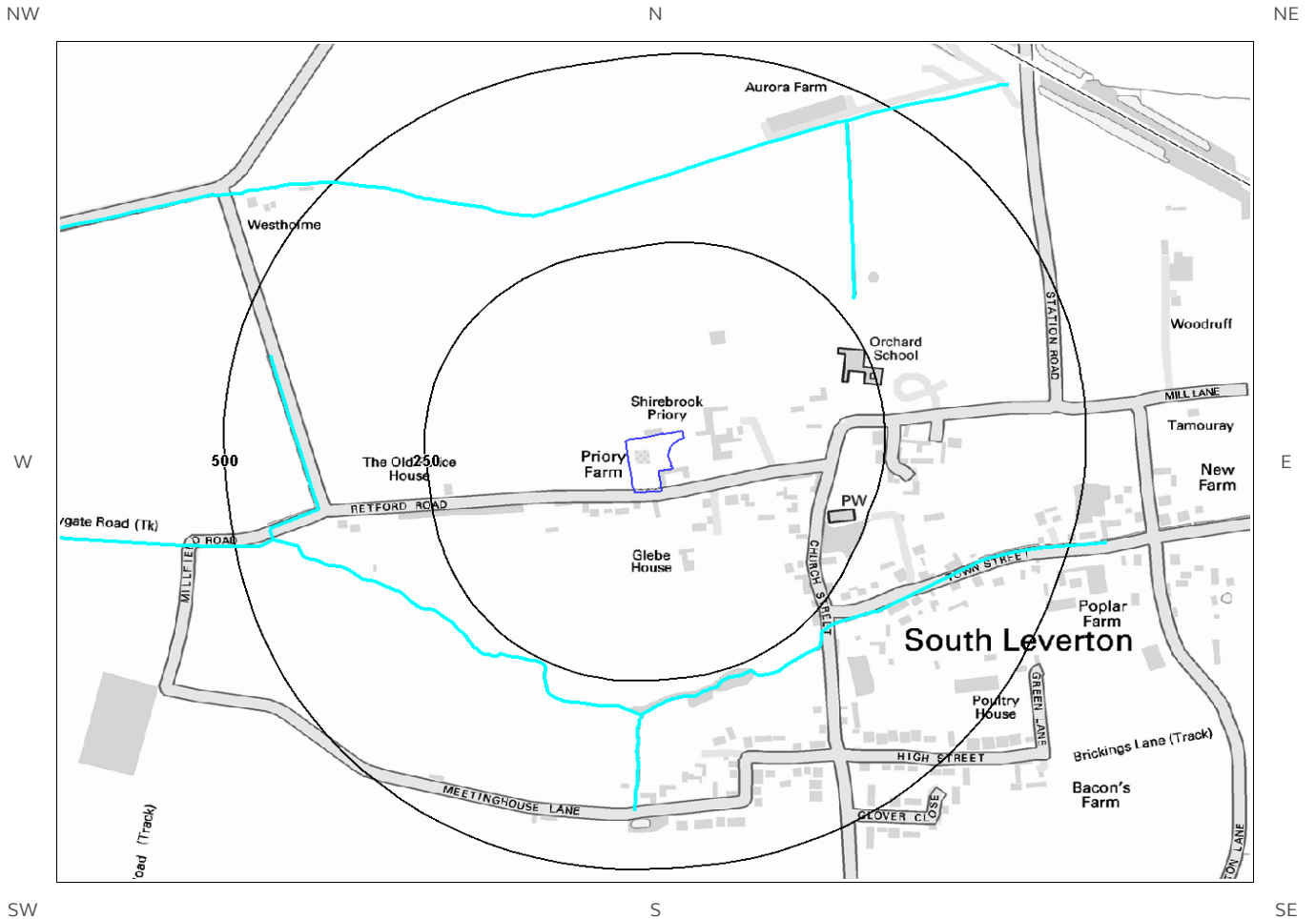
6d. Hydrogeology – Source Protection Zones within confined aquifer



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6e. Hydrology – Watercourse Network and River Quality



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6. Hydrogeology and Hydrology

6.1 Aquifer within Superficial Deposits

Are there 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	199	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

Are there 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	Secondary B	Predominantly lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers

6.3 Groundwater Abstraction Licences

Are there any Groundwater Abstraction Licences within 2000m of the study site? None identified

Database searched and no data found.

6.4 Surface Water Abstraction Licences

Are there any 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	1431	SE	479400 380500	Status: Historical Licence No: 03/28/69/0251 Details: Spray Irrigation - Direct Direct Source: Surface Water Midlands Region Point: South Leverton - Catchwater Drain Data Type: Point Name: J S HIGHFIELD AND SONS Annual Volume (m ³): - Max Daily Volume (m ³): - Application No: - Original Start Date: 20/8/1996 Expiry Date: 31/10/2006 Issue No: 100 Version Start Date: 1/4/2003 Version End Date:
Not shown	1431	SE	479400 380500	Status: Historical Licence No: 03/28/69/0251/1 Details: Spray Irrigation - Direct Direct Source: Surface Water Midlands Region Point: South Leverton - Catchwater Drain Data Type: Point Name: J S HIGHFIELD AND SONS Annual Volume (m ³): 45000 Max Daily Volume (m ³): 900 Application No: - Original Start Date: 8/8/2003 Expiry Date: 31/3/2015 Issue No: 1 Version Start Date: 8/8/2003 Version End Date:

6.5 Potable Water Abstraction Licences

Are there any Potable Water Abstraction Licences within 2000m of the study site? None identified

Database searched and no data found.

6.6 Source Protection Zones

Are there any 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

Are there any 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

Is there any Environment Agency/Natural Resources Wales information on groundwater vulnerability and soil leaching potential within 500m of the study site? None identified

Database searched and no data found.

6.9 River Quality

Is there any Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site? Identified

6.9.1 Biological Quality:

Database searched and no data found.

6.9.2 Chemical Quality:

Chemical quality data is based on the General Quality Assessment Headline Indicators scheme (GQAHI). In England, each chemical sample is measured for ammonia and dissolved oxygen. In Wales, the samples are measured for biological oxygen demand (BOD), ammonia and dissolved oxygen. The results are graded from A ('Very Good') to F ('Bad').

The following Chemical Quality records are shown on the Hydrology Map (6e):

ID	Distance (m)	Direction	NGR	River Quality Grade	Chemical Quality Grade				
					2005	2006	2007	2008	2009
Not shown	1419	E	479470 381730	River Name: Catchwater Drain Reach: Trib From North Leverton To R Trent End/Start of Stretch: Start of Stretch NGR	B	B	B	B	B

6.10 Ordnance Survey MasterMap Water Network

Are there any Ordnance Survey MasterMap Water Network entries within 500m of the study site?

#DRN_Count#

#NDF_DRN_tag#

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	254 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
2	254 SW	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
2	262 S	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
3	262 S	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
3	264 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: 0.5
4	264 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: 0.5
4	275 NE	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
5	275 NE	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
5	285 NE	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
6	285 NE	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
6	295 S	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
Not shown	295 S	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
7	308 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: Not provided Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
8	308 SE	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: Not provided Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
8	317 N	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
Not shown	317 N	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
9	390 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
Not shown	390 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
10	400 E	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: 2.3
Not shown	400 E	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: 2.3

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
11	452 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
12	452 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: Not provided Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
Not shown	452 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
Not shown	452 W	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: Not provided Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
13	457 NE	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
Not shown	457 NE	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
14	458 NE	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
Not shown	458 NE	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
15	463 E	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: Not provided Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
Not shown	463 E	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: Not provided Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
16	470 E	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: 2.2
Not shown	470 E	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: 2.2

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
17	494 NW	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided
Not shown	494 NW	-	Inland river not influenced by normal tidal action.	Catchment Area: Trent Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section: Not Provided

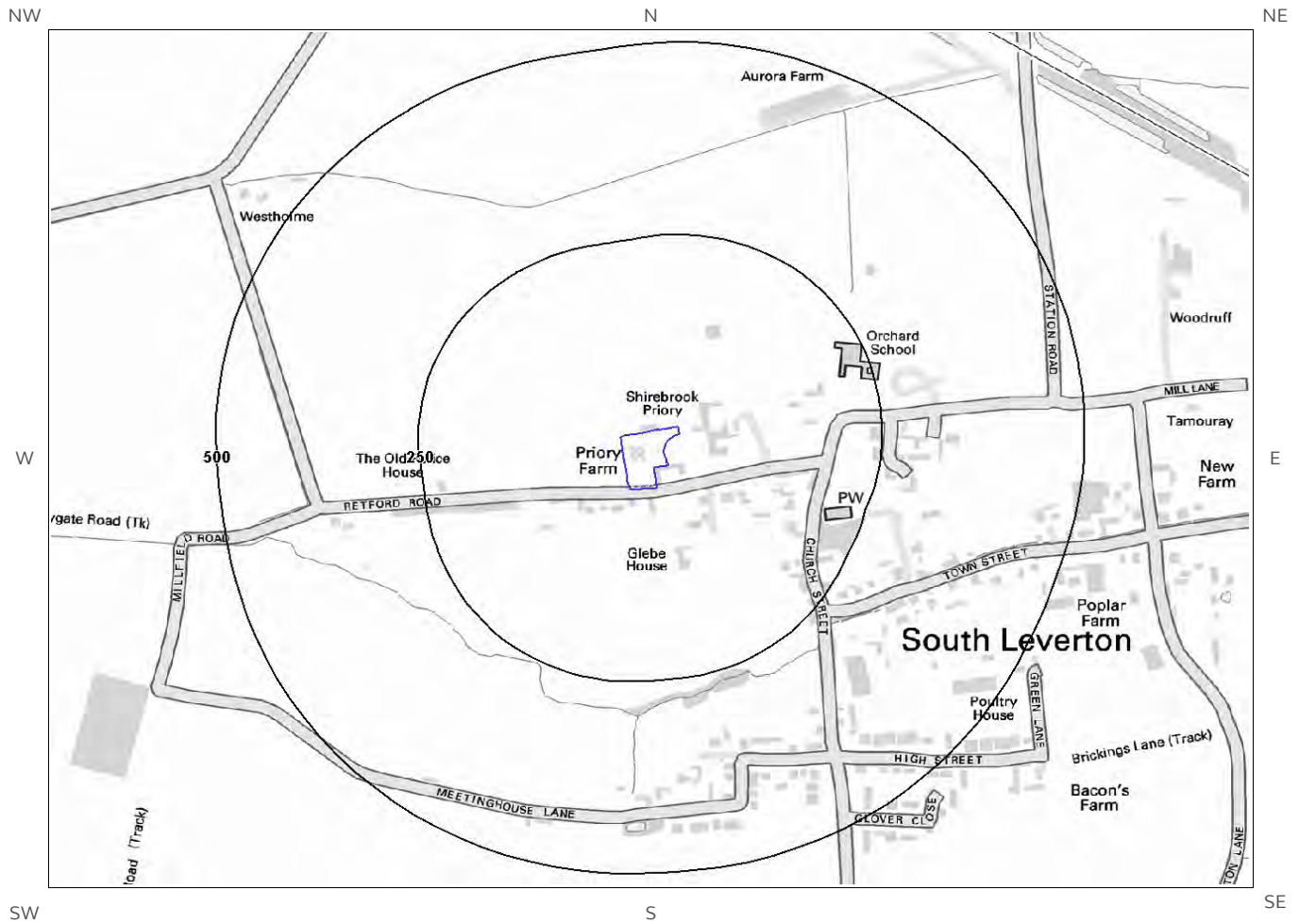
6.11 Surface Water Features

Are there any surface water features within 250m of the study site?

None identified

Database searched and no data found.

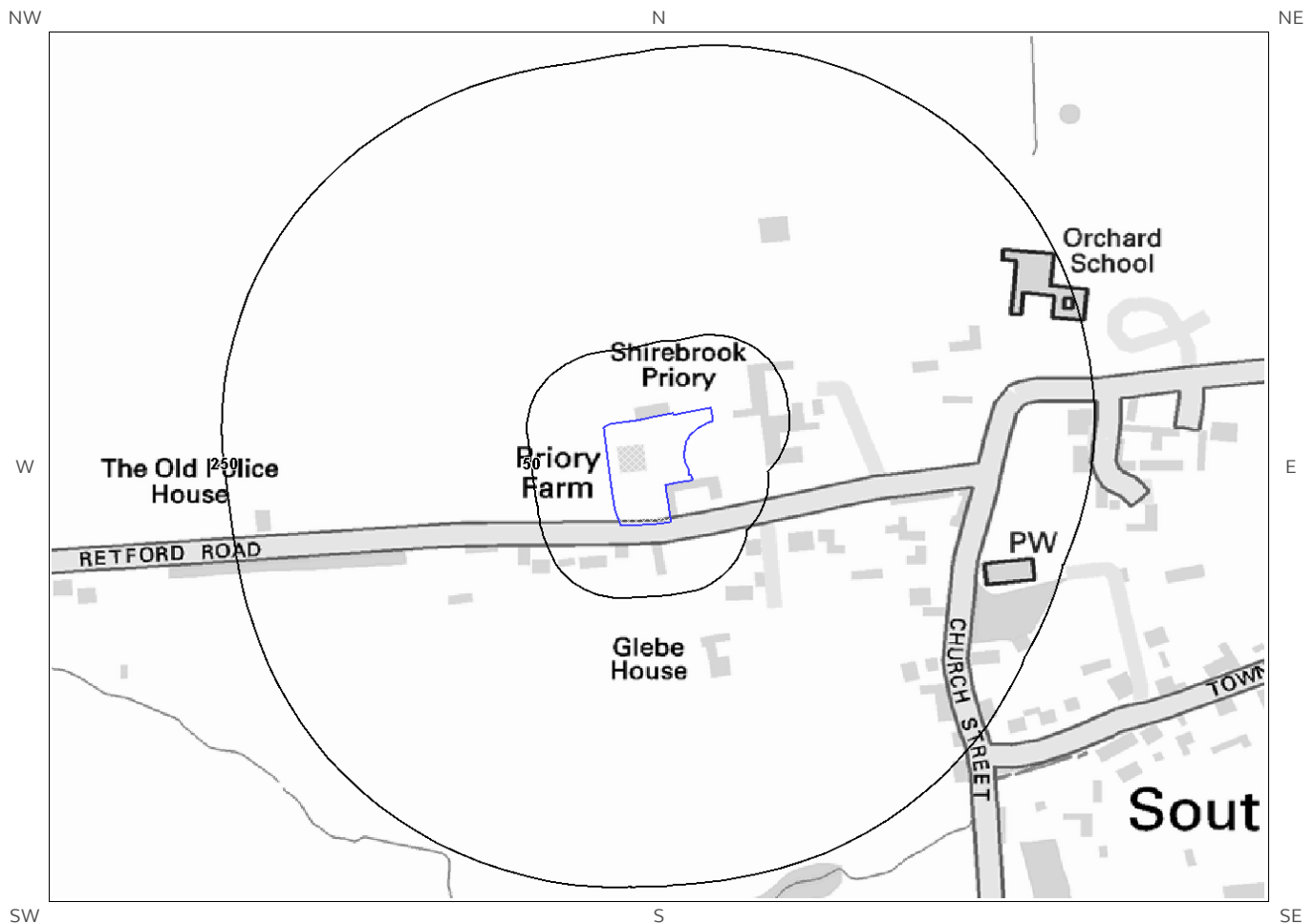
7a. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)



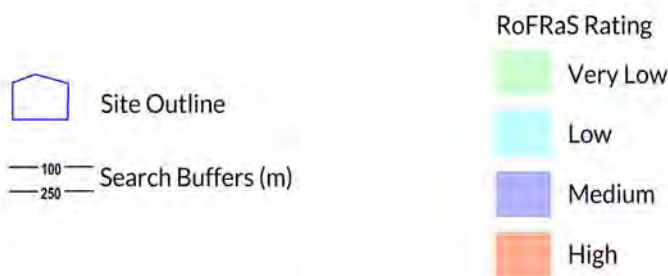
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7b. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) Map



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7 Flooding

7.1 River and Coastal Zone 2 Flooding

Is the site within 250m of an Environment Agency/Natural Resources Wales Zone 2 floodplain? 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

Is the site within 250m of an Environment Agency/Natural Resources Wales Zone 3 floodplain? 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

What is the 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

Are there any Flood Defences within 250m of the study site? None identified
Database searched and no data found.

7.5 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? None identified

7.6 Areas benefiting from Flood Storage

Are there any areas used for Flood Storage within 250m of the study site? None identified

7.7 Groundwater Flooding Susceptibility Areas

7.7.1 Are there any British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site? None identified

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 What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions?

The area is not considered to be prone to groundwater flooding based on rock type. Not Prone

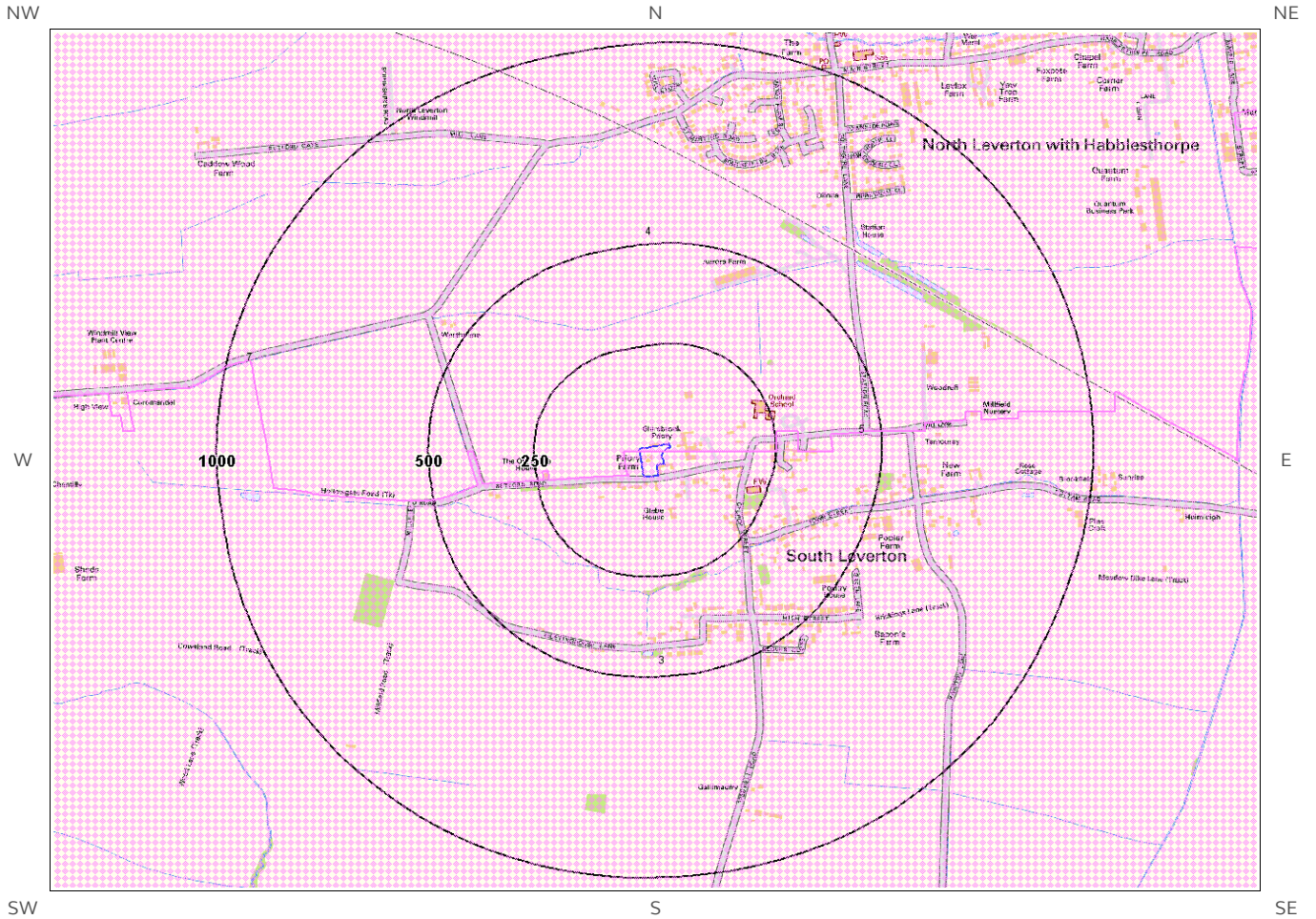
7.8 Groundwater Flooding Confidence Areas

What is the British Geological Survey confidence rating in this result? Not Applicable

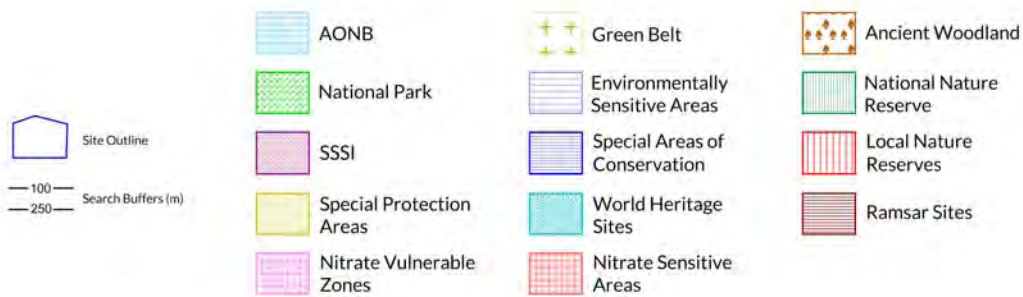
Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

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



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8. Designated Environmentally Sensitive Sites

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

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

2

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

ID	Distance (m)	Direction	SSSI Name	Data Source
Not shown	1123	S	Ashton's Meadow	Natural England
Not shown	1205	S	Ashton's Meadow	Natural England

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:

0

Database searched and no data found.

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:

0

Database searched and no data found.

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

0

Database searched and no data found.

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

0

Database searched and no data found.

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

10

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
3	0	On Site	Existing	DEFRA
4	0	On Site	Existing	DEFRA
5	454	E	Existing	DEFRA
6	662	W	Existing	DEFRA
7	948	W	Existing	DEFRA
Not shown	1137	S	Existing	DEFRA
Not shown	1712	W	Existing	DEFRA
Not shown	1728	NE	Existing	DEFRA
Not shown	1831	W	Existing	DEFRA
Not shown	1853	E	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

What is the maximum Shrink-Swell* 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
Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.

9.1.2 Landslides

What is the 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

What is the 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

What is the 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

What is the 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

What is the maximum Running Sand** 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 running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

* 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

Are there any coal mining areas within 75m of the study site? None identified

Database searched and no data found.

10.2 Non-Coal Mining

Are there any Non-Coal Mining areas within 50m of the study site boundary? None identified

Database searched and no data found.

10.3 Brine Affected Areas

Are there any brine affected areas within 75m of the study site? None identified
Guidance: No Guidance Required.

Contact Details

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

British Geological Survey Enquiries

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:

Web: www.bgs.ac.uk

BGS Geological Hazards Reports and general geological enquiries:
enquiries@bgs.ac.uk

Environment Agency

National Customer Contact Centre, PO Box 544
Rotherham, S60 1BY
Tel: 03708 506 506

Web: www.environment-agency.gov.uk

Email: enquiries@environment-agency.gov.uk

Public Health England

Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
www.gov.uk/phe

Email: enquiries@phe.gov.uk
Main switchboard: 020 7654 8000

The Coal Authority

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

Ordnance Survey

Adanac Drive, Southampton
SO16 0AS
Tel: 08456 050505

Local Authority

Authority: Bassetlaw District Council
Phone: 01909 533 533

Web: <http://www.bassetlaw.gov.uk/>

Address: Queen s Buildings, Potter Street, Worksop, Nottinghamshir,

Gemapping PLC

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



Public Health
England




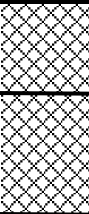
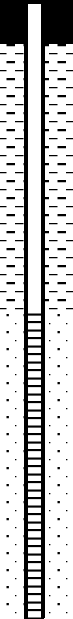

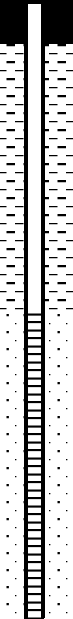
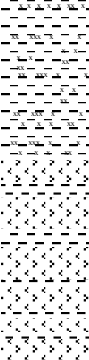
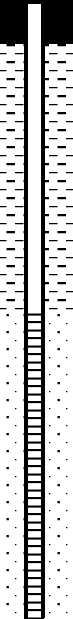
The Coal
Authority




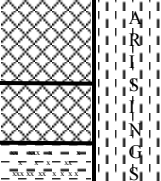
APPENDIX IV

Borehole Logs



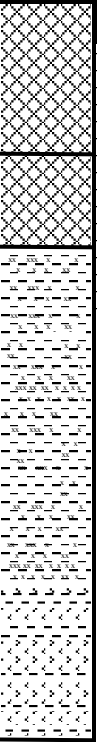
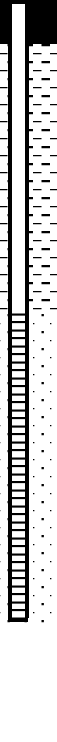


BOREHOLE RECORD

 CASTLE ROCK GEOTECH <i>Geological, Geotechnical & Environmental Consultants Nottingham, England.</i>		Project: Land at Priory Farm, Retford Road, South Leverton, Notts.		Client: Mr & Mrs W. Tompkins		Borehole No: BH01 Sheet 1 of 1					
Date: 19 th April 2018 Method / Equipment: Windowless Sampling / Premier 110 rig Boring Diameter: 101mm to 92mm				Co-ordinates: Site centred on 478103N - 381181E approx. Ground Level:							
Sampling Details		Water Level (m)	SPT N-value (seating / drive penetration)	Description of Strata	Depth (m) (thickness m)	Legend	Well				
Depth (m)	Type/No.										
0.00 - 1.00	C1 (100% recovery)	0.50 ▼		MADE GROUND: 'Compact' brown becoming dark grey gravelly HARDCORE fill becoming clayey towards base. Gravel is fine to coarse angular of various lithologies.	(0.30)						
				MADE GROUND: Firm brown friable structureless slightly sandy very silty CLAY with occasional fine gravel grade brick fragments. (Reworked Former Topsoil)	(0.40)						
0.90 - 1.00	D1 (T)		N=11 (S) (1,2/2,2,3,4)	Stiff to very stiff brownish red occasionally mottled grey green closely fissured slightly sandy very silty medium strength CLAY with intact mudstone lithorelicts. Strong hydrocarbon (diesel?) odour throughout and occasionally with free product on fissures.	(0.70)						
1.00 - 1.45	SPT1			(Distinctly Weathered Mercia Mudstone Group)	(1.10)						
1.00 - 2.00	C2 (80% recovery)		N=50 (S) (11,12/12,12,13,13)	Extremely weak thinly bedded grey green SILTSTONE with pockets and interbeds of very stiff brownish red silty clay.	(1.80)						
1.60 - 1.70	D2 (T)			(Partially Weathered Mercia Mudstone Group)	(0.65)						
1.80 - 1.90	D3 (T)				2.45						
2.00 - 2.45	SPT2			End of borehole at 2.45m below existing ground level.							
SAMPLES / TESTS D Disturbed Sample (T plastic tub / J amber glass jar) B Bulk Sample U Undisturbed Sample (102mm) W Water Sample SPT Standard Penetration Test (S/C) N= No. of blows/300mm penetration in SPT/CPT * Sampler Sank (self weight) ▼ Water Strike ▼ Standing Water Level (S.W.L.) NR No Sample Recovery				REMARKS: 1. Hand shear vane (HSV) test carried out at 0.70m - 72kN/m ² . 2. Sampler refusal at 2.00m. 3. Groundwater not encountered during drilling. S.W.L. on removal of drilling tools from borehole at 1.25m and 20 minutes after completion at 0.50m. 4. Ground gas / groundwater monitoring well (50mm i.d.) installed to 2.00m, (slotted response zone 2.00 to 1.00m), as detailed above. 5. SPT 'N' - values are uncorrected.				Scale: 1: 20 All dimensions in metres Logged by: RAL Checked by: RWJP Project Ref: 180401N			



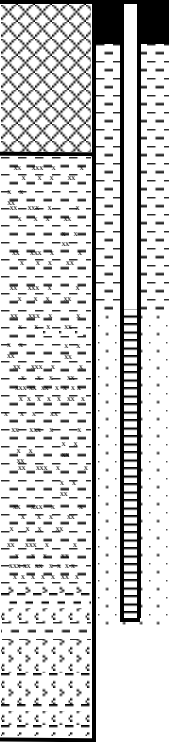
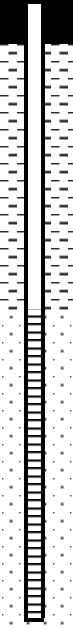


BOREHOLE RECORD

 CASTLE ROCK GEOTECH Geological, Geotechnical & Environmental Consultants Nottingham, England.		Project: Land at Priory Farm, Retford Road, South Leverton, Notts.					
		Client: Mr & Mrs W. Tompkins	Borehole No: BH02 Sheet 1 of 1				
Date: 19 th April 2018 Method / Equipment: Windowless Sampling / Premier 110 rig Boring Diameter: 101mm to 92mm		Co-ordinates: Site centred on 478103N - 381181E approx. Ground Level:					
Sampling Details		Water Level (m)	SPT N-value (seating / drive penetration)	Description of Strata	Depth (m) (thickness m)	Legend	Backfill
Depth (m)	Type/No.						
0.00 - 1.00	C1 (95% recovery)	0.65 ▼	N=17 (S) (2,3/3,4,5,5)	MADE GROUND: 'Compact' dark brown sandy gravelly HARDCORE fill becoming clayey towards base. Gravel is fine to coarse angular of various lithologies.	(0.30)		A R I S I N G S
0.20 - 0.40	D1 (T)			MADE GROUND: Firm grey brown friable structureless slightly sandy very silty CLAY with gravel grade fragments of brick, concrete, stone, black ash, and river gravel. (Reworked Former Topsoil)	(0.20)		
0.90 - 1.00	D2 (T)			Stiff to very stiff brownish red occasionally mottled grey green closely fissured friable slightly sandy very silty medium to high strength CLAY with intact mudstone lithorelicts. (Distinctly Weathered Mercia Mudstone Group)	(1.45)		
1.00 - 1.45	SPT1						
1.00 - 2.00	C2 (70% recovery)						
1.40 - 1.50	D3 (T)						
2.00 - 2.43	SPT2	2.10 ▼	50/285 (S) (10,10/13,12,15,10/60)	Extremely weak thinly bedded grey green SILTSTONE with pockets and interbeds of very stiff brownish red silty clay. (Partially Weathered Mercia Mudstone Group)	(0.45)		
				End of borehole at 2.40m below existing ground level.	2.40		
SAMPLES / TESTS D Disturbed Sample (T plastic tub / J amber glass jar) B Bulk Sample U Undisturbed Sample (102mm) W Water Sample SPT Standard Penetration Test (S/C) N= No. of blows/300mm penetration in SPT/CPT * Sampler Sank (self weight) ▼ Water Strike ▼ Standing Water Level (S.W.L.) NR No Sample Recovery				REMARKS: 1. Hand shear vane (HSV) test carried out at 0.80m - 53kN/m ² . 2. Sampler refusal at 2.00m. 3. Groundwater encountered at 2.10m. S.W.L. 20 minutes after completion at 0.65m. 4. Borehole backfilled with arisings at end of shift. 5. SPT 'N' - values are uncorrected.		Scale: 1: 20 All dimensions in metres Logged by: RAL Checked by: RWJP Project Ref: 180401N	


BOREHOLE RECORD

 CASTLE ROCK GEOTECH <i>Geological, Geotechnical & Environmental Consultants</i> Nottingham, England.		Project: Land at Priory Farm, Retford Road, South Leverton, Notts.					
		Client: Mr & Mrs W. Tompkins	Borehole No: BH03 Sheet 1 of 1				
Date: 19 th April 2018 Method / Equipment: Windowless Sampling / Premier 110 rig Boring Diameter: 101mm to 92mm		Co-ordinates: Site centred on 478103N - 381181E approx. Ground Level:					
Sampling Details		Water Level (m)	SPT N-value (seating / drive penetration)	Description of Strata	Depth (m) (thickness m)	Legend	Well
Depth (m)	Type/No.						
0.00 - 1.00 0.10 - 0.40	C1 (85% recovery) D1 (T)	1.50 	N=17 (S) (2,3/3,4,5,5)	MADE GROUND: 'Compact' dark grey sandy gravelly HARDCORE fill with frequent black ash. Gravel is fine to coarse angular of various lithologies including concrete.	(0.50)		
				MADE GROUND: Firm brown friable structureless slightly sandy very silty CLAY with rare fine gravel grade brick fragments. (Reworked Former Topsoil)	0.50 (0.30)		
0.90 - 1.00 1.00 - 1.45 1.00 - 2.00	D2 (T) SPT1 C2 (75% recovery)			Stiff to very stiff red brown becoming brownish red occasionally mottled grey green closely fissured slightly sandy very silty medium to high strength CLAY with intact mudstone lithorelicts. Moderate hydrocarbon (diesel?) odour throughout. (Distinctly Weathered Mercia Mudstone Group)	0.80 (1.10)		
1.50 - 1.60	D3 (T)						
1.90 - 2.00 2.00 - 2.41	D4 (T) SPT2		50/265 (S) (11,12/14,13,13,10/40)	Extremely weak thinly bedded grey green SILTSTONE with pockets and interbeds of very stiff brownish red silty clay. (Partially Weathered Mercia Mudstone Group)	1.90 (0.50)		
				End of borehole at 2.40m below existing ground level.	2.40		
SAMPLES / TESTS D Disturbed Sample (T plastic tub / J amber glass jar) B Bulk Sample U Undisturbed Sample (102mm) W Water Sample SPT Standard Penetration Test (S/C) N= No. of blows/300mm penetration in SPT/CPT * Sampler Sank (self weight)  Water Strike  Standing Water Level (S.W.L.) NR No Sample Recovery		REMARKS: 1. Hand shear vane (HSV) tests carried out at 0.80m - 57kN/m ² and 1.80m - 81kN/m ² . 2. Sampler refusal at 2.00m. 3. Groundwater not encountered during drilling. S.W.L. on removal of drilling tools from borehole at 1.60m and 20 minutes after completion at 1.50m. 4. Ground gas / groundwater monitoring well (50mm i.d.) installed to 2.00m, (slotted response zone 2.00 to 1.00m), as detailed above. 5. SPT 'N' - values are uncorrected.		Scale: 1: 20 All dimensions in metres Logged by: RAL Checked by: RWJP Project Ref: 180401N			

BOREHOLE RECORD

 CASTLE ROCK GEOTECH <i>Geological, Geotechnical & Environmental Consultants Nottingham, England.</i>		Project: Land at Priory Farm, Retford Road, South Leverton, Notts.						
		Client: Mr & Mrs W. Tompkins	Borehole No: BH04 Sheet 1 of 1					
Date: 19 th April 2018 Method / Equipment: Windowless Sampling / Premier 110 rig Boring Diameter: 101mm to 92mm		Co-ordinates: Site centred on 478103N - 381181E approx. Ground Level:						
Sampling Details		Water Level (m)	SPT N-value (seating / drive penetration)	Description of Strata	Depth (m) (thickness m)	Legend	Well	
Depth (m)	Type/No.							
0.00 - 1.00	C1 (90% recovery)	1.50 	N=23 (S) (3,4/5,5,6,7)	MADE GROUND: 'Compact' light grey sandy gravelly HARDCORE fill comprising mainly angular gravel and cobble grade crushed aggregate with occasional pieces of concrete.	(0.50)			
0.20 - 0.40	D1 (TJ)			Stiff to very stiff brownish red occasionally mottled grey green closely fissured slightly sandy very silty high strength CLAY with intact mudstone lithorelicts. (Distinctly Weathered Mercia Mudstone Group)	0.50			
0.90 - 1.00 1.00 - 1.45 1.00 - 2.00	D2 (T) SPT1 C2 (50% recovery)			(1.40)	Extremely weak thinly bedded grey green SILTSTONE with pockets and interbeds of very stiff brownish red silty clay. (Partially Weathered Mercia Mudstone Group)			(0.50)
1.70 - 1.80	D3 (T)			1.90	End of borehole at 2.40m below existing ground level.			2.40
2.00 - 2.43	SPT2		50/285 (S) (12,12/13,15,14, 9/60)					
SAMPLES / TESTS D Disturbed Sample (T plastic tub / J amber glass jar) B Bulk Sample U Undisturbed Sample (102mm) W Water Sample SPT Standard Penetration Test (S/C) N= No. of blows/300mm penetration in SPT/CPT * Sampler Sank (self weight)  Water Strike  Standing Water Level (S.W.L.) NR No Sample Recovery		REMARKS: 1. Hand shear vane (HSV) test carried out at 0.80m - 110kN/m ² . 2. Sampler refusal at 2.00m. 3. Groundwater not encountered during drilling. S.W.L. on removal of drilling tools from borehole at 1.60m and 20 minutes after completion at 1.50m. 4. Ground gas / groundwater monitoring well (50mm i.d.) installed to 2.00m, (slotted response zone 2.00 to 1.00m), as detailed above. 5. SPT 'N' - values are uncorrected.		Scale: 1: 20 All dimensions in metres <hr/> Logged by: RAL <hr/> Checked by: RWJP <hr/> Project Ref: 180401N				

BOREHOLE RECORD


 CASTLE ROCK GEOTECH Geological, Geotechnical & Environmental Consultants Nottingham, England.		Project: Land at Priory Farm, Retford Road, South Leverton, Notts.					
		Client: Mr & Mrs W. Tompkins	Borehole No: BH05 Sheet 1 of 1				
Date: 19 th April 2018 Method / Equipment: Windowless Sampling / Premier 110 rig Boring Diameter: 101mm to 92mm		Co-ordinates: Site centred on 478103N - 381181E approx. Ground Level:					
Sampling Details		Water Level (m)	SPT N-value (seating / drive penetration)	Description of Strata	Depth (m) (thickness m)	Legend	Backfill
Depth (m)	Type/No.						
0.00 - 1.00	C1 (85% recovery)	0.40 ▼	N=10 (S) (3,3/3,2,2,3)	MADE GROUND: 'Compact' sandy gravelly HARDCORE fill comprising mainly crushed aggregate and brick rubble in a brown sandy clay matrix and with a polythene membrane at 0.20m.	(0.40)	[Cross-hatch pattern]	ARISINGS
0.90 - 1.00 1.00 - 1.45 1.00 - 2.00	D1 (T) SPT1 C2 (70% recovery)			Stiff to very stiff brownish red occasionally mottled grey green closely fissured slightly sandy very silty medium to high strength CLAY with intact mudstone lithorelicts and occasional sand bands. Strong hydrocarbon (diesel?) odour throughout and becoming brown at base and with free product in sand band. (Distinctly Weathered Mercia Mudstone Group)	0.40	[Dotted pattern]	
1.40 - 1.50 1.60 - 1.80	D2 (T) D3 (T)	Extremely weak thinly bedded grey green SILTSTONE with pockets and interbeds of very stiff brownish red silty clay. (Partially Weathered Mercia Mudstone Group)	1.85	[Horizontal line pattern]			
2.00 - 2.42	SPT2	1.85 ▼	50/275 (S) (10,12/13,13,14,10 ₅₀)	End of borehole at 2.40m below existing ground level.	(0.55)	[Dotted pattern]	
					2.40		

SAMPLES / TESTS	
D	Disturbed Sample (T plastic tub / J amber glass jar)
B	Bulk Sample
U	Undisturbed Sample (102mm)
W	Water Sample
SPT	Standard Penetration Test (S/C)
N=	No. of blows/300mm penetration in SPT/CPT
*	Sampler Sank (self weight)
▼	Water Strike
▼	Standing Water Level (S.W.L.)
NR	No Sample Recovery


REMARKS:
1. Hand shear vane (HSV) test carried out at 0.80m - 110kN/m ² . 2. Sampler refusal at 2.00m. 3. Groundwater seepage encountered at 1.85m (strong hydrocarbon odour). S.W.L. on removal of drilling tools from borehole at 1.10m and 20 minutes after completion at 0.40m. 4. Borehole backfilled with arisings at end of shift. 5. SPT 'N' - values are uncorrected.

Scale: 1: 20 All dimensions in metres
Logged by: RAL
Checked by: RWJP
Project Ref: 180401N


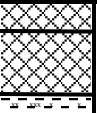

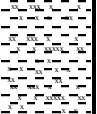

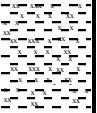

BOREHOLE RECORD

 CASTLE ROCK GEOTECH Geological, Geotechnical & Environmental Consultants Nottingham, England.		Project: Land at Priory Farm, Retford Road, South Leverton, Notts.					
		Client: Mr & Mrs W. Tompkins	Borehole No: BH06 Sheet 1 of 1				
Date: 19 th April 2018 Method / Equipment: Windowless Sampling / Premier 110 rig Boring Diameter: 101mm to 92mm		Co-ordinates: Site centred on 478103N - 381181E approx. Ground Level:					
Sampling Details		Water Level (m)	SPT N-value (seating / drive penetration)	Description of Strata	Depth (m) (thickness m)	Legend	Backfill
Depth (m)	Type/No.						
0.00 - 1.00	C1 (100% recovery)	0.85 ▼	N=14 (S) (3,3/3,4,3,4)	MADE GROUND: 'Compact' sandy gravelly HARDCORE fill comprising mainly black ash, brick and concrete rubble in a grey brown slightly clayey sand matrix.	(0.40)	(0.40)	(0.40)
0.20 - 0.40	D1 (TJ)						
0.90 - 1.00 1.00 - 1.45 1.00 - 2.00	D2 (T) SPT1 C2 (60% recovery)			1.70	50/275 (S) (10,12/12,12,15, 11/50)	Stiff to very stiff red brown becoming brownish red occasionally mottled grey green closely fissured slightly sandy very silty medium to high strength CLAY with intact mudstone lithorelicts. (Distinctly Weathered Mercia Mudstone Group)	(1.30)
1.80 - 1.90 2.00 - 2.42	D3 (T) SPT2	Extremely weak thinly bedded grey green SILTSTONE with pockets and interbeds of very stiff brownish red silty clay. (Partially Weathered Mercia Mudstone Group)	(0.70)			(0.70)	(0.70)
				End of borehole at 2.40m below existing ground level.	2.40		
SAMPLES / TESTS D Disturbed Sample (T plastic tub / J amber glass jar) B Bulk Sample U Undisturbed Sample (102mm) W Water Sample SPT Standard Penetration Test (S/C) N= No. of blows/300mm penetration in SPT/CPT * Sampler Sank (self weight) ▼ Water Strike ▼ Standing Water Level (S.W.L.) NR No Sample Recovery				REMARKS: 1. Hand shear vane (HSV) test carried out at 0.90m - 124kN/m ² . 2. Sampler refusal at 2.00m. 3. Groundwater not encountered during drilling. S.W.L. on removal of drilling tools from borehole at 1.15m and 20 minutes after completion at 0.85m. 4. Borehole backfilled with arisings at end of shift. 5. SPT 'N' - values are uncorrected.		Scale: 1: 20 All dimensions in metres <hr/> Logged by: RAL <hr/> Checked by: RWJP <hr/> Project Ref: 180401N	



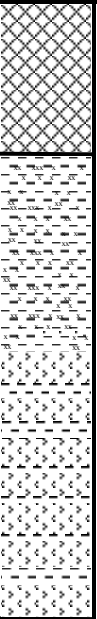


BOREHOLE RECORD

 CASTLE ROCK GEOTECH <i>Geological, Geotechnical & Environmental Consultants Nottingham, England.</i>		Project: Land at Priory Farm, Retford Road, South Leverton, Notts.					
		Client: Mr & Mrs W. Tompkins	Borehole No: BH07 Sheet 1 of 1				
Date: 19 th April 2018 Method / Equipment: Windowless Sampling / Premier 110 rig Boring Diameter: 101mm to 92mm		Co-ordinates: Site centred on 478103N - 381181E approx. Ground Level:					
Sampling Details		Water Level (m)	SPT N-value (seating / drive penetration)	Description of Strata	Depth (m) (thickness m)	Legend	Backfill
Depth (m)	Type/No.						
0.00 - 1.00 0.10 - 0.40	C1 (90% recovery) D1 (T)	0.70 ▼	N=12 (S) (2,2/2,3,4,3)	MADE GROUND: 'Compact' sandy gravelly HARDCORE fill comprising mainly black ash, brick fragments, clinker and coke in a grey brown sand matrix.	(0.40)	(0.40)	(0.30)
0.90 - 1.00 1.00 - 1.45 1.00 - 2.00	D2 (T) SPT1 C2 (80% recovery)			Firm brownish red occasionally mottled grey green closely fissured slightly sandy very silty low to medium strength CLAY with intact mudstone lithorelicts. (Distinctly Weathered Mercia Mudstone Group)	(1.10)	(1.10)	
1.60 - 1.70	D3 (T)			Extremely weak thinly bedded grey green SILTSTONE with pockets and interbeds of very stiff brownish red silty clay. (Partially Weathered Mercia Mudstone Group)	(0.55)	(0.55)	
1.90 - 2.00 2.00 - 2.43	D4 (T) SPT2		50/285 (S) (10,11/14,13,13, 10/60)	End of borehole at 2.40m below existing ground level.	(2.40)	(2.40)	
SAMPLES / TESTS D Disturbed Sample (T plastic tub / J amber glass jar) B Bulk Sample U Undisturbed Sample (102mm) W Water Sample SPT Standard Penetration Test (S/C) N= No. of blows/300mm penetration in SPT/CPT * Sampler Sank (self weight) ▼ Water Strike ▼ Standing Water Level (S.W.L.) NR No Sample Recovery		REMARKS: 1. Hand shear vane (HSV) tests carried out at 0.80m - 38kN/m ² and 1.70m - 34kN/m ² . 2. Sampler refusal at 2.00m. 3. Groundwater not encountered during drilling. S.W.L. on removal of drilling tools from borehole at 1.75m and 20 minutes after completion at 0.70m. 4. Borehole backfilled with arisings at end of shift. 5. SPT 'N' - values are uncorrected.		Scale: 1: 20 All dimensions in metres Logged by: RAL Checked by: RWJP Project Ref: 180401N			

BOREHOLE RECORD

 CASTLE ROCK GEOTECH Geological, Geotechnical & Environmental Consultants Nottingham, England.		Project: Land at Priory Farm, Retford Road, South Leverton, Notts.					
		Client: Mr & Mrs W. Tompkins	Borehole No: SA01 Sheet 1 of 1				
Date: 19 th April 2018 Method / Equipment: Windowless Sampling / Premier 110 rig Boring Diameter: 101mm		Co-ordinates: Site centred on 478103N - 381181E approx. Ground Level:					
Sampling Details		Water Level (m)	SPT N-value (seating / drive penetration)	Description of Strata	Depth (m) (thickness m)	Legend	Backfill
Depth (m)	Type/No.						
0.00 - 1.00 0.10 - 0.30	C1 (90% recovery) D1 (TJ)	1.80 ▼		MADE GROUND: 'Compact' dark grey slightly clayey sandy gravelly HARDCORE fill. Gravel is fine to coarse angular of various lithologies including brick and concrete.	(0.10) 0.10 (0.20) 0.30		
			Initially firm (to approx. 0.70m) becoming stiff and very stiff red brown becoming brownish red occasionally mottled grey green closely fissured slightly sandy very silty CLAY with numerous roots and rootlets. (Former Topsoil)	(1.40)			
1.00 - 2.00	C2 (100% recovery)		Extremely weak thinly bedded grey green SILTSTONE with pockets and interbeds of very stiff brownish red silty clay. (Partially Weathered Mercia Mudstone Group)	1.70 (0.30)			
				End of borehole at 2.00m below existing ground level.	2.00		
SAMPLES / TESTS D Disturbed Sample (T plastic tub / J amber glass jar) B Bulk Sample U Undisturbed Sample (102mm) W Water Sample SPT Standard Penetration Test (S/C) N= No. of blows/300mm penetration in SPT/CPT * Sampler Sank (self weight) ▼ Water Strike ▼ Standing Water Level (S.W.L.) NR No Sample Recovery		REMARKS: 1. Sampler refusal at 2.00m. 2. Groundwater not encountered during drilling. S.W.L. on removal of drilling tools from borehole at 1.80m. 3. Temporary groundwater monitoring well (38mm i.d.) installed to 2.00m, (slotted response zone 2.00m to 0.50m), on completion for subsequent falling head test. 4. Monitoring well removed and borehole backfilled with arisings on completion.		Scale: 1: 20 All dimensions in metres Logged by: RAL Checked by: RWJP Project Ref: 180401N			

BOREHOLE RECORD

 CASTLE ROCK GEOTECH Geological, Geotechnical & Environmental Consultants Nottingham, England.		Project: Land at Priory Farm, Retford Road, South Leverton, Notts.					
		Client: Mr & Mrs W. Tompkins	Borehole No: SA02 Sheet 1 of 1				
Date: 19 th April 2018 Method / Equipment: Windowless Sampling / Premier 110 rig Boring Diameter: 101mm		Co-ordinates: Site centred on 478103N - 381181E approx. Ground Level:					
Sampling Details		Water Level (m)	SPT N-value (seating / drive penetration)	Description of Strata	Depth (m) (thickness m)	Legend	Backfill
Depth (m)	Type/No.						
0.00 - 1.00	C1 (80% recovery)	1.20 		MADE GROUND: 'Compact' light grey sand and gravel grade crushed aggregate (0.10m) over firm brown and brownish red structureless sandy silty CLAY with stone cobbles and a slight hydrocarbon (diesel?) odour.	(0.50)	 ARISING SILTS AND CLAYS	ARISING SILTS AND CLAYS
0.20 - 0.40	D1 (TJ)			Stiff to very stiff brownish red occasionally mottled grey green closely fissured slightly sandy very silty CLAY with intact mudstone lithorelicts. (Distinctly Weathered Mercia Mudstone Group)	(0.65)		
1.00 - 2.00	C2 (95% recovery)			Extremely weak thinly bedded grey green SILTSTONE with pockets and interbeds of very stiff brownish red silty clay. (Partially Weathered Mercia Mudstone Group)	(0.85)		
				End of borehole at 2.00m below existing ground level.	2.00		
SAMPLES / TESTS D Disturbed Sample (T plastic tub / J amber glass jar) B Bulk Sample U Undisturbed Sample (102mm) W Water Sample SPT Standard Penetration Test (S/C) N= No. of blows/300mm penetration in SPT/CPT * Sampler Sank (self weight)  Water Strike  Standing Water Level (S.W.L.) NR No Sample Recovery				REMARKS: 1. Sampler refusal at 2.00m. 2. Groundwater not encountered during drilling. S.W.L. on removal of drilling tools from borehole at 1.20m. 3. Temporary groundwater monitoring well (38mm i.d.) installed to 1.75m, (slotted response zone 1.75m to 0.50m), on completion for subsequent falling head test. 4. Monitoring well removed and borehole backfilled with arisings on completion.		Scale: 1: 20 All dimensions in metres <hr/> Logged by: RAL <hr/> Checked by: RWJP <hr/> Project Ref: 180401N	

APPENDIX V

Soil Chemical Contamination Test Results

ELAB



Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618
Facsimile: (01424) 729911
info@elab-uk.co.uk

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number: 18-17223

Issue: 1

Date of Issue: 27/04/2018

Contact: Robert Price

Customer Details: Castle Rock Geotech
22A Morley Road
Nottingham
Nottinghamshire
NG3 6LL

Quotation No: Q14-00074

Order No: 180401N/rwjp

Customer Reference: 180401N

Date Received: 23/04/2018

Date Approved: 27/04/2018

Details: Land at Priory Farm, Retford Road, South Leverton

Approved by:

A handwritten signature in black ink, appearing to read 'Mike Varley', with a large, sweeping flourish at the end.

Mike Varley, Technical Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)



Sample Summary

Report No.: 18-17223

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
133710	SA01 D1 0.10 - 0.30	19/04/2018	23/04/2018	Silty loam	
133711	SA02 D1 0.20 - 0.40	19/04/2018	23/04/2018	Silty clayey loam	
133712	BH01 D1 0.90 - 1.00	19/04/2018	23/04/2018	Sandy loam	
133713	BH03 D1 0.10 - 0.40	19/04/2018	23/04/2018	Sandy loam + Stones	
133714	BH03 D2 0.90 - 1.00	19/04/2018	23/04/2018	Silty clayey loam	
133715	BH04 D1 0.20 - 0.40	19/04/2018	23/04/2018	Silty loam	
133716	BH05 D2 1.40 - 1.50	19/04/2018	23/04/2018	Loamy sand	
133717	BH06 D1 0.20 - 0.40	19/04/2018	23/04/2018	Sandy loam	
133718	BH07 D1 0.10 - 0.40	19/04/2018	23/04/2018	Sandy silty loam	
133719	BH02 D3 1.40 - 1.50	19/04/2018	23/04/2018	Silty clayey loam	
133720	BH03 D4 1.90 - 2.00	19/04/2018	23/04/2018	Sandy silty loam	
133721	BH04 D3 1.70 - 1.80	19/04/2018	23/04/2018	Silty clayey loam	
133722	BH06 D3 1.80 - 1.90	19/04/2018	23/04/2018	Silty loam	
133723	BH07 D2 0.90 - 1.00	19/04/2018	23/04/2018	Sandy clayey loam	



Results Summary

Report No.: 18-17223

ELAB Reference	133710	133711	133712	133713	133714
Customer Reference	D1	D1	D1	D1	D2
Sample ID					
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	SA01	SA02	BH01	BH03	BH03
Sample Depth (m)	0.10 - 0.30	0.20 - 0.40	0.90 - 1.00	0.10 - 0.40	0.90 - 1.00
Sampling Date	19/04/2018	19/04/2018	19/04/2018	19/04/2018	19/04/2018

Determinand	Codes	Units	LOD					
Metals								
Arsenic	M	mg/kg	1	12.3	8.0	7.2	6.2	7.1
Beryllium	U	mg/kg	1	< 1.0	1.1	< 1.0	< 1.0	1.2
Cadmium	M	mg/kg	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Chromium	M	mg/kg	5	39.5	55.0	45.4	36.7	49.6
Copper	M	mg/kg	5	39.9	24.4	11.9	13.2	15.2
Lead	M	mg/kg	5	149	36.3	12.4	6.9	14.4
Mercury	M	mg/kg	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Nickel	M	mg/kg	5	41.9	48.7	42.1	26	43.1
Selenium	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium	M	mg/kg	5	38.8	53.7	41.6	5.9	47.8
Zinc	M	mg/kg	5	165	95.7	63.5	13.7	72.4
Anions								
Water Soluble Sulphate	M	g/l	0.02	0.03	0.05	0.02	0.09	0.06
Inorganics								
Elemental Sulphur	M	mg/kg	20	< 20	< 20	< 20	< 20	< 20
Free Cyanide	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Total Sulphide	N	mg/kg	2	< 2	< 2	< 2	< 2	< 2
Total Cyanide	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Water Soluble Boron	N	mg/kg	0.5	0.9	1.1	< 0.5	< 0.5	< 0.5
Miscellaneous								
pH	M	pH units	0.1	7.8	8.0	8.0	11.3	9.1
Soil Organic Matter	U	%	0.1	3.5	1.3	0.4	4.0	0.3
Phenols								
Total Phenols	N	mg/kg	6	< 6	< 6	< 6	< 6	< 6

Results Summary

Report No.: 18-17223

ELAB Reference	133710	133711	133712	133713	133714
Customer Reference	D1	D1	D1	D1	D2
Sample ID					
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	SA01	SA02	BH01	BH03	BH03
Sample Depth (m)	0.10 - 0.30	0.20 - 0.40	0.90 - 1.00	0.10 - 0.40	0.90 - 1.00
Sampling Date	19/04/2018	19/04/2018	19/04/2018	19/04/2018	19/04/2018

Determinand	Codes	Units	LOD					
Polyaromatic hydrocarbons								
Naphthalene	M	mg/kg	0.1	0.4	< 0.1	2.8	4.2	0.5
Acenaphthylene	M	mg/kg	0.1	0.4	0.1	< 0.1	0.7	< 0.1
Acenaphthene	M	mg/kg	0.1	< 0.1	0.2	0.7	21.9	< 0.1
Fluorene	M	mg/kg	0.1	< 0.1	0.1	0.2	18.3	< 0.1
Phenanthrene	M	mg/kg	0.1	1.5	1.3	< 0.1	221	< 0.1
Anthracene	M	mg/kg	0.1	0.4	0.3	< 0.1	54.1	< 0.1
Fluoranthene	M	mg/kg	0.1	3.6	2.4	< 0.1	300	< 0.1
Pyrene	M	mg/kg	0.1	3.1	2.0	< 0.1	250	0.2
Benzo(a)anthracene	M	mg/kg	0.1	1.9	1.2	< 0.1	117	< 0.1
Chrysene	M	mg/kg	0.1	2.8	1.4	< 0.1	119	< 0.1
Benzo (b) fluoranthene	M	mg/kg	0.1	3.0	1.3	< 0.1	107	< 0.1
Benzo(k)fluoranthene	M	mg/kg	0.1	3.1	1.5	< 0.1	79	< 0.1
Benzo (a) pyrene	M	mg/kg	0.1	3.1	1.3	< 0.1	110	0.1
Indeno (1,2,3-cd) pyrene	M	mg/kg	0.1	2.4	1.0	< 0.1	61.4	< 0.1
Dibenzo(a,h)anthracene	M	mg/kg	0.1	0.7	0.3	< 0.1	14	< 0.1
Benzo[g,h,i]perylene	M	mg/kg	0.1	2.4	1.0	< 0.1	54.1	< 0.1
Total PAH(16)	M	mg/kg	0.4	28.9	15.5	3.8	1530	0.8
BTEX								
Benzene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Toluene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Ethylbenzene	M	ug/kg	10	< 10.0	< 10.0	56.5	< 10.0	< 10.0
Xylenes	M	ug/kg	10	< 10.0	< 10.0	2100	< 10.0	< 10.0
MTBE	N	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
TPH CWG								
>C5-C6 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C6-C8 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C8-C10 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	120	< 1.0	3.9
>C10-C12 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	128	< 1.0	14.1
>C12-C16 Aliphatic	N	mg/kg	1	1.8	< 1.0	155	46.8	28.1
>C16-C21 Aliphatic	N	mg/kg	1	3.7	< 1.0	2.3	144	1.7
>C21-C35 Aliphatic	N	mg/kg	1	63.6	6.1	< 1.0	2580	2.3
>C35-C40 Aliphatic	N	mg/kg	1	16.2	1.5	< 1.0	1080	< 1.0
>C5-C7 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C7-C8 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C8-C10 Aromatic	N	mg/kg	1	< 1.0	< 1.0	119	< 1.0	2.1
>C10-C12 Aromatic	N	mg/kg	1	< 1.0	< 1.0	148	< 1.0	11.7
>C12-C16 Aromatic	N	mg/kg	1	1.7	< 1.0	205	47.3	29.9
>C16-C21 Aromatic	N	mg/kg	1	3.9	< 1.0	3.4	242	1.8
>C21-C35 Aromatic	N	mg/kg	1	69.6	5.8	< 1.0	4740	1.2
>C35-C40 Aromatic	N	mg/kg	1	20.3	1.3	< 1.0	1890	< 1.0
Total (>C5-C40) Ali/Aro	N	mg/kg	1	181	14.7	879	10800	96.7



Results Summary

Report No.: 18-17223

ELAB Reference	133715	133716	133717	133718	133719
Customer Reference	D1	D2	D1	D1	D3
Sample ID					
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	BH04	BH05	BH06	BH07	BH02
Sample Depth (m)	0.20 - 0.40	1.40 - 1.50	0.20 - 0.40	0.10 - 0.40	1.40 - 1.50
Sampling Date	19/04/2018	19/04/2018	19/04/2018	19/04/2018	19/04/2018

Determinand	Codes	Units	LOD					
Metals								
Arsenic	M	mg/kg	1	6.2	7.6	12.0	18.0	n/t
Beryllium	U	mg/kg	1	< 1.0	1.3	1.3	< 1.0	n/t
Cadmium	M	mg/kg	0.5	< 0.5	< 0.5	< 0.5	< 0.5	n/t
Chromium	M	mg/kg	5	26.3	59.7	16.3	64.6	n/t
Copper	M	mg/kg	5	19.0	15.5	36.2	41.7	n/t
Lead	M	mg/kg	5	45.8	13.1	101	150	n/t
Mercury	M	mg/kg	0.5	< 0.5	< 0.5	< 0.5	< 0.5	n/t
Nickel	M	mg/kg	5	47.0	55.8	19.0	41.2	n/t
Selenium	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	n/t
Vanadium	M	mg/kg	5	24.9	53.6	26.2	80.9	n/t
Zinc	M	mg/kg	5	73.2	76.5	74.1	95.0	n/t
Anions								
Water Soluble Sulphate	M	g/l	0.02	0.06	0.03	0.14	0.15	0.02
Inorganics								
Elemental Sulphur	M	mg/kg	20	91	30	35	64	n/t
Free Cyanide	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	n/t
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	< 0.8	< 0.8	< 0.8	n/t
Total Sulphide	N	mg/kg	2	< 2	< 2	6	4	n/t
Total Cyanide	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	n/t
Water Soluble Boron	N	mg/kg	0.5	1.2	< 0.5	0.9	< 0.5	n/t
Miscellaneous								
pH	M	pH units	0.1	8.5	8.7	8.7	8.5	8.6
Soil Organic Matter	U	%	0.1	2.7	0.3	1.6	4.5	n/t
Phenols								
Total Phenols	N	mg/kg	6	< 6	< 6	< 6	< 6	n/t

Results Summary

Report No.: 18-17223

ELAB Reference	133715	133716	133717	133718	133719
Customer Reference	D1	D2	D1	D1	D3
Sample ID					
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	BH04	BH05	BH06	BH07	BH02
Sample Depth (m)	0.20 - 0.40	1.40 - 1.50	0.20 - 0.40	0.10 - 0.40	1.40 - 1.50
Sampling Date	19/04/2018	19/04/2018	19/04/2018	19/04/2018	19/04/2018

Determinand	Codes	Units	LOD						
Polyaromatic hydrocarbons									
Naphthalene	M	mg/kg	0.1	< 0.1	< 0.1	0.3	0.4	n/t	
Acenaphthylene	M	mg/kg	0.1	< 0.1	< 0.1	0.1	0.3	n/t	
Acenaphthene	M	mg/kg	0.1	< 0.1	< 0.1	2.6	0.3	n/t	
Fluorene	M	mg/kg	0.1	< 0.1	< 0.1	4.6	0.3	n/t	
Phenanthrene	M	mg/kg	0.1	< 0.1	< 0.1	69.9	5.1	n/t	
Anthracene	M	mg/kg	0.1	< 0.1	< 0.1	16.9	1.3	n/t	
Fluoranthene	M	mg/kg	0.1	0.2	< 0.1	69.4	9.9	n/t	
Pyrene	M	mg/kg	0.1	0.2	< 0.1	50.9	8.4	n/t	
Benzo(a)anthracene	M	mg/kg	0.1	< 0.1	< 0.1	29.9	6.7	n/t	
Chrysene	M	mg/kg	0.1	0.1	< 0.1	34.1	6.5	n/t	
Benzo (b) fluoranthene	M	mg/kg	0.1	0.2	< 0.1	20.2	7.1	n/t	
Benzo(k)fluoranthene	M	mg/kg	0.1	0.2	< 0.1	21.5	7.0	n/t	
Benzo (a) pyrene	M	mg/kg	0.1	0.1	< 0.1	20.9	6.9	n/t	
Indeno (1,2,3-cd) pyrene	M	mg/kg	0.1	0.1	< 0.1	9.8	4.7	n/t	
Dibenzo(a,h)anthracene	M	mg/kg	0.1	0.1	< 0.1	3.8	1.4	n/t	
Benzo[g,h,i]perylene	M	mg/kg	0.1	0.1	< 0.1	7.8	4.5	n/t	
Total PAH(16)	M	mg/kg	0.4	1.5	< 0.4	363	70.8	n/t	
BTEX									
Benzene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	n/t	
Toluene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	n/t	
Ethylbenzene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	n/t	
Xylenes	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	n/t	
MTBE	N	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	n/t	
TPH CWG									
>C5-C6 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	n/t	
>C6-C8 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	n/t	
>C8-C10 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	1.6	n/t	
>C10-C12 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	n/t	
>C12-C16 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	n/t	
>C16-C21 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	4.9	< 1.0	n/t	
>C21-C35 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	13.1	13.5	n/t	
>C35-C40 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	5.4	n/t	
>C5-C7 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	n/t	
>C7-C8 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	n/t	
>C8-C10 Aromatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	n/t	
>C10-C12 Aromatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	n/t	
>C12-C16 Aromatic	N	mg/kg	1	< 1.0	1.4	1.6	< 1.0	n/t	
>C16-C21 Aromatic	N	mg/kg	1	< 1.0	< 1.0	39.9	1.8	n/t	
>C21-C35 Aromatic	N	mg/kg	1	< 1.0	< 1.0	152	32.1	n/t	
>C35-C40 Aromatic	N	mg/kg	1	< 1.0	< 1.0	10.5	19.7	n/t	
Total (>C5-C40) Ali/Aro	N	mg/kg	1	< 1.0	1.4	222	74.1	n/t	

Results Summary

Report No.: 18-17223

ELAB Reference	133720	133721	133722	133723
Customer Reference	D4	D3	D3	D2
Sample ID				
Sample Type	SOIL	SOIL	SOIL	SOIL
Sample Location	BH03	BH04	BH06	BH07
Sample Depth (m)	1.90 - 2.00	1.70 - 1.80	1.80 - 1.90	0.90 - 1.00
Sampling Date	19/04/2018	19/04/2018	19/04/2018	19/04/2018

Determinand	Codes	Units	LOD				
Metals							
Arsenic	M	mg/kg	1	n/t	n/t	n/t	n/t
Beryllium	U	mg/kg	1	n/t	n/t	n/t	n/t
Cadmium	M	mg/kg	0.5	n/t	n/t	n/t	n/t
Chromium	M	mg/kg	5	n/t	n/t	n/t	n/t
Copper	M	mg/kg	5	n/t	n/t	n/t	n/t
Lead	M	mg/kg	5	n/t	n/t	n/t	n/t
Mercury	M	mg/kg	0.5	n/t	n/t	n/t	n/t
Nickel	M	mg/kg	5	n/t	n/t	n/t	n/t
Selenium	M	mg/kg	1	n/t	n/t	n/t	n/t
Vanadium	M	mg/kg	5	n/t	n/t	n/t	n/t
Zinc	M	mg/kg	5	n/t	n/t	n/t	n/t
Anions							
Water Soluble Sulphate	M	g/l	0.02	0.02	0.04	< 0.02	0.03
Inorganics							
Elemental Sulphur	M	mg/kg	20	n/t	n/t	n/t	n/t
Free Cyanide	N	mg/kg	1	n/t	n/t	n/t	n/t
Hexavalent Chromium	N	mg/kg	0.8	n/t	n/t	n/t	n/t
Total Sulphide	N	mg/kg	2	n/t	n/t	n/t	n/t
Total Cyanide	M	mg/kg	1	n/t	n/t	n/t	n/t
Water Soluble Boron	N	mg/kg	0.5	n/t	n/t	n/t	n/t
Miscellaneous							
pH	M	pH units	0.1	8.6	8.5	8.6	8.4
Soil Organic Matter	U	%	0.1	n/t	n/t	n/t	n/t
Phenols							
Total Phenols	N	mg/kg	6	n/t	n/t	n/t	n/t



2683



Results Summary

Report No.: 18-17223

ELAB Reference	133720	133721	133722	133723
Customer Reference	D4	D3	D3	D2
Sample ID				
Sample Type	SOIL	SOIL	SOIL	SOIL
Sample Location	BH03	BH04	BH06	BH07
Sample Depth (m)	1.90 - 2.00	1.70 - 1.80	1.80 - 1.90	0.90 - 1.00
Sampling Date	19/04/2018	19/04/2018	19/04/2018	19/04/2018

Determinand	Codes	Units	LOD				
Polyaromatic hydrocarbons							
Naphthalene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Acenaphthylene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Acenaphthene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Fluorene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Phenanthrene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Anthracene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Fluoranthene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Pyrene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Benzo(a)anthracene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Chrysene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Benzo (b) fluoranthene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Benzo(k)fluoranthene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Benzo (a) pyrene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Indeno (1,2,3-cd) pyrene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Dibenzo(a,h)anthracene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Benzo[g,h,i]perylene	M	mg/kg	0.1	n/t	n/t	n/t	n/t
Total PAH(16)	M	mg/kg	0.4	n/t	n/t	n/t	n/t
BTEX							
Benzene	M	ug/kg	10	n/t	n/t	n/t	n/t
Toluene	M	ug/kg	10	n/t	n/t	n/t	n/t
Ethylbenzene	M	ug/kg	10	n/t	n/t	n/t	n/t
Xylenes	M	ug/kg	10	n/t	n/t	n/t	n/t
MTBE	N	ug/kg	10	n/t	n/t	n/t	n/t
TPH CWG							
>C5-C6 Aliphatic	N	mg/kg	0.01	n/t	n/t	n/t	n/t
>C6-C8 Aliphatic	N	mg/kg	0.01	n/t	n/t	n/t	n/t
>C8-C10 Aliphatic	N	mg/kg	1	n/t	n/t	n/t	n/t
>C10-C12 Aliphatic	N	mg/kg	1	n/t	n/t	n/t	n/t
>C12-C16 Aliphatic	N	mg/kg	1	n/t	n/t	n/t	n/t
>C16-C21 Aliphatic	N	mg/kg	1	n/t	n/t	n/t	n/t
>C21-C35 Aliphatic	N	mg/kg	1	n/t	n/t	n/t	n/t
>C35-C40 Aliphatic	N	mg/kg	1	n/t	n/t	n/t	n/t
>C5-C7 Aromatic	N	mg/kg	0.01	n/t	n/t	n/t	n/t
>C7-C8 Aromatic	N	mg/kg	0.01	n/t	n/t	n/t	n/t
>C8-C10 Aromatic	N	mg/kg	1	n/t	n/t	n/t	n/t
>C10-C12 Aromatic	N	mg/kg	1	n/t	n/t	n/t	n/t
>C12-C16 Aromatic	N	mg/kg	1	n/t	n/t	n/t	n/t
>C16-C21 Aromatic	N	mg/kg	1	n/t	n/t	n/t	n/t
>C21-C35 Aromatic	N	mg/kg	1	n/t	n/t	n/t	n/t
>C35-C40 Aromatic	N	mg/kg	1	n/t	n/t	n/t	n/t
Total (>C5-C40) Ali/Aro	N	mg/kg	1	n/t	n/t	n/t	n/t

Results Summary

Report No.: 18-17223

Asbestos Results

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

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
133710	0.10 - 0.30	SA01 D1	brown sandy soil with stones, brick and clinker	Chrysotile (fibre bundles)	0.484	0.484	< 0.001	0.484
133711	0.20 - 0.40	SA02 D1	brown sandy soil with stones, brick and clinker	No asbestos detected	n/t	n/t	n/t	n/t
133713	0.10 - 0.40	BH03 D1	grey sandy soil with stones, clinker and concrete	No asbestos detected	n/t	n/t	n/t	n/t
133717	0.20 - 0.40	BH06 D1	brown sandy soil with stones, clinker and brick	No asbestos detected	n/t	n/t	n/t	n/t
133718	0.10 - 0.40	BH07 D1	brown sandy soil with stones, clinker and brick	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 18-17223

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Free cyanide	N	As submitted sample	25/04/2018	107	Colorimetry
Sulphide	N	As submitted sample	26/04/2018	109	Colorimetry
Hexavalent chromium	N	As submitted sample	25/04/2018	110	Colorimetry
pH	M	Air dried sample	26/04/2018	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	25/04/2018	118	ICPMS
Phenols in solids	N	As submitted sample	25/04/2018	121	HPLC
Elemental Sulphur	M	Air dried sample	25/04/2018	122	HPLC
PAH (GC-FID)	M	As submitted sample	25/04/2018	133	GC-FID
Water soluble anions	M	Air dried sample	25/04/2018	172	Ion Chromatography
Low range Aliphatic hydrocarbons soil	N	As submitted sample	26/04/2018	181	GC-MS
Low range Aromatic hydrocarbons soil	N	As submitted sample	26/04/2018	181	GC-MS
BTEX in solids	M	As submitted sample	26/04/2018	181A	GC-MS
Water soluble boron	N	Air dried sample	25/04/2018	202	Colorimetry
Total cyanide	M	As submitted sample	25/04/2018	204	Colorimetry
Aliphatic hydrocarbons in soil	N	As submitted sample	25/04/2018	214	GC-FID
Aliphatic/Aromatic hydrocarbons in soil	N	As submitted sample	27/04/2018	214	GC-FID
Aromatic hydrocarbons in soil	N	As submitted sample	25/04/2018	214	GC-FID
Soil organic matter	U	Air dried sample	27/04/2018	BS1377:P3	Titrimetry
Asbestos identification	U	Air dried sample	25/04/2018	PMAN	Microscopy

Tests marked N are not UKAS accredited



Report Information

Report No.: 18-17223

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

PCB congener results may include any coeluting PCBs

Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

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

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

Sample Retention and Disposal

All soil samples will be retained for a period of one month

All water samples will be retained for 7 days following the date of the test report

Charges may apply to extended sample storage

APPENDIX VI

Geotechnical laboratory Test Results



LABORATORY REPORT



4043

Contract Number: PSL18/2003

Report Date: 10 May 2018
Client's Reference: 180401N
Client Name: Castle Rock Geotech
22A Morley Road
Mapperley
Nottingham
NG3 6LL

For the attention of: Rick Lowe

Contract Title: Priory Farm, South Leverton
Date Received: 30/4/2018
Date Commenced: 30/4/2018
Date Completed: 10/5/2018

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson
(Director)

A Watkins
(Director)

R Berriman
(Quality Manager)

L Knight
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SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BH02	2	D	0.90	1.00	Brown slightly sandy CLAY.
BH03	3	D	1.50	1.60	Brown slightly sandy CLAY.
BH04	2	D	0.90	1.00	Brown slightly sandy CLAY.
BH05	1	D	0.90	1.00	Reddish brown slightly sandy CLAY.
BH07	3	D	1.60	1.70	Brown very sandy CLAY.

 4043		Priory Farm, South Leverton	Contract No:
			PSL18/2003
			Client Ref:
			180401N



SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

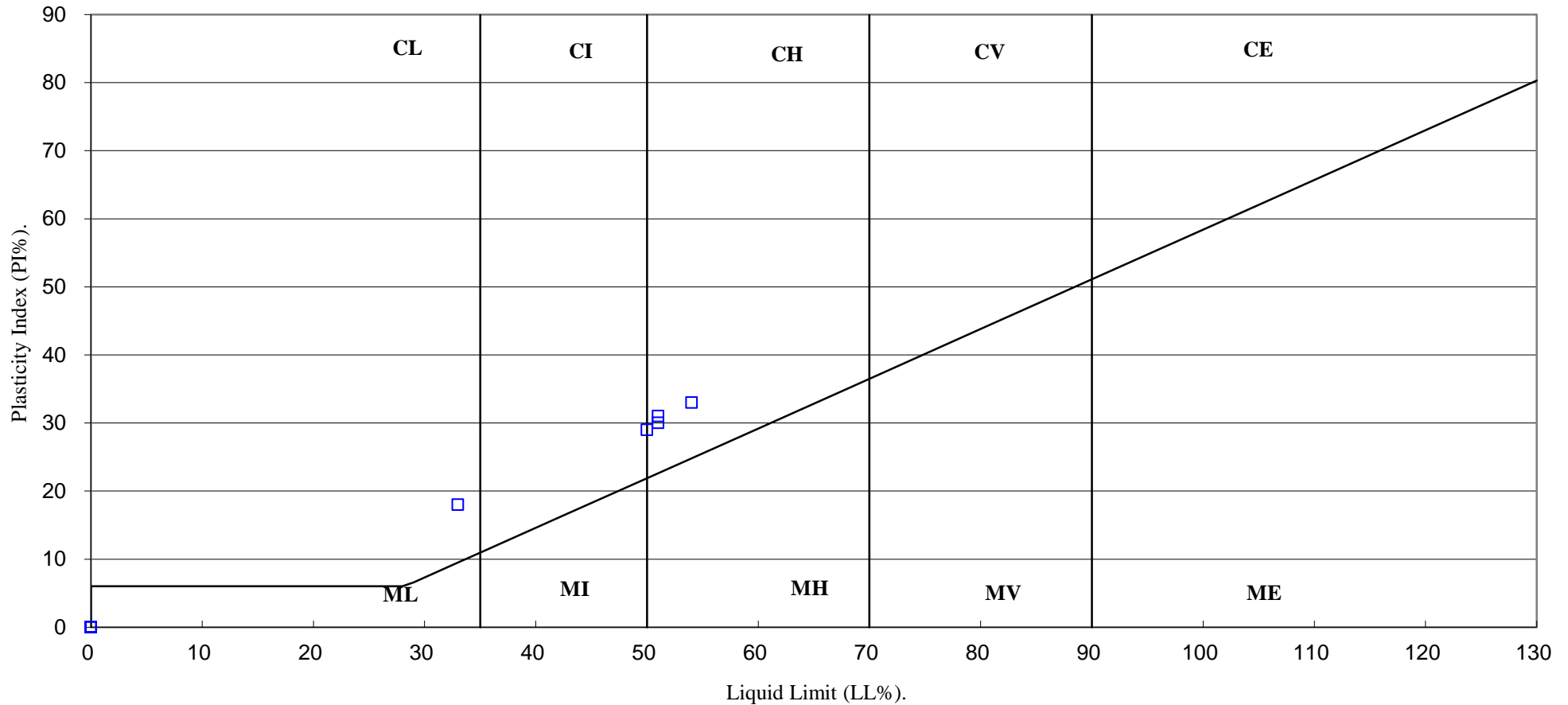
Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % <small>Clause 3.2</small>	Linear Shrinkage % <small>Clause 6.5</small>	Particle Density Mg/m ³ <small>Clause 8.2</small>	Liquid Limit % <small>Clause 4.3/4</small>	Plastic Limit % <small>Clause 5.3</small>	Plasticity Index % <small>Clause 5.4</small>	Passing .425mm %	Remarks
BH02	2	D	0.90	1.00	23			51	20	31	100	High plasticity CH.
BH03	3	D	1.50	1.60	24			51	21	30	100	High plasticity CH.
BH04	2	D	0.90	1.00	19			50	21	29	100	High plasticity CH.
BH05	1	D	0.90	1.00	23			54	21	33	100	High plasticity CH.
BH07	3	D	1.60	1.70	23			33	15	18	100	Low plasticity CL.

SYMBOLS : NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.

 4043		Priory Farm, South Leverton	Contract No:
			PSL18/2003
			Client Ref:
			180401N

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL
Professional Soils Laboratory

Priory Farm, South Leverton

Contract No:

PSL18/2003

Client Ref:

180401N

APPENDIX VII

Ground Gas and Groundwater Level Monitoring Results



GROUND GAS AND GROUNDWATER MONITORING RECORD SHEET 24th April 2018

Project No.	180401N
Client	Mr & Mrs W. Tompkins
Project Name / Site	LAND AT PRIORY FARM, RETFORD ROAD, SOUTH LEVERTON, NOTTS.
Date	24 th April 2018 Start: 13.00pm / Finish: 14.10pm
Weather	Overcast, light to moderate rain; temperature 12°C; Wind Speed / Direction: 19kmph / WSW
Atmospheric Pressure (mb)	During the 24 hours prior to monitoring the atmospheric pressure rose by 1mb <u>Start:</u> 1009mb <u>Finish:</u> 1008mb (Pressure trend – falling)
Equipment	Gas Data Ltd – GFM435 Gas Analyser (MCERTS approved, std Ver 3.1) MiniRAE 3000 Photo-Ionisation Detector (PID) and Electronic Dipmeter
CRG Operator	RWJP

BH No:	Base of Installation (m) / (50mm dia.)	Peak	Methane (% v/v)	Methane (LEL %)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	H ₂ S (ppm)	CO (ppm)	Vapour (by PID) (ppm)	Gas Flow (l/hr)	Depth to groundwater (m begl)
		Steady									
BH01	2.00	Peak	N.D.	N.A.	0.2	20.3	N.D.	N.D.	688	N.D.	0.50 (a)
		Steady	N.D.	N.A.	0.2	20.3	N.D.	N.D.	642	N.D.	
BH03	2.00	Peak	N.D.	N.A.	0.2	20.1	N.D.	N.D.	48	N.D.	0.62 (b)
		Steady	N.D.	N.A.	0.2	20.1	N.D.	N.D.	41	N.D.	
BH04	2.00	Peak	N.D.	N.A.	0.4	20.0	N.D.	N.D.	10.2	N.D.	0.54 (c)
		Steady	N.D.	N.A.	0.3	20.0	N.D.	N.D.	7.6	N.D.	
Ambient			N.D.	N.A.	0.0	20.5	N.D.	N.D.	N.D.	N.A.	N.A.

Notes:

1. LEL – Lower Explosive Limit (100% LEL = 5% Flammable Gas)
2. N.D. – Value at or below 0.0% - accuracy of equipment use +/- 0.5%
3. N.A. – Not Applicable / Not Available
4. N.R. – Not Recorded
5. H₂S - hydrogen sulphide & CO - carbon monoxide
6. The steady reading is the level which remained constant after a minimum 100 seconds
7. Borehole Pressure (DP) – 0Pa
8. (a) – Baled out to 1.90m prior to monitoring
(b) – Baled out to 1.85m prior to monitoring
(c) – Baled out to 1.70m prior to monitoring



GROUND GAS AND GROUNDWATER MONITORING RECORD SHEET 11th May 2018

Project No.	180401N
Client	Mr & Mrs W. Tompkins
Project Name / Site	LAND AT PRIORY FARM, RETFORD ROAD, SOUTH LEVERTON, NOTTS.
Date	11 th May 2018 Start: 13.15pm / Finish: 14.30pm
Weather	Warm, mild, moderately cloudy; temperature 16°C; Wind Speed / Direction: 24kmph / SSW
Atmospheric Pressure (mb)	During the 24 hours prior to monitoring the atmospheric pressure fell by 2mb <u>Start:</u> 1014mb <u>Finish:</u> 1012mb (Pressure trend – falling)
Equipment	Gas Data Ltd – GFM435 Gas Analyser (MCERTS approved, std Ver 3.1) MiniRAE 3000 Photo-Ionisation Detector (PID) and Electronic Dipmeter
CRG Operator	RAL

BH No:	Base of Installation (m) / (50mm dia.)	Peak	Methane (% v/v)	Methane (LEL %)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	H ₂ S (ppm)	CO (ppm)	Vapour (by PID) (ppm)	Gas Flow (l/hr)	Depth to groundwater (m begl)
		Steady									
BH01	2.00	Peak	N.D.	N.A.	2.0	17.3	N.D.	N.D.	26.2	N.D.	0.64
		Steady	N.D.	N.A.	2.0	17.3	N.D.	N.D.	8.2	N.D.	
BH03	2.00	Peak	N.D.	N.A.	0.1	19.9	N.D.	N.D.	4.6	N.D.	0.55
		Steady	N.D.	N.A.	0.1	19.9	N.D.	N.D.	2.4	N.D.	
BH04	2.00	Peak	N.D.	N.A.	0.0	19.5	N.D.	N.D.	24.9	N.D.	0.65
		Steady	N.D.	N.A.	0.0	19.5	N.D.	N.D.	3.0	N.D.	
Ambient			N.D.	N.A.	0.0	20.7	N.D.	N.D.	N.D.	N.A.	N.A.

Notes:

1. LEL – Lower Explosive Limit (100% LEL = 5% Flammable Gas)
2. N.D. – Value at or below 0.0% - accuracy of equipment use +/- 0.5%
3. N.A. – Not Applicable / Not Available
4. N.R. – Not Recorded
5. H₂S - hydrogen sulphide & CO - carbon monoxide
6. The steady reading is the level which remained constant after a minimum 100 seconds
7. Borehole Pressure (DP) – 0Pa



GROUND GAS AND GROUNDWATER MONITORING RECORD SHEET 30th May 2018

Project No.	180401N
Client	Mr & Mrs W. Tompkins
Project Name / Site	LAND AT PRIORY FARM, RETFORD ROAD, SOUTH LEVERTON, NOTTS.
Date	30 th May 2018 Start: 14.00pm / Finish: 15.00pm
Weather	Cool, damp, overcast; temperature 14°C; Wind Speed / Direction: 10kmph / NNE
Atmospheric Pressure (mb)	During the 24 hours prior to monitoring the atmospheric pressure fell by 5mb <u>Start:</u> 1013mb <u>Finish:</u> 1011mb (Pressure trend – falling)
Equipment	Gas Data Ltd – GFM435 Gas Analyser (MCERTS approved, std Ver 3.1) MiniRAE 3000 Photo-Ionisation Detector (PID) and Electronic Dipmeter
CRG Operator	RAL

BH No:	Base of Installation (m) / (50mm dia.)	Peak	Methane (% v/v)	Methane (LEL %)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	H ₂ S (ppm)	CO (ppm)	Vapour (by PID) (ppm)	Gas Flow (l/hr)	Depth to groundwater (m begl)
		Steady									
BH01	2.00	Peak	N.D.	N.A.	2.4	18.1	N.D.	N.D.	26.8	N.D.	0.89
		Steady	N.D.	N.A.	2.4	18.1	N.D.	N.D.	10.2	N.D.	
BH03	2.00	Peak	N.D.	N.A.	0.0	19.6	N.D.	N.D.	8.3	N.D.	0.78
		Steady	N.D.	N.A.	0.0	19.6	N.D.	N.D.	4.3	N.D.	
BH04	2.00	Peak	N.D.	N.A.	0.1	20.1	N.D.	N.D.	2.4	N.D.	0.89
		Steady	N.D.	N.A.	0.1	20.1	N.D.	N.D.	2.2	N.D.	
Ambient			N.D.	N.A.	0.0	20.7	N.D.	N.D.	N.D.	N.A.	N.A.

Notes:

1. LEL – Lower Explosive Limit (100% LEL = 5% Flammable Gas)
2. N.D. – Value at or below 0.0% - accuracy of equipment use +/- 0.5%
3. N.A. – Not Applicable / Not Available
4. N.R. – Not Recorded
5. H₂S - hydrogen sulphide & CO - carbon monoxide
6. The steady reading is the level which remained constant after a minimum 100 seconds
7. Borehole Pressure (DP) – 0Pa



GROUND GAS AND GROUNDWATER MONITORING RECORD SHEET 6th June 2018

Project No.	180401N
Client	Mr & Mrs W. Tompkins
Project Name / Site	LAND AT PRIORY FARM, RETFORD ROAD, SOUTH LEVERTON, NOTTS.
Date	6 th June 2018 Start: 12.00pm / Finish: 13.00pm
Weather	Mild, cloudy, overcast; temperature 16°C; Wind Speed / Direction: 11kmph / N
Atmospheric Pressure (mb)	During the 24 hours prior to monitoring the atmospheric pressure was steady <u>Start:</u> 1018mb <u>Finish:</u> 1017mb (Pressure trend – falling)
Equipment	Gas Data Ltd – GFM435 Gas Analyser (MCERTS approved, std Ver 3.1) MiniRAE 3000 Photo-Ionisation Detector (PID) and Electronic Dipmeter
CRG Operator	RAL

BH No:	Base of Installation (m) / (50mm dia.)	Peak	Methane (% v/v)	Methane (LEL %)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	H ₂ S (ppm)	CO (ppm)	Vapour (by PID) (ppm)	Gas Flow (l/hr)	Depth to groundwater (m begl)
		Steady									
BH01	2.00	Peak	N.D.	N.A.	1.9	18.5	N.D.	N.D.	14.5	N.D.	0.98
		Steady	N.D.	N.A.	1.9	18.5	N.D.	N.D.	4.7	N.D.	
BH03	2.00	Peak	N.D.	N.A.	0.0	19.8	N.D.	N.D.	5.1	N.D.	0.88
		Steady	N.D.	N.A.	0.0	19.8	N.D.	N.D.	4.4	N.D.	
BH04	2.00	Peak	N.D.	N.A.	0.0	19.6	N.D.	N.D.	6.0	N.D.	0.97
		Steady	N.D.	N.A.	0.0	19.6	N.D.	N.D.	2.1	N.D.	
Ambient			N.D.	N.A.	0.0	20.5	N.D.	N.D.	N.D.	N.A.	N.A.

Notes:

1. LEL – Lower Explosive Limit (100% LEL = 5% Flammable Gas)
2. N.D. – Value at or below 0.0% - accuracy of equipment use +/- 0.5%
3. N.A. – Not Applicable / Not Available
4. N.R. – Not Recorded
5. H₂S - hydrogen sulphide & CO - carbon monoxide
6. The steady reading is the level which remained constant after a minimum 100 seconds
7. Borehole Pressure (DP) – 0Pa

APPENDIX VIII

Falling Head / Infiltration Test Results

**Castle Rock
Geotech**



CRG Project Ref.	180401N
Project Name	PRIORY FARM, SOUTH LEVERTON, NOTTS.
Project Managers	Mr & Mrs W. Tompkins
Test Location	SA01
Test No.	T1
Test Date	19th April 2018
By	RWJP
Checked By	RAL

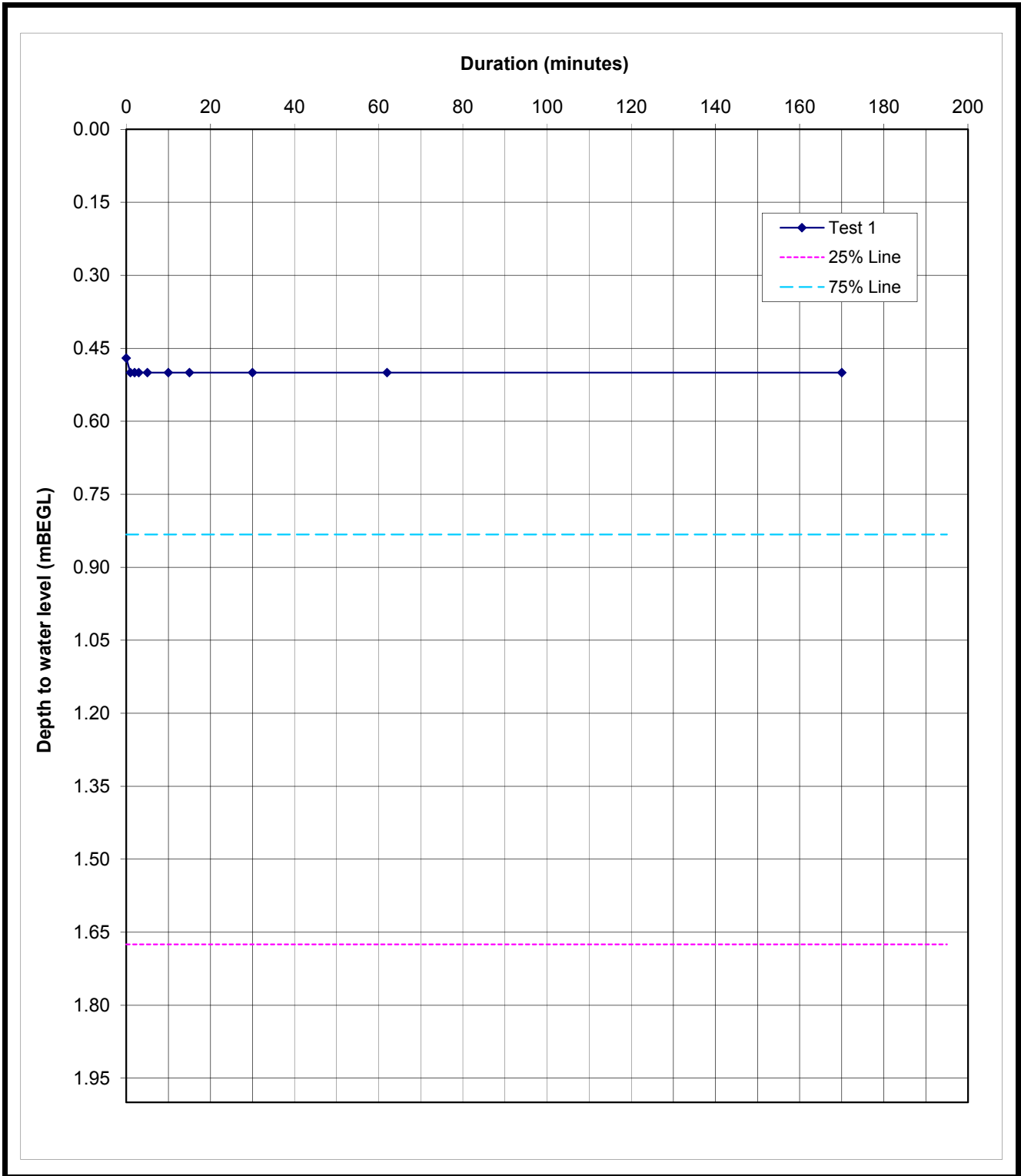
Falling Head Infiltration Calculation Spreadsheet for Test 1 on SA01

Depth of Borehole =	2.00 m
Natural GW Level (mbegl)=	1.80 m
Width of Borehole *=	0.080 m
Length of Borehole * =	0.080 m
(* equivalent borehole diameter)	
Void Ratio=	0.50
(Granular Fill Used Yes = 0.50 / No = 1.00)	
Level of Water bgl before Start of Test =	0.50 mBEGL
Level of Water bgl at End of Test =	0.50 mBEGL
Available Height of Borehole for Infiltration =	1.30 m
Depth at 75% Max. Effective Depth =	0.833 mBEGL
Depth at 25% Max. Effective Depth =	1.675 mBEGL
Depth at 50% Max. Effective Depth =	1.15 mBEGL
Effective Storage Volume of Water in the Borehole between 75% and 25% of maximum effective depth	0.0027 m ³
Internal Surface Area of the Borehole up to 50% max. effective depth and excluding the base	0.21 m ²
Time Elapsed at 75% Max. Effective Depth =	min
Time Elapsed at 25% Max. Effective Depth =	min
Time for water level to fall from 75% to 25% effective depth	min
Duration of FH Test =	170 min
Soil Infiltration Rate f1 =	N/A m/s

**Castle Rock
Geotech**



CRG Project Ref.	180401N
Project Name	PRIORY FARM, SOUTH LEVERTON, NOTTS.
Project Managers	Mr & Mrs W. Tompkins
Test Location	SA01
Test No.	T1
Test Date	19th April 2018
By	RWJP
Checked By	RAL





CRG Project Ref.	180401N
Project Name	PRIORY FARM, SOUTH LEVERTON, NOTTS.
Project Managers	Mr & Mrs W. Tompkins
Test Location	SA02
Test No.	T1
Test Date	19th April 2018
By	RWJP
Checked By	RAL

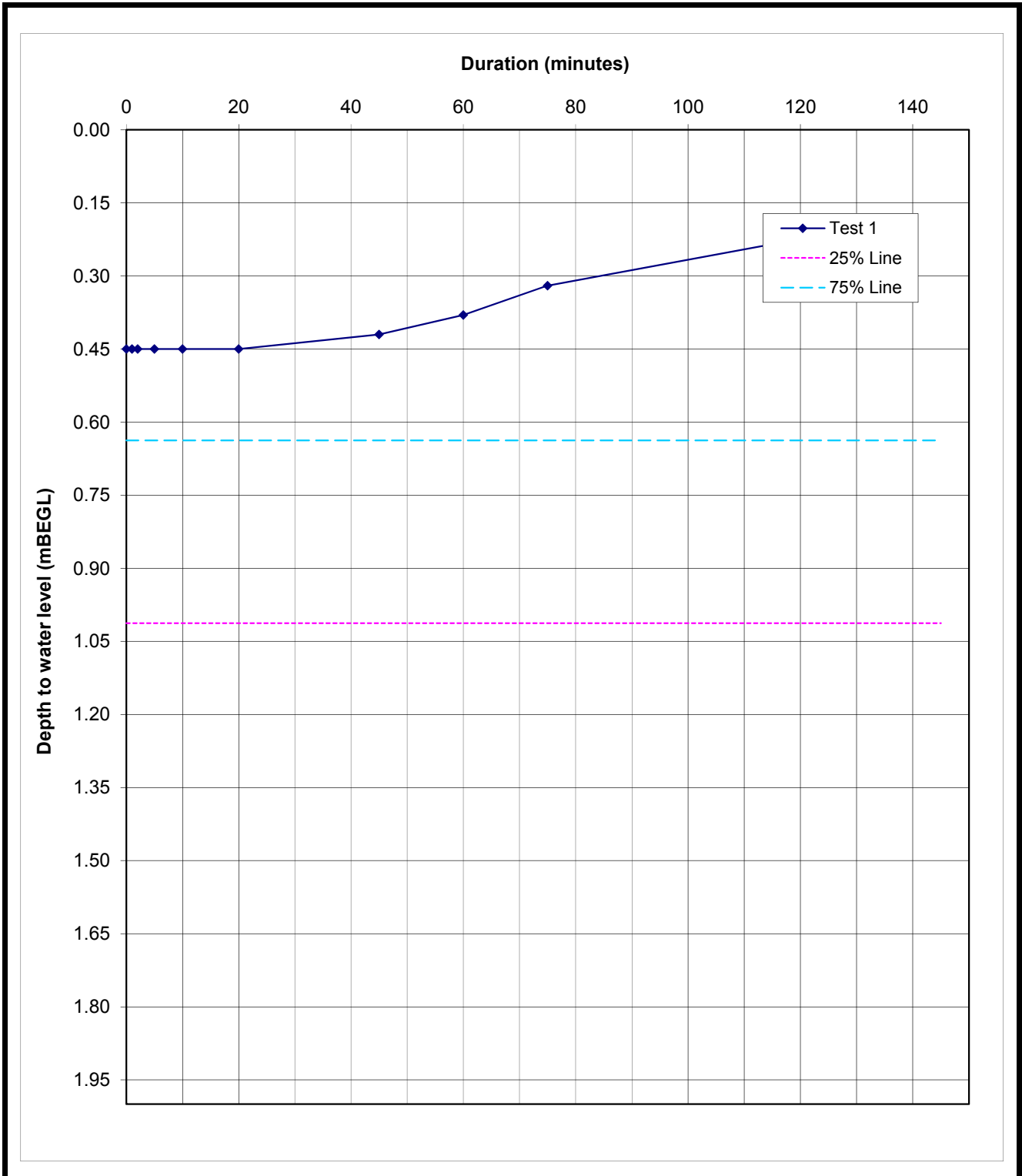
Falling Head Infiltration Calculation Spreadsheet for Test 1 on SA01

Depth of Borehole =	2.00 m
Natural GW Level (mbegl)=	1.20 m
Width of Borehole *=	0.080 m
Length of Borehole * =	0.080 m
(* equivalent borehole diameter)	
Void Ratio=	0.50
(Granular Fill Used Yes = 0.50 / No = 1.00)	
Level of Water bgl before Start of Test =	0.45 mBEGL
Level of Water bgl at End of Test =	0.22 mBEGL
Available Height of Borehole for Infiltration =	0.75 m
Depth at 75% Max. Effective Depth =	0.638 mBEGL
Depth at 25% Max. Effective Depth =	1.013 mBEGL
Depth at 50% Max. Effective Depth =	0.825 mBEGL
Effective Storage Volume of Water in the Borehole between 75% and 25% of maximum effective depth	0.0012 m ³
Internal Surface Area of the Borehole up to 50% max. effective depth and excluding the base	0.12 m ²
Time Elapsed at 75% Max. Effective Depth =	min
Time Elapsed at 25% Max. Effective Depth =	min
Time for water level to fall from 75% to 25% effective depth	min
Duration of FH Test =	122 min
Soil Infiltration Rate f1 =	N/A m/s

**Castle Rock
Geotech**



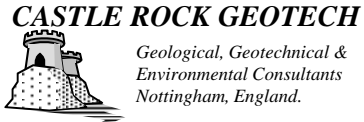
CRG Project Ref.	180401N
Project Name	PRIORY FARM, SOUTH LEVERTON, NOTTS.
Project Managers	Mr & Mrs W. Tompkins
Test Location	SA02
Test No.	T1
Test Date	19th April 2018
By	RWJP
Checked By	RAL



APPENDIX IX

Site Photographs / Plates

APPENDIX IX – SITE PHOTOGRAPHS / PLATES



Project: Land at Priory Farm,
Retford Road, South Leverton, Notts.

Client: Mr & Mrs W. Tompkins



Plate 1: The southern part of the site viewed from Retford Road



Plate 2: The south-eastern part of the site adjacent to Priory Farm



Plate 3: The eastern area of the site viewed from the south



Plate 4: The central area of the site and the eastern elevation of the agricultural building



Plate 5: The north-eastern area of the site



Plate 6: The northern part of the site viewed from the east

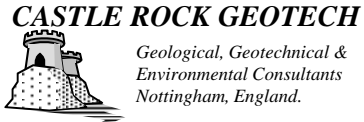


Plate 7: The north-western area of the site



Plate 8: The plant storage area to the west of the agricultural building

APPENDIX IX – SITE PHOTOGRAPHS / PLATES



Project: Land at Priory Farm,
Retford Road, South Leverton, Notts.

Client: Mr & Mrs W. Tompkins



Plate 9: The interior of the agricultural building



Plate 10: The arisings from borehole BH01,
G.L. to 2.45m



Plate 11: The arisings from borehole BH02,
G.L. to 2.40m



Plate 12: The arisings from borehole BH03,
G.L. to 2.40m



Plate 13: The arisings from borehole BH04,
G.L. to 2.40m



Plate 14: The arisings from borehole BH05,
G.L. to 2.40m



Plate 15: The arisings from borehole BH06,
G.L. to 2.40m



Plate 16: The arisings from borehole BH07,
G.L. to 2.40m

APPENDIX IX – SITE PHOTOGRAPHS / PLATES

CASTLE ROCK GEOTECH



Geological, Geotechnical &
Environmental Consultants
Nottingham, England.

Project: **Land at Priory Farm,
Retford Road, South Leverton, Notts.**

Client: Mr & Mrs W. Tompkins



Plate 17: The arisings from borehole SA01,
G.L. to 2.00m



Plate 18: The arisings from borehole SA02,
G.L. to 2.00m

APPENDIX X

Notes on Limitations

NOTES ON LIMITATIONS

PHASE I DESK STUDY & PHASE II GROUND INVESTIGATION

PHASE I DESK STUDY:-

The Phase I Desk Study report comprise a review of information available from a number of sources/parties (potentially also including the Client) together with a walk over of the site (where applicable and included within the quotation/tender). The opinions given in the Phase I Desk Study are based on the information available from third parties/sources that has been obtained within the available timeframe. Castle Rock Geotech assumes all third party information to be true and correct and therefore cannot accept liability for the accuracy of such information supplied.

Should additional information become available that may affect the comments and opinions made within the Phase I Desk Study, Castle Rock Geotech reserves the right to review such information and make modifications to comments/opinions as appropriate.

It should be borne in mind that a Phase I Desk Study collates available information to generate a Conceptual Model of the site. The actual geotechnical and environmental considerations can only be fully quantified by intrusive investigation works to confirm the accuracy of the Conceptual Site Model.

PHASE II GROUND INVESTIGATION:-

Castle Rock Geotech has prepared this report solely for the use of the Client and / or his agent and is not suitable for any other circumstances than for the purpose for which it was prepared. This report has been prepared for the titled project only and should any third party wish to use or rely upon the contents of the report, written approval from Castle Rock Geotech must be sought.

Castle Rock Geotech (CRG) accepts no responsibility or liability

a) for the consequences of this document being used for the purpose other than that for which it was commissioned and for this document to any other party other than the person by whom it was commissioned.

The data essentially comprised a study of available documented information from various sources together with discussions with relevant authorities and other interested parties. The information reviewed is not exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. If additional information becomes available which might impact our environmental conclusions, we request the opportunity to review the information, reassess the potential concerns and modify our opinion if warranted.

Unless otherwise stated, CRG will not undertake any desk study searches or risk assessments for potential unexploded ordnance, and we therefore cannot be held liable for any delays or costs incurred either directly or indirectly as a result of the identification of unexploded ordnance risks on the site, or for losses incurred either directly or indirectly as a result of accidental detonations of ordnance on site during investigations and / or subsequent development works.

This report does not consider ecological impacts (e.g. bats) or botanical risks (e.g. Japanese Knotweed). It is recommended that these be considered as part of the assessment of development constraints for the site.

The investigation has been carried out in order to provide information concerning the ground and groundwater conditions to allow a reasonable risk assessment to be made. Castle Rock Geotech undertakes to exercise all reasonable skill, care and due diligence in the exercise of the investigation with respect to sampling techniques, sample storage and report interpretation.

The assessments and judgement given in this report are directed by both the finite data on which they are based and the proposed works to which they are addressed. Data acquisition is subject to the limitations of the methods of investigation used. Exploratory holes undertaken during fieldwork investigate a small volume of ground in relation to the size of the site and as such can only provide an indication of site conditions. There may be conditions pertaining to the site and the proposed development, which have not been disclosed by the investigations.



NOTES ON LIMITATIONS

PHASE I DESK STUDY & PHASE II GROUND INVESTIGATION

The findings and opinions are relevant to the dates of our site works and should not be relied upon to represent conditions at substantially later dates. Conditions at the site will change over time due to natural variations and anthropogenic activities. Groundwater, surface water and soil gas conditions should be anticipated to change with diurnal, seasonal and meteorological variations.

The opinions expressed in this report regarding any contamination are based on simple statistical analysis and comparison with available guidance values. No liability can be accepted for the retrospective effects of any changes or amendments to these values.

Castle Rock Geotech cannot and does not guarantee the authenticity or reliability of the information it has relied upon. New information, improved practices or changes in legislation may necessitate an alteration to the report in whole or in part after its submission. Therefore, with any changes to the proposed development, or should the development proceed after the expiry of one year from the date of the report, the report should be referred back to Castle Rock Geotech for re-assessment and, if necessary, re-appraisal.

Castle Rock Geotech cannot be held responsible for structural failures caused by the location of foundations of any form of structure within the influence of exploratory holes.

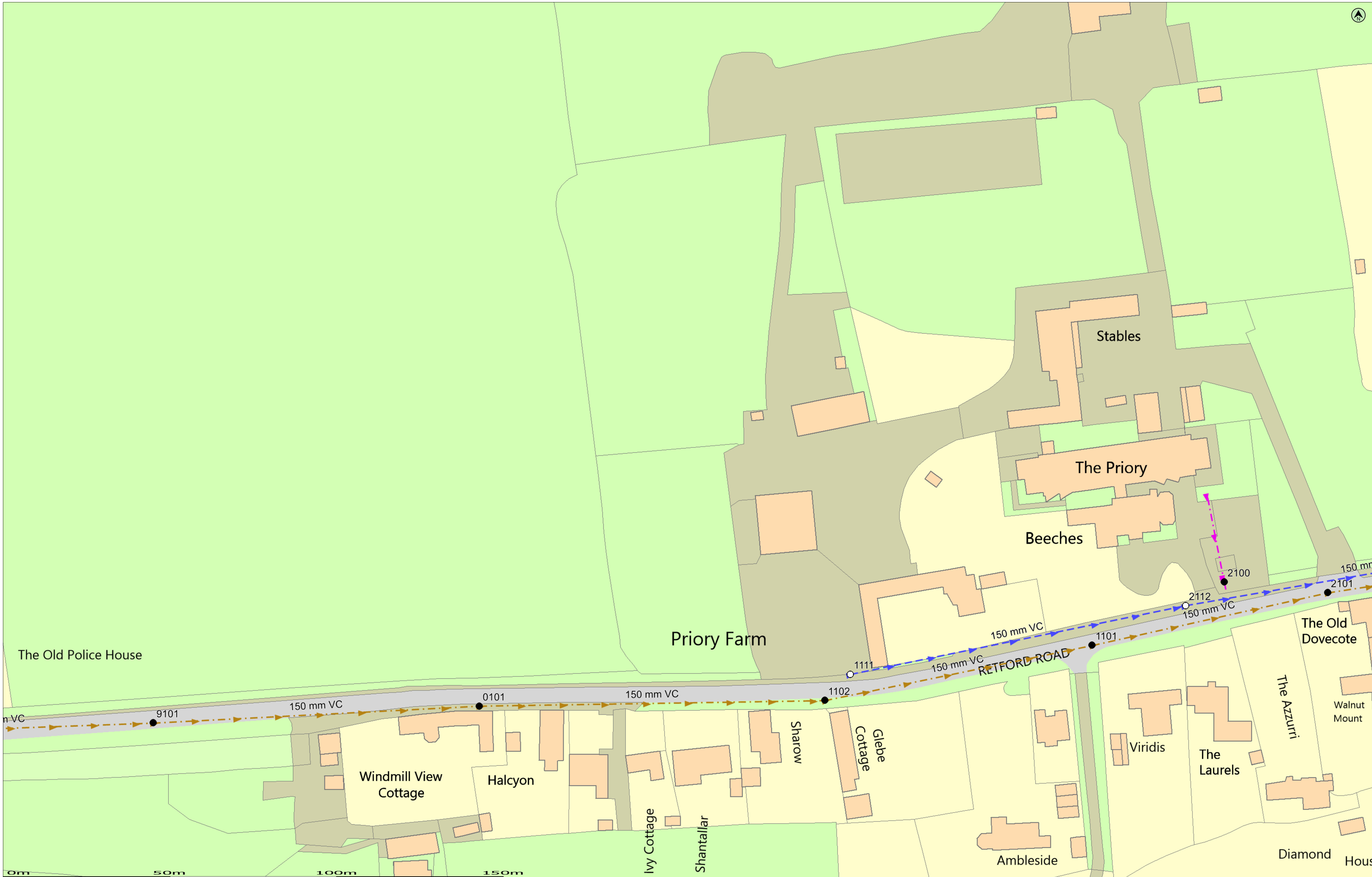




CASTLE ROCK GEOTECH

***SITE INVESTIGATIONS
Geotechnical, Geological &
Environmental Consultants***

www.crgео.co.uk

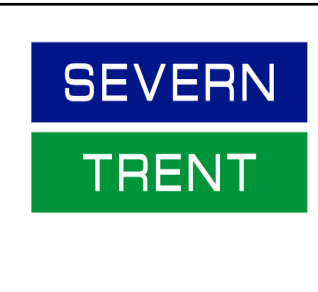


0m 50m 100m 150m Scale: 1:500 Map Centre: 478065,381209 Data updated: 14/04/21 Our Ref: 547755 - 1 Wastewater Plan A1

Do not scale off this Map. This plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its correctness is given or implied. In particular this plan and any information shown on it must not be relied upon in the event of any development or works (including but not limited to excavations) in the vicinity of SEVERN TRENT WATER assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems. On 1 October 2011 most private sewers and private lateral drains in Severn Trent Water's sewerage area, which were connected to a public sewer as at 1 July 2011, transferred to the ownership of Severn Trent Water and became public sewers and public lateral drains. A further transfer takes place on 1 October 2012. Private pumping stations, which form part of these sewers or lateral drains, will transfer to ownership of Severn Trent Water on or before 1 October 2016. Severn Trent Water does not possess complete records of these assets. These assets may not be displayed on the map. Reproduction by permission of Ordnance Survey on behalf of HMSO. © Crown Copyright and database right 2004. All rights reserved. Ordnance Survey licence number: 100031673. Document users other than SEVERN TRENT WATER business users are advised that this document is provided for reference purpose only and is subject to copyright, therefore, no further copies should be made from it.

Public Sewer	Public Sewer (Overhead)	Public Sewer (Underground)	Private Sewer	Private Sewer (Overhead)	Private Sewer (Underground)	Manhole	Manhole (Cover)	Manhole (Open)	Manhole (Cover) (Open)	Manhole (Cover) (Closed)	Manhole (Cover) (Open) (Proposed)	Manhole (Cover) (Closed) (Proposed)	Manhole (Cover) (Open) (Proposed) (with manhole)	Manhole (Cover) (Closed) (Proposed) (with manhole)	Manhole (Cover) (Open) (Proposed) (with manhole)	Manhole (Cover) (Closed) (Proposed) (with manhole)
Public Sewer (Overhead)	Public Sewer (Underground)	Private Sewer	Private Sewer (Overhead)	Private Sewer (Underground)	Manhole	Manhole (Cover)	Manhole (Open)	Manhole (Cover) (Open)	Manhole (Cover) (Closed)	Manhole (Cover) (Open) (Proposed)	Manhole (Cover) (Closed) (Proposed)	Manhole (Cover) (Open) (Proposed) (with manhole)	Manhole (Cover) (Closed) (Proposed) (with manhole)	Manhole (Cover) (Open) (Proposed) (with manhole)	Manhole (Cover) (Closed) (Proposed) (with manhole)	Manhole (Cover) (Open) (Proposed) (with manhole)

joe.hurst@fortemconsultants.co.uk
 Priory Farm



GENERAL CONDITIONS AND PRECAUTIONS TO BE TAKEN WHEN CARRYING OUT WORK ADJACENT TO SEVERN TRENT WATER'S APPARATUS

Please ensure that a copy of these conditions is passed to your representative and/or your contractor on site. If any damage is caused to Severn Trent Water Limited (STW) apparatus (defined below), the person, contractor or subcontractor responsible must inform STW immediately on:

0800 783 4444 (24 hours)

- a) These general conditions and precautions apply to the public sewerage, water distribution and cables in ducts including (but not limited to) sewers which are the subject of an Agreement under Section 104 of the Water Industry Act 1991(a legal agreement between a developer and STW, where a developer agrees to build sewers to an agreed standard, which STW will then adopt); mains installed in accordance with an agreement for the self-construction of water mains entered into with STW and the assets described at condition b) of these general conditions and precautions. Such apparatus is referred to as "STW Apparatus" in these general conditions and precautions.
- b) Please be aware that due to The Private Sewers Transfer Regulations June 2011, the number of public sewers has increased, but many of these are not shown on the public sewer record. However, some idea of their positions may be obtained from the position of inspection covers and their existence must be anticipated.
- c) On request, STW will issue a copy of the plan showing the approximate locations of STW Apparatus although in certain instances a charge will be made. The position of private drains, private sewers and water service pipes to properties are not normally shown but their presence must be anticipated. This plan and the information supplied with it is furnished as a general guide only and STW does not guarantee its accuracy.
- d) STW does not update these plans on a regular basis. Therefore the position and depth of STW Apparatus may change and this plan is issued subject to any such change. Before any works are carried out, you should confirm whether any changes to the plan have been made since it was issued.
- e) The plan must not be relied upon in the event of excavations or other works in the vicinity of STW Apparatus. It is your responsibility to ascertain the precise location of any STW Apparatus prior to undertaking any development or other works (including but not limited to excavations).
- f) No person or company shall be relieved from liability for loss and/or damage caused to STW Apparatus by reason of the actual position and/or depths of STW Apparatus being different from those shown on the plan.

In order to achieve safe working conditions adjacent to any STW Apparatus the following should be observed:

1. All STW Apparatus should be located by hand digging prior to the use of mechanical excavators.
2. All information set out in any plans received from us, or given by our staff at the site of the works, about the position and depth of the mains, is approximate. Every possible precaution should be taken to avoid damage to STW Apparatus. You or your contractor must ensure the safety of STW Apparatus and will be responsible for the cost of repairing any loss and/or damage caused (including without limitation replacement parts).
3. Water mains are normally laid at a depth of 900mm. No records are kept of customer service pipes which are normally laid at a depth of 750mm; but some idea of their positions may be obtained from the position of stop tap covers and their existence must be anticipated.
4. During construction work, where heavy plant will cross the line of STW Apparatus, specific crossing points must be agreed with STW and suitably reinforced where required. These crossing points should be clearly marked and crossing of the line of STW Apparatus at other locations must be prevented.
5. Where it is proposed to carry out piling or boring within 20 metres of any STW Apparatus, STW should be consulted to enable any affected STW Apparatus to be surveyed prior to the works commencing.
6. Where excavation of trenches adjacent to any STW Apparatus affects its support, the STW Apparatus must be supported to the satisfaction of STW. Water mains and some sewers are pressurised and can fail if excavation removes support to thrust blocks to bends and other fittings.
7. Where a trench is excavated crossing or parallel to the line of any STW Apparatus, the backfill should be adequately compacted to prevent any settlement which could subsequently cause damage to the STW Apparatus. In special cases, it may be necessary to provide permanent support to STW Apparatus which has been exposed over a length of the excavation before backfilling and reinstatement is carried out. There should be no concrete backfill in contact with the STW Apparatus.
8. No other apparatus should be laid along the line of STW Apparatus irrespective of clearance. Above ground apparatus must not be located within a minimum of 3 metres either side of the centre line of STW Apparatus for smaller sized pipes and 6 metres either side for larger sized pipes without prior approval. No manhole or chamber shall be built over or around any STW Apparatus.
9. A minimum radial clearance of 300 millimetres should be allowed between any plant or equipment being installed and existing STW Apparatus. We reserve the right to increase this distance where strategic assets are affected.
10. Where any STW Apparatus coated with a special wrapping is damaged, even to a minor extent, STW must be notified and the trench left open until the damage has been inspected and the necessary repairs have been carried out. In the case of any material damage to any STW Apparatus causing leakage, weakening of the mechanical strength of the pipe or corrosion-protection damage, the necessary remedial work will be recharged to you.
11. It may be necessary to adjust the finished level of any surface boxes which may fall within your proposed construction. Please ensure that these are not damaged, buried or otherwise rendered inaccessible as a result of the works and that all stop taps, valves, hydrants, etc. remain accessible and operable. Minor reduction in existing levels may result in conflict with STW Apparatus such as valve spindles or tops of hydrants housed under the surface boxes. Checks should be made during site investigations to ascertain the level of such STW Apparatus in order to determine any necessary alterations in advance of the works.
12. With regard to any proposed resurfacing works, you are required to contact STW on the number given above to arrange a site inspection to establish the condition of any STW Apparatus in the nature of surface boxes or manhole covers and frames affected by the works. STW will then advise on any measures to be taken, in the event of this a proportionate charge will be made.
13. You are advised that STW will not agree to either the erection of posts, directly over or within 1.0 metre of valves and hydrants,
14. No explosives are to be used in the vicinity of any STW Apparatus without prior consultation with STW.

TREE PLANTING RESTRICTIONS

There are many problems with the location of trees adjacent to sewers, water mains and other STW Apparatus and these can lead to the loss of trees and hence amenity to the area which many people may have become used to. It is best if the problem is not created in the first place. Set out below are the recommendations for tree planting in close proximity to public sewers, water mains and other STW Apparatus.

15. Please ensure that, in relation to STW Apparatus, the mature root systems and canopies of any tree planted do not and will not encroach within the recommended distances specified in the notes below.
16. Both Poplar and Willow trees have extensive root systems and should not be planted within 12 metres of a sewer, water main or other STW Apparatus.
17. The following trees and those of similar size, be they deciduous or evergreen, should not be planted within 6 metres of a sewer, water main or other STW Apparatus. E.g. Ash, Beech, Birch, most Conifers, Elm, Horse Chestnut, Lime, Oak, Sycamore, Apple and Pear. Asset Protection Statements Updated May 2014
18. STW personnel require a clear path to conduct surveys etc. No shrubs or bushes should be planted within 2 metre of the centre line of a sewer, water main or other STW Apparatus.
19. In certain circumstances, both STW and landowners may wish to plant shrubs/bushes in close proximity to a sewer, water main of other STW Apparatus for screening purposes. The following are shallow rooting and are suitable for this purpose: Blackthorn, Broom, Cotoneaster, Elder, Hazel, Laurel, Privet, Quickthorn, Snowberry, and most ornamental flowering shrubs.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0101	F	29.04	27.28	1.76
1101	F	26.5	24.99	1.51
1102	F	27.09	25.56	1.53
2100	F		0	0
2101	F	25.59	24.01	1.58
9101	F	29.66	27.81	1.85
1111	S	27.16	26.05	1.11
2112	S	25.93	24.55	1.38

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
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Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
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Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
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Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
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Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
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