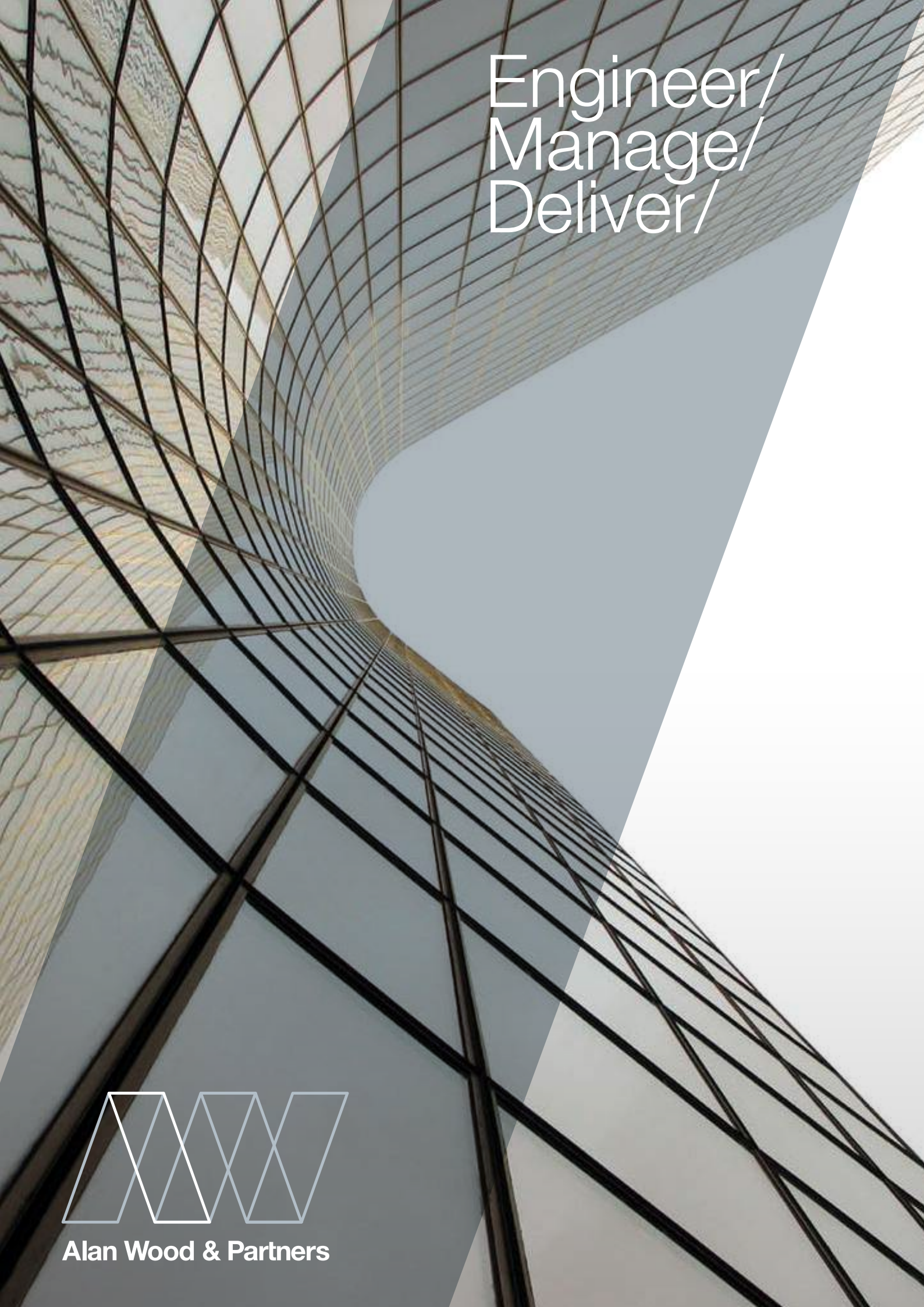

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PHASE I/II GEO-ENVIRONMENTAL INVESTIGATION REPORT

SCAPEGOAT HILL, GOLCAR, HUDDERSFIELD HD7 4ND

For

Brierstone Ltd

Project Reference: JS/ST/40706-Rp001

Prepared by: **S. Thomas**, *BSc (Hons), MSc, FGS*

Redacted

Signed: .....

Date: 3rd May 2018

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Signed: ....

Date: 3 May 2018

Issue	Revision	Revised by	Approved by	Revised Date

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EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

Site Location & Description	The site is located off Old Lane, Scapegoat Hill, Golcar, Huddersfield HD7 4ND, and is centred at approximate National Grid Reference (NGR) 409007mE, 416372mN.
Historical Land Use	The site has not undergone significant development in the past. An unlabelled, potentially residential structure was marked on the earliest available historical map until c.1961. The adjacent land has previously been developed with residential properties, as the Scapegoat Hill village became developed.
Geology	Near surface superficial deposits are not recorded within the site boundary. The recorded solid geology is recorded as Rough Rock Flags Bedrock (Sandstone) at the northern site boundary. Millstone Grit Group (Mudstone, Siltstone, and Sandstone) is recorded across the majority of the site.
Hydrogeology	**Bedrock:** Bedrock is recorded as Rough Rock Flags Bedrock (Sandstone) at the northern site boundary. Millstone Grit Group (Mudstone, Siltstone, and Sandstone) is recorded across the majority of the site. **Source Protection:** There are no source protection zones within 500m of the study area. **Vulnerability & Leaching Potential:** The site is within a 'H3' soil vulnerability zone, with the site underlain by a 'minor aquifer' and in an area with high leaching potential.
Mining Assessment	The site is not located within a Coal Authority 'Coal Mining Reporting Area'. Risk associated with coal mining related subsidence is considered to be very low. Non-coal mining has been recorded on the site for a non-specified vein mineral. However, as evidence of non-coal mining was not recorded during the site investigation works, risk is considered to be negligible.
Geotechnical Assessment	Geotechnical laboratory testing was carried out on one sample of cohesive soil by PSL LTD. The calculated modified plasticity index (NHBC Chapter 4.2) was found to be non-plastic. Unconfined compressive strength and Point Load Testing has been undertaken on samples of bedrock to produce unconfined compressive strength parameters. mudstone bedrock should be considered to have a typical UCS of 10.2MPa, with siltstone at 0.80MPa, and sandstone at 4.20MPa. A slope stability assessment is to be undertaken in order to assess the long term stability of the site following re-development. This will be reported under a separate cover.
Environmental Assessment	Elevated arsenic, and lead (TP3 at 0.60m) were elevated above the relevant GAC criteria. It is recommended that the identified hotspot material is excavated and either removed from site or re-located under areas of hardstanding. Elevated benzo(b)fluoranthene, benzo(a)pyrene and dibenzo(a,h)anthracene (TP2 Topsoil at 0.30m bgl) were elevated above the relevant GAC criteria. It is recommended that the identified hotspot material is excavated and removed from site. Elevated leachable arsenic, copper and lead have been found within samples of topsoil and made ground across the site. As the site is being re-developed with new residential properties, the permeable surface area of

	the site is being reduced. Superficial deposits include a 1.4m thick deposit of gravelly clay (BH1), and a deposit of very sandy clay (BH3). The geological bedrock has been found to comprise layers of mudstone, siltstone and sandstone. Groundwater has been recorded at 8.92m bgl (BH2), 20.80m bgl (BH3), and 19.34m bgl (BH4). The presence of low permeability layers of mudstone will suppress the infiltration of water through the site into the groundwater. The nearest surface water feature is a Tertiary River, located 210m to the south west of the study area, and there are no groundwater or surface water abstraction licences within 500m of the study area. As a result, risk associated with elevated leachable contaminants is considered to be low.
Foundations	Made ground soils of any type are not suitable founding stratum. The proposed new residential properties are likely to be constructed on traditional deep strip, or trench-fill foundation, founded on the near surface bedrock. The widening, strengthening and reinforcement of foundations in accordance with NHBC Standards would be required where footings are found to straddle strata of different type (e.g. sand, clay, silt) or where soft and/or where locally unstable ground is encountered at founding depth.
Ground Slabs	Made ground have been encountered upto 0.75m bgl, however, this material is not located under the footprint of the proposed development. The existing topographical levels are to be reduced under the footprint of the proposed structures. As a result, it is considered that ground bearing floor slabs are suitable for the proposed development.
Precautions near Trees	As superficial deposits across the site have been predominantly granular in nature, heave precautionary measures are not likely to be required. All foundations should be constructed in accordance with NHBC Standards (i.e. Chapter 4.2).
Drainage	Due to the site topography, and the presence of shallow bedrock and isolated deposits of cohesive superficial soils, a soakaway drainage system is not considered to be suitable.
Sulphate	Concrete specification; Design Sulphate classification of DS-2, along with an ACEC class of AC-3z. 11.3.4. The on-site soils are not considered to be at risk from containing pyrite.
Potable Water Supplies	Risk to potable water supply pipes is considered to be low. On the basis of available test results it is likely that protective measures will be required. Consultation should be undertaken with the local water authority with respect to any precautions they may require, prior to construction.
Obstruction & Excavations	Near surface bedrock deposits have been encountered within 2m of the site surface. The proposed development includes alterations to the site topography in order to construct a suitable development platform. The peckering out of bedrock deposits should be allowed for, and the use of suitable excavation machinery. It should be noted that the advancement of these excavations may be slowed due to the strength of the near surface bedrock deposits.
Boundary Conditions	An earth retaining wall marks the southern and south western site boundary along Taylor Lane and Old Lane, respectively. The retaining wall along Taylor Lane appears to have suffered rotational failure with cracking noted to have occurred through the mortar between the brickwork. This movement is considered to be a result of poor construction methods.
Roads	On the basis of visual observation, it is considered that the near surface soils are likely to have a minimum CBR value of around 2.5%, perhaps higher, but this should be confirmed.
Further Works	Ground gas monitoring – to be reported under a separate cover

	Ground stability assessment – to be reported under a separate cover

NB. The Executive Summary presented above is an overview of the key findings and conclusions of the report. There may be other information contained within the body of the report which puts into context the findings of the Executive Summary. No reliance should therefore be placed on the Executive Summary until the report as a whole has been read in full.

1 INTRODUCTION

1.1 Appointment

1.1.1 Alan Wood and Partners were appointed by Brierstone Ltd (the 'Client') to undertake Geotechnical and Geo-Environmental Investigations of a parcel of land located off Old Lane, Scapegoat Hill, Golcar, Huddersfield HD7 4ND.

1.1.2 The report has been prepared for the sole use and reliance of Brierstone Ltd. No other third party may rely on, reproduce or redistribute any content of this report without the prior written consent of Alan Wood and Partners. Any unauthorised third parties using the information presented in this report do so entirely at their own risk and are duly excluded from any warranty, duty of care or skill.

1.2 Development Proposals

1.2.1 It is understood that the site is to be redeveloped for residential properties. A proposed preliminary development layout was provided to Alan Wood and Partners, which is appended to this report.

1.3 Report Status

1.3.1 The geoenvironmental investigation of the site has been carried out in two phases. These works have comprised the completion of a Phase I preliminary assessment (desk based study) and a subsequent Phase II (intrusive) investigation, the results of which are presented in this report.

1.3.2 The Phase I assessment consisted of a study of information surrounding the site's geoenvironmental setting and that provided by the Environment Agency, Groundsure, the British Geological Survey and the Coal Authority, so that an initial Conceptual Site Model (CSM) and Risk Assessment (RA) could be completed. The scope of the intrusive investigation was formulated on the basis of information obtained from the Phase I assessment.

1.4 Objectives of the Investigation

1.4.1 The scope of works undertaken as part of this appraisal was to:

- Carry out a physical inspection of the site (walkover survey):

- Review any pre-existing documentation relating to ground conditions (geotechnical and environmental);
- Investigate the ground conditions present on-site and identify their geotechnical properties in relation to the site's proposed end use;
- Investigate the hydrogeological regime beneath the site wherever possible;
- Investigate the potential risks to the development from hazardous ground gas sources (to be reported under separate cover);
- Identify the nature and concentration of any contamination within the on-site soils and undertake a tiered risk assessment to establish likely risks to sensitive receptors. Defining a Conceptual Site Model of potential contaminant linkages relevant to the proposed redevelopment of the site; and
- Provide preliminary advice in relation to any environmental or geotechnical issues associated with the site including foundation recommendations and other recommendations needed to facilitate the proposed redevelopment, including, where necessary, identifying any additional phases of work or remediation that need to be carried out.

1.5 Site Works

1.5.1 The findings and recommendations given in this report are based on fieldwork undertaken between the 14th March and 25th March 2018, this comprising the completion of three hand dug inspection pits (HP1 to HP3), four mechanically excavated trial holes (TP1 to TP4), and four rotary cored boreholes (BH1 to BH4).

1.6 Limitations of Study

1.6.1 This report presents factual and interpretative geotechnical and environmental information, along with provisional construction proposals and recommendations relevant to the objectives of the investigation for the site end-use given above. The report has been prepared for the titled project and Alan Wood and Partners can accept no responsibility or liability for the consequences of the use of this document, wholly or in part, for any other purpose than that for which it was commissioned.

1.6.2 For the purposes of this report and thus defining risk to the proposed development from an environmental point of view, a 'residential' end use scenario with plant uptake has been adopted. Interpretation and recommendations should not be assumed valid for alternate land uses. Where the proposed site usage changes, the findings of this report should be re-assessed to accommodate the change in proposed end-use.

1.6.3 The conclusions and recommendations presented in this report are based on site-specific information obtained during the desk study, ground conditions encountered and laboratory analysis and are considered reasonable on the basis of available information at the time the assessment was carried out. They should not necessarily be relied upon to represent site conditions at a substantially later date.

1.6.4 The findings and opinions provided in this report are given in good faith and are subject to the limitations and constraints imposed by the methods and information sources described. Factual information has been obtained from a variety of sources. Alan Wood and Partners assumes that third party data is reliable, but has not independently confirmed this. The validity and accuracy of this information is therefore outside the control of Alan Wood and Partners. Professional judgement and experience is however used to ensure that uncertainties are reduced to a level appropriate to the site conditions, the purpose of the investigation and the resources devoted to it by the Client.

1.6.5 Whilst every effort has been made to carry out an assessment that enables a realistic characterisation of the geotechnical and environmental parameters at the site, the possibility of significant spatial variation in actual ground, groundwater and environmental (gas and contamination) conditions existing between or beyond exploratory hole locations cannot be discounted. Where information or opinion is given this is for guidance only. Further information, ground investigation, construction activities, change of site use or the passage of time may reveal conditions that were not indicated in the data and therefore could not have been considered in the preparation of this report. Where such information might impact upon stated opinions, Alan Wood and Partners cannot accept responsibility for conditions not encountered and reserves the right to modify or retract the opinions expressed in this report. Where opinions expressed are based on current available guidelines and legislation, no liability can be accepted by AWP for the effects of any future changes to such

guidelines and legislation. New information of improved practices and changes in legislation may require reinterpretation of the report as a whole, or in part.

1.6.6 This report does not constitute an archaeological or ecological assessment, nor does it constitute an asbestos inspection. A suitably qualified consultant should be consulted where these aspects of work are required.

1.6.7 A flood risk assessment in accordance with Planning Policy Statement 25, *Development and Flood Risk* (2010) has not been undertaken as part of this commission.

1.6.8 All ground investigation works and soil descriptions were undertaken in general accordance with BS EN ISO 14688-1 'Geotechnical Investigation and Testing – Identification and Classification of Soil' (2002), BS10175 (2011), BS 5930 (2010) and/or BS EN 1997-1:2004 (Part 1, General Rules) and BS EN 1997-2:2007 (Part 2, Ground Investigation and Testing).

2 SITE DETAILS AND DESCRIPTION

2.1 Introduction

2.1.1 Published environmental, geological and historical data relating to the site area has been reviewed, in conjunction with a walkover survey undertaken on 14th March 2018, the findings of which are presented below. The principal considerations of immediate relevance are presented in the following sections.

2.2 Site Location & Description

2.2.1 The site is located off Old Lane, Scapegoat Hill, Golcar, Huddersfield HD7 4ND, and is centred at approximate National Grid Reference (NGR) 409007mE, 416372mN. A site location plan is presented as Figure 40706/001.

2.2.2 The site area is approximately 0.34 hectares (0.84 acres). The site has a steep gradient, which dips in a southerly direction and an overall slope angle of 15°. The site is predominantly surfaced with soft landscaping, which is vegetated with grass and shrubbery.

2.2.3 The site is divided in two sections by an east to west orientated access track. The northern section of the site is a rectangular piece of land, and is bordered on all sides by residential properties. One of the new proposed residential dwellings is to be constructed in the centre of this area.

2.2.4 The southern parcel of land is larger in size and triangular in shape. This plot of land is bordered by a burial ground to the east, with residential properties to the south and west. Taylor Lane and Old Lane boarder the southern boundary. Two residential properties are to be constructed within this area. There is a significant level difference between the northern and southern boundaries. The site has an overall gradient of 15°. An earth retaining wall marks the southern and south western site boundary along Taylor Lane and Old Lane, respectively. The retaining wall along Taylor Lane appears to have suffered rotational failure with cracking noted to have occurred through the mortar between the brickwork. A concrete garage structure is present on the southern boundary, at the intersection with Old Lane and Taylor Lane.

2.2.5 Invasive weeds, including Japanese Knotweed and Giant Hogweed were not observed during the site works.

3 GEO-ENVIRONMENTAL SETTING

3.1 Anticipated Geology, Hydrogeology & Mining

3.1.1 A summary of the available published geological and hydrogeological information is provided in Table 3.1 below and overleaf. A review of the following information was undertaken:

- British Geological Survey 1:50,000 scale series, 77 Huddersfield, Solid & Drift Edition;
- British Geological Survey on-shore borehole records database;
- Coal Authority database on coal mining reporting areas from the following web pages:
  - http://coal.decc.gov.uk/en/coal/cms/publications/data/map;
  - http://coal.decc.gov.uk/en/coal/cms/services/planning/strategy;
- Environment Agency online aquifer designation database; and
- Emapsite GeoInsight Data Report Ref. EMS-466873_626779 (Appendix A) and EnviroInsight Report Ref. EMS-466873_626780 (Appendix B), dated 12th March 2018.

Table 3.1 - General Geological Information

Made Ground	Deposits of made ground are not recorded within 500m of the site boundary.
Superficial and Solid Geology	**Superficial Deposits:** Superficial deposits are not recorded beneath the site boundary. **Bedrock:** Bedrock is recorded as Rough Rock Flags Bedrock (Sandstone) at the northern site boundary. Millstone Grit Group (Mudstone, Siltstone, and Sandstone) is recorded across the majority of the site.
Discontinuities	A geological fault is located 275m to the south west of the site. There are no recorded discontinuities within the site boundary.
Hydrogeology	With respect to site specific information presented on the Environment Agency's website and Groundsure report, the following has been identified: **Bedrock:** The near surface bedrock deposit is recorded as a 'Secondary(A) Aquifer'. **Source Protection:** There are no source protection zones within 500m of the study area. **Vulnerability & Leaching Potential:** The site is within a 'H3' soil vulnerability zone, with the site underlain by a 'minor aquifer' and in an area with high leaching potential.
Hydrology	The nearest surface water feature comprises a Tertiary River, 209m to the south west.
Radon and Mine Gas	The site is in a Radon affected area, as between 1% and 3% of properties are above the Action Level. However, Radon protective measures are not necessary.
Coal Mining	The site is not in an area where coal mining has taken place within 100m of the study area.
Non-coal Mining	Non-coal mining has been recorded on the site for a non-specified vein mineral.

Natural Cavities	There are no natural cavities within 1000m of the site area.

Table 3.2 - Environmental Data

Discharge Consents	There are no records of Red List Discharge Consents within 500m of the study area.
Pollution Incidents to Controlled Waters	There are no Environment Agency records of pollution incidents within 500m of the site.
Landfill Sites, Waste Management / Transfer / Treatment and Disposal Sites	There are no current of historical Environment Agency landfill sites within 1km of the site. There are no BGS non-operational landfill sites within 1km of the site. There are three landfills recorded by Local Authority and Historical Mapping Records within 1km of the study area, the nearest of which is located 682m to the south of the site, which was operational c.1961 and was used as a refuse tip. There are no other waste sites within 500m of the study area.
Flood	There are no areas designated as susceptible to River and Coastal 'Zone 2' or 'Zone 3' flooding within 250m of the site area. The 'Risk of Flooding from Rivers and the Sea' is classified as 'Very Low'.
Groundwater and Surface Water Abstractions	There are no groundwater abstraction licences within 1km of the study area. There is one surface water abstraction licence within 1km of the study area, located 903m to the north east.
Public Register of Contaminated Land: Part 2A (EPA 1990)	There are no sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990.
Invasive Plant Species	Invasive plant species, including Japanese Knotweed were not identified during the intrusive site investigation works.

4 HISTORICAL LAND USE

4.1.1 A study of historical Ordnance Survey maps has been undertaken to identify any potentially contaminative former land-uses at the site. The main historical features of the site and surrounding area are summarised in the following table, whilst a copy of the historical maps is presented in Appendix C.

4.1.2 Ordnance Survey map editions may not however be complete and it is possible, therefore, that additional land uses to those presented in the plans have occurred.

4.1.3 A summary of the historical land use and surrounding area is presented in Table 4.1 below and Table 4.2.

Table 4.1 - Historical Land Use (On Site)

Date	Map Scale	Feature
1854	1:10,560	Site largely unoccupied. An unlabelled structure was located at the north-eastern site boundary.
1892	1:10,560	No significant alterations.
1893	1:2,500	No significant alterations.
1907	1:2,500	No significant alterations.
1908	1:10,560	No significant alterations.
1919	1:2,500	No significant alterations.
1930	1:10,560	No significant alterations.
1932	1:2,500	No significant alterations.
1938	1:10,560	No significant alterations.
1948	1:10,560	No significant alterations.
1956	1:10,560	No significant alterations.
1961	1:2,500	On-site structure appears to have been re-constructed.
1963	1:2,500	No significant alterations.
1967	1:10,560	On-site structure appears to have been demolished.
1978	1:10,000	No significant alterations.
1980	1:2,500	No significant alterations.
1991	1:2,500*	No significant alterations.
1993	1:1,250*	No significant alterations.
1993	1:10,000	No significant alterations.
2002	1:10,000	No significant alterations.
2010	1:10,000	No significant alterations.
2014	1:10,000	No significant alterations.

* incomplete mapping record

Table 4.2 - Historical Land Use (Off Site)

Date	Map Scale	Direction	Feature
1854	1:10,560	North	Undeveloped agricultural land with
		East	Undeveloped agricultural land
		South	Undeveloped agricultural land
		West	Undeveloped agricultural land
1892	1:10,560	North	Residential properties constructed (<50m)
		East	Residential properties constructed (<50m)
		South	No significant alterations. Reservoir (100m)
		West	Residential properties constructed (<50m), Liberal Club (90m), excavation scar and spring (100m)
1893	1:2,500	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations
1907	1:2,500	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations
1908	1:10,560	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations
1919	1:2,500	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations
1930	1:10,560	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations
1932	1:2,500	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations
1938	1:10,560	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations
1948	1:10,560	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations
1956	1:10,560	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations
1961	1:2,500	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations
1963	1:2,500	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations

* incomplete mapping record

Table 4.3 - Historical Land Use (Off Site) Continued

Date	Map Scale	Direction	Feature
1967	1:10,560	North	New residential properties (<500m)
		East	New residential properties (<500m)
		South	New residential properties (<500m)
		West	New residential properties (<500m)
1978	1:10,000	North	No significant alterations
		East	New residential properties (<500m)
		South	No significant alterations
		West	New residential properties (<500m)
1980	1:2,500	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations
1991	1:2,500*	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations
1993	1:1,250*	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations
1993	1:10,000	North	New residential properties (<500m)
		East	No significant alterations
		South	No significant alterations
		West	New residential properties (<500m)
2002	1:10,000	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations
2010	1:10,000	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations
2014	1:10,000	North	No significant alterations
		East	No significant alterations
		South	No significant alterations
		West	No significant alterations

5 PHASE I GEOTECHNICAL APPRAISAL

5.1 Made Ground

5.1.1 As the site has undergone a limited amount of historical development, and made ground deposits are not recorded within the site boundary, made ground deposits are likely to be limited in extent.

5.1.2 The presence, type and extent of any made ground soils will need to be established through ground investigation.

5.2 Natural Strata

5.2.1 Near surface superficial deposits are not recorded within the site boundary.

5.2.2 The recorded solid geology is recorded as Rough Rock Flags Bedrock (Sandstone) at the northern site boundary. Millstone Grit Group (Mudstone, Siltstone, and Sandstone) is recorded across the majority of the site.

5.3 Groundwater

5.3.1 No significant perched groundwater is anticipated, due to the nature of the site topography.

5.3.2 True groundwater will be present within the underlying Rough Rock Flags Bedrock and Millstone Grit Group bedrock deposits, at depth.

5.4 Stability Issues

5.4.1 There is a significant level difference between the northern and southern boundaries, with a steep slope marking the topographical change. An assessment of the stability of the slope in its current condition and proposed model is to be undertaken using computer design software (Limit State Geo version 3.4a). The results of this analysis will be reported under a separate cover.

5.5 Coal Mining Induced Subsidence

5.5.1 The site is not located within a Coal Authority ‘Coal Mining Reporting Area’. Risk associated with coal mining related subsidence is considered to be very low.

5.6 Non-Coal Mining

5.6.1 Non-coal mining has been recorded on the site for a non-specified vein mineral. Should evidence associated with quarrying works be encountered during the site investigation works, an assessment will be required to establish possible impact on the development. Where this is found to affect construction, appropriate precautions may need to be incorporated in to the design (e.g. deepened foundations, reinforced superstructure etc). Such risk is considered, at this stage, to be low.

5.7 Excavation Conditions

5.7.1 The proposed development includes alterations to the site topography in order to construct a suitable development platform. The peckering out of bedrock deposits should be allowed for, and the use of suitable excavation machinery. It should be noted that the advancement of these excavations may be slowed due to the strength of the near surface bedrock deposits.

5.7.2 It is likely that excavations should be relatively stable in the short term. However, some materials such as granular soils and made ground are liable to collapse without warning. This situation is likely to be exacerbated by water ingress. No man entry into unsupported excavations should be allowed without an appropriate risk assessment. Reference to CIRIA report 97 (1983) should be made to establish suitable means of support, or battering of excavation sides.

5.7.3 It is considered unlikely that dewatering will be required for shallow short-term excavations. Anticipated groundwater conditions suggest that simple dewatering techniques (e.g. sump pumping) are likely to be adequate to control water ingress on a routine basis. However, it is recommended that provision for the drainage of surface water is allowed for to prevent surface water ponding or collection both during and post construction, as this may lead to deterioration of the founding stratum.

6 PHASE I ENVIRONMENTAL ASSSESSMENT

6.1 Introduction

6.1.1 The following section summaries the Preliminary Phase I Conceptual Site Model (CSM), which has been produced following the review of available pertinent desk study and third-party information. The CSM summarises the understanding of surface and sub-surface features, the potential sources of contamination, pathways and receptors in order to support the identification and assessment of plausible contaminant linkages.

6.2 Initial Conceptual Site Model & Risk Assessment

6.2.1 The risk assessment has been carried out to assess the likelihood of risk to human health and the wider environment, on the basis of information reviewed. The risk assessment is a qualitative *source-pathway-receptor* assessment and its function is to assess the likelihood that each possible linkage exists and to decide whether they pose potentially unacceptable risks to identified receptors (i.e. people, structures, water bodies or ecosystems) that may be harmed.

6.2.2 Risk can be defined as the combination of the consequence of a harmful effect and the probability of its occurrence. The existence of a contaminant linkage is dependent on site use, as well as environmental conditions: **if no contaminant linkage(s) can be proven, then the risk(s) may be discounted**.

6.3 Site Summary & Environmental Sensitivity

6.3.1 A review of available desk study information indicates that the site area has a limited development history. The surrounding land has been occupied by predominantly residential properties with the exception of land to the east of the site, which has been used as a burial ground. and the extent of such material would need to be confirmed through ground investigation.

6.3.2 Deposits of made ground are expected to be limited across the site

6.3.3 The underlying geology is indicated to comprise Rough Rock Flags Bedrock (Sandstone) which is recorded across the northern site boundary. The site is predominantly underlain by the Millstone Grit Group (Mudstone, Siltstone, and Sandstone) is recorded across the majority of the site.

6.3.4 Some perched/shallow groundwater may be present within the near surface granular deposits, but this is likely to be localised.

6.3.5 It is considered possible that elevated concentrations of CO_2 and CH_4 may be present as a result of the burial ground to the east. On this basis, it would be prudent to assess the potential for fugitive ground gas migration through a period of monitoring appropriate to the site's proposed end use.

6.3.6 Although the likely sources of significant contamination are expected to be limited, there remains the potential for on-site soils to contain naturally elevated concentrations of metals and metalloids (e.g. arsenic), non-metal inorganics and organic contamination (e.g. PAH) organochlorine pesticides and organophosphate pesticides. Asbestos contaminants and fuel oil/diesel/petrol are not anticipated however.

6.3.7 The Rough Rock Flags Bedrock Millstone Grit Group bedrock, are classified as a 'Secondary (A) Aquifer', and the site is in an area with 'High Leaching Potential'. Risk associated with leachable contaminants is considered to be low.

6.3.8 In summary, given the site history, the anticipated contaminant load within the on-site soils, its underlying geology, gassing potential and the nature of controlled waters receptors, sensitivity of the site is considered, at this stage, to be **very low** to **moderate/low**. The nature and concentration of any contamination will need to be confirmed through testing.

6.4 Potential Sources

6.4.1 A potential source is defined as 'a contaminant which is in, or under the land and has the potential to cause harm to human health or to cause pollution of controlled waters'.

6.4.2 The following potential contaminants that may be associated with the site are summarised in Table 6.1 overleaf.

Table 6.1 - Summary of Potential Contaminant Sources

Potential Sources	**Associated Potential Contaminants** (*not limited to*)	
	Metals, inorganics and other contaminants	*Organics*
Contaminated made ground/topsoil soils originating from previous development and agricultural site use	Heavy metals/metalloids, sulphate, asbestos	PAH, organochlorine pesticides and organophosphate pesticides
Naturally occurring elevated levels of potential contaminants within the underlying near surface natural strata	Heavy metals/metalloids, sulphate	PAH
Hazardous ground gases associated with nearby burial ground	CO_2 and CH_4	

6.5 Summary of Potential Receptors

6.5.1 A receptor is the potential target of the source contaminant, to which either significant harm or deterioration in quality may be caused.

6.5.2 The potential sensitive receptors with respect to the potential contamination hazards identified above are considered below.

Table 6.2 - Summary of Potential Receptors

Potential Receptor	**Comment**
Human Health	Site end-users Site operatives (during construction phase only)
Construction	Potable water supply pipes
	Foundations
Underlying natural strata	Near surface soils and/or any perched groundwater

6.6 Plausible Pathways

6.6.1 Migration pathways are routes by which contaminant sources may come into contact with receptors. Potential pathways for different types of contaminants vary depending on the properties of the contaminant, the mechanism of its release and the nature of the receptor. The principal potential contaminant pathways by which receptors might

become exposed to potential contamination at the site are summarised as follows in Table 6.3 below.

Table 6.3 - Summary of Plausible Pathways

Potential Source	Pathway
Potentially contaminated made ground soils, underlying natural strata / perched groundwater	Direct ingestion, dermal contact, dust and/or vapour inhalation
	Direct ingestion and/or dermal contact with liquid contaminants
	Leaching and direct contact with foundations and potable water supply pipes. Lateral migration of contaminants through preferential pathways
Hazardous Ground Gases	Accumulation of hazardous ground gases (CH_4 and CO_2) in buildings

6.7 Risk Assessment

6.7.1 The potential contaminant linkages listed above are based on available data and the features noted during the 'walkover'. Therefore, the linkages identified are tentative in nature and are subject to the following uncertainties (to be followed up through ground investigation):

- Nature and extent of the made ground at the site;
- Nature of the underlying natural strata at the site;
- The actual distribution of contaminants within the made ground and underlying natural soils; and
- The hydrogeological regime beneath the site.

6.7.2 The assessment presented herein assumes that the site to have a residential end-use, with plant uptake. The assessment is not valid for other land uses. Should the proposed end-use of the site change, the assessment contained herein would need to be revised to accommodate this.

6.7.3 The identified potential contaminants and receptors have been considered in relation to the pathways that may link them. The risk classification has been estimated in

accordance with those methods prescribed in CIRIA publication C552 '*Contaminated Land Risk Assessment: A Guide to Good Practice*', 2001.

6.7.4 Risk is regarded as a combination of the likelihood of an 'event' occurring and its severity: both elements must be taken into account when assessing risk. The method for risk assessment, or evaluation, is purely qualitative. As defined in CIRIA C552:2001, the magnitude of the potential 'severity' of risk occurring may be assessed against:

- **Severe**: short term risk to human health likely to result in significant harm as defined under EPA 1990, Part 2A. Short term risk of pollution to sensitive water receptor;
- **Medium**: significant harm to human health, pollution of sensitive water resource or significant change to an ecosystem or specific organism;
- **Mild**: pollution of non-sensitive water resource but significant damage to crops, buildings, structures and services or the environment;
- **Minor**: harm, which may result in financial loss, or expenditure to resolve. Non-permanent effects to human health. Easily repairable effects of damage to buildings, structures and services.

6.7.5 Similarly, the classification of the magnitude of the 'probability' of the risk occurring may be assessed against:

- **High Likelihood**: a contaminant linkage exists and an event appears very likely in the short term, or almost inevitable in the long term, or pollution is causing harm at the receptor;
- **Likely**: a contaminant linkage exists and it is probable that an event will occur. An event may not occur, but it is possible in the short term and likely over the long term;
- **Low Likelihood**: a contaminant linkage exists and it is possible that an event will occur. It is not certain that an event will occur over time but it is less likely in the short term;
- **Unlikely**: a contaminant linkage exists but it is not possible to say if an event will occur even over a very long time.

6.7.6 Following completion of the severity and probability assessment, classifications can be compared to indicate the actual risk each contaminant linkage presents: this can only be undertaken where there is a possibility of there being an active contaminant linkage.

6.7.7 The risk categories which can be assigned are presented in Table 6.4 below and range between 'very high risk' to 'very low risk'; *NB - it is not possible to classify an identified risk as 'no-risk'*.

Table 6.4 - Risk Categories

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**Highly Likely**	Very High	High	Moderate	Moderate / Low
	Likely	High	Moderate	Moderate / Low	Low
	Low Likelihood	Moderate	Moderate / Low	Low	Very Low
	Unlikely	Moderate / Low	Low	Very Low	Very Low

Reproduced from Table 6.5, CIRIA C552/2001

- **Very High** – severe harm could arise to a designated receptor or that severe harm is occurring. Urgent investigation and remediation is likely to be required;
- **High** – harm could occur to a designated receptor and that urgent investigation and remediation may be needed in the short term, but are likely over the longer term;
- **Moderate** – harm could occur. It is unlikely to be severe, most probably relatively mild. Investigation is normally required to clarify the risk with some remedial works being required in the longer term;
- **Low** – possible that harm could occur, but if it did, at worst it would be mild;
- **Very Low** – low possibility of harm arising, and that if it does it is not likely to be severe.

6.7.8 The identified potential contaminants and receptors have been considered in relation to the pathways that may link them. The resulting contaminant linkages are presented in Table 6.5.

Table 6.5 - Summary of Phase I Conceptual Site Model & Risk Assessment

Potential Source	Potential Receptor	Plausible Pathway	Probability	Severity	Initial Risk Rating	Provisional Solution
Potentially contaminated made ground, near surface natural strata / perched groundwater	Human Health Site end-users, inc. maintenance and site workers (short term risk during construction)	Direct ingestion or dermal contact with soil, dust and/or vapour inhalation	Low likelihood	Medium	**Moderate/Low**	Soil capping or removal of contaminated soils where necessary
		Direct ingestion and/or dermal contact with liquid contaminants	Unlikely	Mild	**Very Low**	
		Direct ingestion and/or inhalation of asbestos fibres	Unlikely	Severe	**Moderate/Low**	Appropriate removal and disposal, burial at depth or soil capping where necessary
	Construction (Potable Water Supply Pipes)	Direct contact/leaching (tainting)	Low likelihood	Mild	**Low**	Upgraded water pipes/clean backfill material where necessary
	Construction (Foundations)	Direct contact/leaching	Low likelihood	Mild	**Low**	Appropriate concrete specification
	Controlled Waters	Surface run-off / lateral migration	Low Likelihood	Mild	**Low**	tbc subject to soil leachate laboratory analysis
Hazardous Ground Gases; Adjacent burial ground site	Human Health	Inhalation (via ingress and accumulation)	Low likelihood	Medium	**Moderate/Low**	tbc subject to monitoring results

6.7.9 The preliminary conceptual site model (CSM) presented above has indicated that several contaminant linkages may exist on-site.

6.7.10 In order to investigate any unacceptable risk presented by these, intrusive investigation is required. The intrusive works will provide information on actual contaminants present on-site and plausible pathways to potentially sensitive receptors.

7 GROUND INVESTIGATION FIELDWORK

7.1 Introduction

7.1.1 The investigation requirements at the site were twofold: to undertake a geotechnical investigation and an environmental investigation. A site-wide ground investigation was therefore carried out to identify geotechnical and environmental liabilities in relation to the proposed development work at the site.

7.1.2 As part of the intrusive investigation, enabling works were carried out with the use of a mini digger in order to construct a working platform at three rotary cored borehole locations (BH2 to BH4).

7.1.3 Alan Wood and Partners scoped the intrusive investigation on the basis of information submitted in the desk study report and in general accordance with guidance given in BS5930:1999+A2:2010, BS10175:2011+A1:2013 and BS EN 1997:2004 and 2007.

7.2 Site Works

7.2.1 The findings and recommendations given in this report are based on fieldwork undertaken between 14th March and 25th March 2018.

7.2.2 The positions of the exploratory holes are shown on the appended ground investigation plan, Figure 40706/002. They were positioned on the basis of the findings of the site conceptual model, and were distributed in accessible areas, and in general accordance with the requirements of BS10175:2011+A1:2013 and the working site conditions at the time each phase of investigation was completed.

7.2.3 No specific areas of interest were targeted from an environmental point of view. The boreholes were positioned in order to obtain geotechnical information at the locations of the proposed new residential properties in order to assist the design of foundations and retaining walls.

7.3 Geotechnical Investigation

7.3.1 The scope of works undertaken is outlined in Table 7.1 overleaf.

Table 7.1 - Summary of Works

Method of Investigation	No.	Maximum Recorded Depth (m bgl)
Machine excavated trial pits	4	1.80m
Hand dug inspection pits	3	1.00m
Rotary cored boreholes*	4	20.50m

*Boreholes BH2 to BH4 installed for ground gas monitoring.

7.3.2 A development-wide geotechnical investigation was carried out to identify liabilities in relation to the proposed construction works at the site and aid the design of appropriate foundation solutions. The following objectives of the ground investigation were therefore to:

- Confirm the lateral and vertical extent of any made ground soils, the nature of the underlying natural ground and the depth to bedrock at selected positions across the area under investigation;
- Undertake rock coring to determine the geotechnical properties of bedrock material, including Rock Quality Designation (RQD) and to investigate the rock discontinuity and fracture conditions within the bedrock deposit;
- Determine the depth to groundwater;
- Recover bulk samples for geotechnical testing where necessary; and
- Recover rock core samples for geotechnical testing.

7.3.3 Standard strata descriptions of the soils encountered are in general compliance with BS EN 1997:2004, BS EN 1997:2007, BS EN ISO 14688:2002, BS EN ISO 14688:2004 and BS EN ISO 14689:2003. The individual strata depths recorded on each hand dug inspection pit, trial hole, or borehole log are those from existing ground levels.

7.3.4 Geotechnical laboratory testing was undertaken on a selection of soil and rock core samples in accordance with those techniques outlined in BS 1377:1990 'Methods of Test for Soils for Civil Engineering Purposes' at the laboratory of Professional Soils Laboratory in Doncaster. This laboratory is a fully UKAS compliant laboratory.

7.4 Environmental Investigation

7.4.1 The environmental investigation was designed so that site-specific data could be obtained with respect to any potential soil and groundwater contamination associated with the site so that risks could be quantified in relation to the *source-pathway-receptor* scenarios and plausible contaminant linkages postulated in the initial Conceptual Site Model summarised above.

7.4.2 Given the potentially historic contaminative nature of the on-site soils, it was considered possible that, when considered within the context of proposed end-use, the on-site soils may present an (albeit low) unacceptable risk to human health and/or the wider environment.

7.4.3 The scope of works undertaken, were therefore to:

- Inspect and identify the general soil conditions that prevail across the site;
- Assess the potential for soil contamination within any made ground, the underlying natural strata or groundwater;
- Recover soil samples to test for heavy metals, metalloids, non-metal inorganics, organics including organochlorine pesticides and organophosphate pesticides and asbestos fibres;
- Install ground gas and ground water monitoring instrumentation to allow for the assessment of risk from fugitive ground gases.

7.4.4 Representative samples of the on-site soils were therefore recovered from the trial pits that were positioned to provide coverage of the site area under investigation. Sampling was undertaken in accordance with those guidelines prescribed in BS 10175:2011. All environmental samples were collected in 500ml plastic tubs with sealable lids, 250ml glass amber jars or vials (subject to analytical requirements). Care was taken to minimise cross contamination (i.e. wiping of equipment) between sampling. Environmental samples were packed into cool boxes with ice packs and transported by courier to Chemtech, an MCERTS and UKAS accredited laboratory for analysis and subsequent storage.

7.4.5 The analytical strategy adopted for the environmental investigation was designed to provide an overall assessment of potential contaminants thought to likely be present

within the on-site soils. Whilst no specific contaminants of concern were anticipated in significant concentrations, the soil testing undertaken was for a suite of contaminants in general accordance with NHBC Standards Chapter 4.1 'Land Quality – Managing Ground Conditions' and CLR 8 'Potential Contaminants for the Assessment of Land' (withdrawn but used for reference purposes where applicable). The testing of the following analytes was scheduled on selected samples:

- Heavy metals suite (including As, Cd, Cr, Cu, Hg, Pb, Ni, Zn);
- Speciated Polycyclic Aromatic Hydrocarbons;
- Cyanide (free and total) and Thiocyanate;
- Phenol (total);
- Sulphates (Total and Water Soluble);
- Asbestos fibres;
- Organochlorine pesticides;
- Organophosphate pesticides;
- Soil leachate;
- Sulphide; and
- pH.

7.4.6 Ground gas monitoring installations were installed in all three wells. A programme of works is to be carried out between April and July 2018 with a total of 6 no. visits being undertaken in accordance with CIRIA C665:2007. The results of the gas monitoring are to be reported under separate cover.

8 PHASE II GEOTECHNICAL APPRAISAL

8.1 Ground Conditions

8.1.1 The ground conditions encountered in the exploratory holes completed at the site have been reviewed. A summary of the lithologies encountered is given in the table below, while discussion about each one is given in the following paragraphs.

8.1.2 A copy of the ground investigation logs are presented in Appendix D.

Table 8.1 - Summary of Ground Conditions

Lithology	Exploration Location	Approximate proven depth (m) to base from existing ground level	Approximate thickness (m)	Allowable safe bearing capacity (kN/m2)
Topsoil	HP1 to HP3, and TP1 to TP4	0.20m to 0.80m		Nil
Made Ground	BH4 and TP3	0.75m to 1.60m		Nil
Gravelly Sand	HP1 to HP3, and TP1 to TP4	0.55m to 1.70m	0.25m to 1.25m	80
Clay	TP3	1.80m	0.20m	120
Millstone Grit Group	All BH locations	20.00m	Base not encountered	500+
Groundwater	Groundwater was not encountered during the site investigation works. Groundwater was recorded at between 8.92m bgl (BH2), 20.80m bgl (BH3) and 19.34m bgl (BH4) during the first round of ground gas monitoring.			

8.2 Made Ground:

8.2.1 A deposit of made ground was encountered within TP3 upto 0.75m bgl; comprising ‘Medium dense, dark brown, clayey, slightly silty, gravelly, SAND. Gravel is fine to coarse, including cobbles, angular to sub-rounded, sandstone brick and glass. Made ground was recorded within BH4 however, this material comprised a level drilling platform which was constructed in order to ensure the drilling rig stability during the works. Evidence of vein mineral quarrying activities, such as deposits of broken ground, have not been encountered during the site investigation works.

8.3 Natural Strata:

8.3.1 The site surface comprises a layer of topsoil which was encountered upto 0.80m bgl. A granular superficial deposit was encountered beneath the topsoil upto 1.70m bgl. This deposit generally comprised sand with a sandstone gravel component. This is considered to be fully weathered mantle of the underlying bedrock.

8.3.2 Bedrock was recorded as mudstone, siltstone and sandstone of the Millstone Grit Group, and was encountered between 1.76m and 20.50m bgl.

8.4 Groundwater:

8.4.1 Groundwater was not encountered during the site investigation works. Groundwater was recorded at between 8.92m bgl (BH2), 20.80m bgl (BH3) and 19.34m bgl (BH4) during the first round of ground gas monitoring.

Visual & Olfactory Evidence of Contamination

8.4.2 No visual or olfactory evidence of gross contamination, such as hydrocarbons, was recorded during the ground investigation.

8.4.3 Geotechnical Testing & Material Properties

Atterbergs, Moisture Content & Volume Change Potential

8.4.4 The geotechnical laboratory testing was carried out on one sample of cohesive soil by PSL LTD. A copy of the test results is presented in Appendix E but are summarised in Table 8.3.

Table 8.2 - Plasticity Index Test Results

Borehole Number	Depth (m)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Volume Change Potential*
HP1	0.70	NP				

* VCP: 10-19% = Low, 20-39% = Medium, 40% and greater = High (after NHBC:2003).

8.4.5 The Plasticity Index (Ip) of a soil is a measure of its Volume Change Potential (VCP) and is determined by Atterberg Limits tests, the results of which are given in the above table. All tests to determine the liquid limit (wL) and plastic limit (wp) were also performed by PSL LTD. A Modified Plasticity Index (I'p) has been calculated for the

samples tested, which is defined as the Plasticity Index multiplied by the percentage of particles less than 425µm. The conversion factor applied is presented in NHBC Standards (2003), Chapter 4.2. The calculated modified plasticity index (NHBC Chapter 4.2) was found to be non-plastic.

Unconfined Compressive Strength

8.4.6 Three samples of the near surface sandstone (BH1 at 7.50m and BH4 at 15.80m), and mudstone (BH2 3.50m to 3.85m) have been analysed for unconfined compressive strength, the results of which have been summarised in Table 8.3.

Table 8.3 – Unconfined Compressive Strength Test Results

Borehole Number	Depth (m)	Rock Description	Date Tested	Moisture Content (%)	Load Failure (kN)	UCS (MPa)	Failure Mode
BH1	7.50	Sandstone	18/04/18	6.2	17.2	4.2	Brittle
BH2	3.5-3.85	Mudstone	18/04/18	9.4	41.4	10.2	Brittle
BH4	15.80	Sandstone	18/04/18	4.2	109.2	26.8	Brittle

8.4.7 The test results show the mudstone deposit to have an unconfined compressive strength of 10.2MPa, with the sandstone to have an unconfined compressive strength ranging from 4.2MPa to 26.8MPa.

8.4.8 Point Load Test

8.4.9 The point load test has been undertaken on twelve samples of the near surface bedrock, the results of which have been summarised as Table 8.4 and Table 8.5.

Table 8.4 – Point Load Test Results

Borehole Number	Depth (m)	Rock Description	Test Type	Failure load (kN)	I_s (MPa)	I_{s50} (MPa)	Calculated UCS (MPa)	Failure Type
BH1	9.50	Mudstone	Axial	0.35	0.09	0.10	2.00	Valid
BH1	13.35	Siltstone	Axial	0.47	0.14	0.15	3.00	Valid
BH1	17.47	Sandstone	Irregular	2.19	0.52	0.58	11.60	Valid
BH1	17.47	Sandstone	Axial	2.78	0.84	0.90	18.00	Valid
BH2	8.80	Mudstone	Axial	0.40	0.15	0.15	3.00	Valid
BH2	14.40	Siltstone	Axial	0.20	0.05	0.06	1.20	Valid
BH2	18.80	Sandstone	Axial	0.58	0.15	0.16	3.20	Valid
BH3	5.10	Mudstone	Axial	0.26	0.11	0.11	2.20	Valid
BH3	12.70	Siltstone	Axial	0.56	0.22	0.22	4.40	Valid
BH3	16.80	Sandstone	Axial	2.51	0.70	0.76	15.20	Valid
BH4	4.90	Siltstone	Axial	0.10	0.04	0.04	0.80	Valid
BH4	11.30	Siltstone	Axial	0.39	0.14	0.14	2.80	Valid

Table 8.5 – Point Load Test

Borehole Number	Depth (m)	Rock Description	Test Type	Failure load (kN)	I_s (MPa)	I_{s50} (MPa)	Calculated UCS (MPa)	Failure Type
BH1	9.50	Mudstone	Diametral	0.23	0.044	0.05	1.00	Valid
BH1	13.35	Siltstone	Diametral	0.65	0.125	0.15	3.00	Valid
BH2	8.80	Mudstone	Diametral	0.50	0.096	0.11	2.20	Valid
BH2	14.40	Siltstone	Diametral	0.29	0.056	0.07	1.40	Valid
BH2	18.80	Sandstone	Diametral	0.35	0.068	0.08	1.60	Valid
BH3	12.70	Siltstone	Diametral	0.70	0.135	0.16	3.20	Valid
BH3	16.80	Sandstone	Diametral	0.84	0.162	0.19	3.80	Valid
BH4	4.90	Siltstone	Diametral	0.05	0.010	0.01	0.20	Valid
BH4	11.30	Siltstone	Diametral	0.15	0.029	0.03	0.60	Valid

8.4.10 Unconfined compressive strength results have been calculated from the point load index results. The Axial test is more comparable with a standard UCS test, and should be considered as the more significant results. The results from the ‘axial’ tests ranged between 0.80MPa and 18.00MPa. The diametrical test is less reliable as this shows the measure of the lamination discontinuity cohesion. The diametrical test results ranged between 0.20MPa and 3.80MPa.

8.4.11 For retaining wall design purposes, near surface mudstone bedrock should be considered to have a typical UCS of 10.2MPa, with siltstone at 0.80MPa, and sandstone at 4.20MPa.

Contamination and Performance of Building Materials (Cementitious Products)

8.4.12 Eleven soil samples were analysed for a suite of contaminants consistent with BRE Special Digest 1 ‘Concrete in Aggressive Ground' (2005). A copy of the individual test results is given in the appended laboratory certificates in Appendix F.

8.4.13 The pH values recorded for the soil samples ranged between 4.0 and 7.6 (pH units) with an average of 5.11, indicating near neutral (slightly acidic) conditions prevail within the on-site soils.

8.4.14 Water soluble sulphate analysis of the soils yielded concentrations between 0.016g/l and 0.77g/l in the samples (0.093g/l on average). An assessment of the data was carried out in accordance with Section C4 'Site Investigation for Aggressive Ground Conditions' and the procedure prescribed in Section C5 'Classification of Site Locations for Chemicals Aggressive to Concrete' of BRE SD1 (2005) to assess whether ground conditions at the site are potentially aggressive to buried concrete products. The results of the assessment indicate that a Design Sulphate classification of DS-2 may be adopted along with an ACEC class of AC-3z.

8.4.15 Mobile groundwater conditions have been assumed in this assessment.

9 LABORATORY CHEMICAL TESTING

9.1 Preamble

9.1.1 Eleven representative samples of soil from within the near surface and at depth were analysed for the suite of contaminants outlined in Section 7.4.5 above. This was in order to assess the general degree and nature of contamination within the on-site soils in relation to the site's proposed redevelopment.

9.1.2 Six soil leachate tests were also carried out to assess the potential for contaminant migration to controlled waters receptors.

9.1.3 A summary of the test results is given in the following tables, whilst a copy of the individual test results is presented in full in Appendix F.

9.2 Guidance for Analytical Results - Assessment Criteria

Soil

9.2.1 With reference to the proposed end use of the site, the results of the chemical testing were assessed as part of an environmental risk assessment against a number of potential receptors, considering risks to human health, environmental quality and the built environment. Such risk assessment comprises the initial comparison of the measured soil concentrations with Generic Assessment Criteria (GAC), which in this instance are considered protective of a *commercial* end use.

9.2.2 Recent changes to UK human health risk assessment has seen the introduction of DEFRAs Category 4 Screening Levels (2014) and the LQM/CIEH Suitable 4 Use Levels (2015). Both set out to provide generic assessment criteria on the basis of updated assumptions relating to the modelling of human exposure to soil contaminants for the standard land uses: residential (with and without home-grown produce), allotments, commercial and public open space.

9.2.3 The general consensus between contaminated land practitioners is that the C4SL values, which are based on the low level of toxicological concern (LLTC), are less cautious than the newly revised GAC values published by LQM/CIEH and may not, therefore, be wholly applicable for use outside the context of Part 2A Statutory Guidance. Although both publications in no way undermine the validity of existing Environment Agency guidance presented in, for example, SR2, SR3 and the existing

CLEA software, we are of the mind that the LQM/CIEH S4UL values, which are based on Health Criteria that represents minimal or tolerable levels of risks to health (as described in the Environment Agency's SR2 guidance) but incorporates the updated exposure assumptions presented in DEFRAs C4SL guidance, provide a better starting point from which to generate generic assessment criteria that can be applied to brownfield development sites and are 'suitable for use' under the planning system.

9.2.4 It should be noted that both approaches are based on sandy loam soil with 6% soil organic matter (SOM). Whilst this does not present a problem for metals, as they are not dependent on soil type or SOM, the algorithms used to model plant uptake and volatilisation for organic contaminants do take account of SOM content in the soil. The GAC values for metals in the standard land uses may therefore be directly applied, whether these are C4SL or S4UL derived, whilst independent GAC values for organics (e.g. PAH, TPH) have been generated using CLEA Version 1.071 and the toxicological updates presented in the aforementioned documents. These have also been adjusted for soil type and are calculated for SOM contents at 1%, 2.5% and 6% for a sandy soil.

9.2.5 A summary of the generic assessment criteria values is presented in Appendix G.

Soil Leachate

Where the desk study and fieldwork do not reveal a potential source of contamination no leachate or groundwater testing is usually performed. Where a potential source is identified the testing will comprise leachate testing on the material considered most likely to pose a risk. Groundwater testing is usually undertaken if water is present at shallow depth.

For the assessment of test results, the Groundwater Threshold Values or Environmental Quality Standards (EQS) are usually adopted for comparison with the leachate or groundwater test results. These are presented in full in The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010. When the most sensitive receptor is considered to be the aquifer (i.e. groundwater) the Groundwater Threshold Values will be adopted as the Tier 1 screening values, whilst where the receptor is a surface water feature (e.g. stream, drain or river) the EQS values will be used to define the Tier I Screening values.

9.3 Test Results

9.3.1 The chemical analysis results and screening criteria are summarised in Tables 9.1 and 9.2 below and overleaf.

Table 9.1 - Summary of Total Soil Concentrations

Contaminant of Concern	GAC* (mg/kg)	Contaminant Concentrations (mg/kg)		No. of Samples Tested	No. of Samples >GAC	Pass/Fail Tier 1 GAC Screen
		Min	Max			
Metals						
Arsenic (inorganic)	37*	1.4	39	11	1	FAIL
Cadmium	22*	<0.2	0.5	11	0	PASS
Chromium (III)	910**	60	123	11	0	PASS
Copper	2,400**	3.4	41	11	0	PASS
Mercury (inorganic)	40**	<0.5		11	0	PASS
Nickel	130**	8.2	35	11	0	PASS
Lead	200*	12	464	11	2	FAIL
Selenium	250**	0.6	3.2	11	0	PASS
Zinc	3,700**	17	146	11	0	PASS

* DEFRA (2014). Development of Category 4 Screening Levels (SP1010);
** LQM/CIEH (2015). S4UL for Human Health Risk Assessment.

Table 9.2 - Summary of Chemical Test Results (PAH)

Contaminant of Concern	GAC* (mg/kg)	Contaminant Concentrations (mg/kg)		No. of Samples Tested	No. of Samples >GAC	Pass/Fail Tier 1 GAC Screen
		Min	Max			
Naphthalene	2.3*	<0.01	0.18	11	0	PASS
Acenaphthylene	400*	<0.01	0.19	11	0	PASS
Acenaphthene	490*	<0.01	0.15	11	0	PASS
Fluorene	390*	<0.01	0.23	11	0	PASS
Phenanthrene	220*	<0.02	4.42	11	0	PASS
Anthracene	5,400*	<0.02	0.92	11	0	PASS
Fluoranthene	560*	<0.02	6.83	11	0	PASS
Pyrene	1,200*	<0.02	5.49	11	0	PASS
Benzo(a)anthracene	11*	0.03	2.64	11	0	PASS
Chrysene	22*	<0.01	2.68	11	0	PASS
Benzo(b)fluoranthene	3.3	<0.02	3.41	11	1	FAIL
Benzo(k)fluoranthene	93*	<0.02	1.51	11	0	PASS
Benzo(a)pyrene	2.7*	<0.02	2.78	11	1	FAIL
Dibenzo(a,h)anthracene	0.28*	<0.02	0.39	11	1	FAIL
Indeno(1,2,3-cd)pyrene	36*	<0.02	1.54	11	0	PASS
Benzo(g,h,i)perylene	340*	<0.02	1.67	11	0	PASS

* [CLEA/LQM/CIEH, 2015] Calculated for commercial end-use scenario in CLEA v1.071. GAC range for 2.5% SOM used unless stated otherwise. Values will be more conservative for cohesive soils.

Metals, Metalloids and Other Inorganic Analytes

9.3.2 A total of eleven soil samples were analysed. Assessment of the soils data indicates that elevated arsenic and lead were elevated (TP3 at 0.60m) above the relevant GAC criteria.

9.3.3 Although elevated inorganic contaminants have been recorded, the concentrations did not significantly exceed the relevant GAC criteria. It is recommended that the identified hotspot material is excavated and either removed from site or re-located under areas of hardstanding.

9.3.4 The potential unacceptable risk to human health in a residential end-use with plant uptake, with respect to metals, metalloids and non-metal inorganics is considered to be low.

Organics (PAH, Organochlorine pesticides and Organophosphate pesticides)

9.3.5 A total of eleven soil samples were analysed. Assessment of the soils data indicates that elevated benzo(b)fluoranthene, benzo(a)pyrene and dibenzo(a,h)anthracene (TP2 at 0.30m bgl) were elevated above the relevant GAC criteria. It is recommended that the identified hotspot material is excavated and removed from site.

9.3.6 Following the remedial works, potential unacceptable risk to human health in a residential end-use, with plant uptake, with respect to organics is considered to be very low.

Asbestos

9.3.7 A total of eleven soil samples were analysed. No asbestos fibres were detected in the samples tested.

9.3.8 Risk associated with asbestos containing materials is therefore not anticipated.

Leachate Analyses

9.3.9 A total of six soil leachate samples were analysed for contaminant mobility. A summary of the results is presented in Table 9.3 overleaf, whilst a copy of the analytical results is given in Appendix F.

Table 9.3 - Summary of Soil Leachate Analyses

Contaminant of Concern	GAC* (µg/l)	Max. Concentration (µg/l)		No. of Samples Tested	No. of Samples > GAC	Pass / Fail Tier 1 GAC Screen
		Min	Max			
Arsenic	7.5*	2.67	10.89	6	2	FAIL
Cadmium	1.1*	<0.07	0.13	6	0	PASS
Chromium	5*	0.6	2.1	6	0	PASS
Copper	10.1*	10.3	20.8	6	6	FAIL
Mercury	0.75*	0.017	0.063	6	0	PASS
Nickel	20.2*	0.9	2.3	6	0	PASS
Lead	7.3*	3.8	28.7	6	4	FAIL
Selenium	10*	0.32	0.68	6	0	PASS
Zinc	75.8*	8	22	6	0	PASS
PAHs						
Benzo(a)pyrene	0.075*	<0.1		6	0	PASS

* General quality of groundwater body threshold values are adopted, or where these are unavailable the groundwater drinking water protected areas threshold values are used.

9.3.10 Elevated concentrations of arsenic, copper and lead have been found within samples of topsoil and made ground across the site. The Millstone Grit Group bedrock deposit is classified as a 'Secondary (A) Aquifer'.

9.3.11 As the site is being re-developed with new residential properties, the permeable surface area of the site is being reduced.

9.3.12 Superficial deposits include a 1.4m thick deposit of gravelly clay (BH1), and a deposit of very sandy clay (BH3). The geological bedrock has been found to comprise layers of mudstone, siltstone and sandstone. Groundwater has been recorded at 8.92m bgl (BH2), 20.80m bgl (BH3), and 19.34m bgl (BH4). The presence of low permeability layers of mudstone will suppress the infiltration of water through the site into the groundwater.

9.3.13 The nearest surface water feature is a Tertiary River, located 210m to the south west of the study area, and there are no groundwater or surface water abstraction licences within 500m of the study area. As a result, risk associated with elevated leachable contaminants is considered to be low.

UKWIR

9.3.14 Due to the presence of elevated contaminants, the use of barrier pipe is likely to be required, according to the UKWIR guidelines. It is recommended that consultation be held with the water authority to confirm any specific requirements they may have.

10 PHASE II ENVIRONMENTAL APPRAISAL

10.1 Introduction

10.1.1 The preliminary CSM given above presented our initial understanding of the site, being based on available geological information, site location, likely contamination status and the overall risk it presented to the identified receptors through various pollution pathways.

10.1.2 This section revises the initial CSM in light of the ground investigation findings and chemical analysis results presented above.

10.1.3 The revised conceptual site model has been developed for the proposed future residential end-use, with plant uptake. This summarises our understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors assuming that no remediation has been undertaken at the site.

10.2 Ground Conditions - Summary

10.2.1 A deposit of made ground was encountered within TP3 upto 0.75m bgl; comprising ‘medium dense, dark brown, clayey, slightly silty, gravelly, SAND. Gravel is fine to coarse, including cobbles, angular to sub-rounded, sandstone brick and glass. Made ground was recorded within BH4, however, this material comprised a level drilling platform which was constructed in order to ensure the drilling rig stability during the works.

10.2.2 The site surface comprises a layer of topsoil which was encountered upto 0.80m bgl. A granular superficial deposit was encountered beneath the topsoil upto 1.70m bgl. This deposit generally comprised sand with a sandstone gravel component. This is considered to be fully weathered mantle of the underlying bedrock.

10.2.3 Bedrock was recorded as mudstone, siltstone and sandstone of the Millstone Grit Group, and was encountered between 1.76m and 20.50m bgl.

10.2.4 Groundwater was not encountered during the site investigation works. Groundwater was recorded at between 8.92m bgl (BH2) and 20.80m bgl (BH3) during the first round of ground gas monitoring.

10.2.5 Elevated arsenic, and lead (TP3 at 0.60m) were elevated above the relevant GAC criteria. It is recommended that the identified hotspot material is excavated and either removed from site or re-located under areas of hardstanding.

10.2.6 Elevated benzo(b)fluoranthene, benzo(a)pyrene and dibenzo(a,h)anthracene (TP2 at 0.30m bgl) were elevated above the relevant GAC criteria. It is recommended that the identified hotspot material is excavated and removed from site.

10.2.7 Elevated leachable arsenic, copper and lead have been found within samples of topsoil and made ground across the site. As the site is being re-developed with new residential properties, the permeable surface area of the site is being reduced. Superficial deposits include a 1.4m thick deposit of gravelly clay (BH1), and a deposit of very sandy clay (BH3). The geological bedrock has been found to comprise layers of mudstone, siltstone and sandstone. Groundwater has been recorded at 8.92m bgl (BH2), 20.80m bgl (BH3), and 19.34m bgl (BH4). The presence of low permeability layers of mudstone will suppress the infiltration of water through the site into the groundwater. The nearest surface water feature is a Tertiary River, located 210m to the south west of the study area, and there are no groundwater or surface water abstraction licences within 500m of the study area. As a result, risk associated with elevated leachable contaminants is considered to be low.

10.3 Qualitative Contaminated Land Risk Assessment

10.3.1 Current UK legislation on contaminated land is principally contained in Sections 78(A) to (YC) in Part 2A of the Environmental Protection Act 1990, which was retrospectively inserted by Section 57 of the Environment Act 1995. The Contaminated Land Regulations 2000 were amended in 2005. The Environmental Protection Act 1990: Part 2A Contaminated Land, Statutory Guidance, Edition 2, 2006, promulgates the revised statutory guidance with respect to the operation of the Contaminated Land Regime following the implementation of the Contaminated Land Regulations, 2005.

10.3.2 The definition of contaminated land is central to the operation of Part 2A. Legislation adopts the principle of a 'suitable for use' approach for the assessment of contaminated land, the rationale reflected in the site-specific risk assessment and determination of remedial strategy. Action is only required if unacceptable risks are

posed to human health or to the environment, taking into account the current land use and geo-environmental setting.

10.3.3 The legislation places a responsibility on the Local Authority to determine whether the land under its jurisdiction is contaminated by consideration of whether:

- Significant harm is being caused;
- There is a significant possibility of significant harm being caused;
- Significant pollution of controlled waters is being caused or is likely to be caused.

10.4 Assessment Framework

10.4.1 The statutory guidance describes a risk assessment methodology in terms of 'significant contaminants' and 'contaminant linkages', using 'source-pathway-receptor' scenarios for the site. Contaminant linkages are formed when there is a linkage between a contaminant source and a receptor by means of a pathway. Each element has to be present, or no linkage can be formed.

10.4.2 Risk assessment and the procedure of identifying sources, pathways and receptors is recognised as an approach to determine the extent and significance of contamination either within the context of Part 2A (when assessing current site status or when considering the acquisition of an existing development) or the planning process (for the redevelopment of an existing site, or when considering the acquisition of a site for redevelopment purposes). Either way, the 'suitable for use' approach is adopted when assessing risk and the source-pathway-receptor assessment defines the conceptual model for the site.

10.4.3 Within the context of this report therefore, the revised risk assessment has been undertaken on the basis that the 'suitable for use' approach remains aligned with the site being redeveloped for the end use given above.

10.5 Summary of Identified Contaminant Linkages

10.5.1 On the basis of the ground investigation and laboratory test results, it is evident that the on-site soils contain elevated concentrations of inorganic and/or organic contaminants in excess of the adopted GACs. As the elevated concentrations were found to be marginally elevated above the relevant GAC criteria, potential

unacceptable risk to human health in a residential end-use, with plant uptake, with respect to organics is considered to be low.

10.5.2 Elevated concentrations of arsenic, copper and lead have been found within samples of topsoil and made ground across the site. The Millstone Grit Group bedrock deposit is classified as a 'Secondary (A) Aquifer'. Risk associated with elevated leachable contaminants is therefore considered to be moderate/low.

10.5.3 A summary of the revised risk assessment is given in Table 10.1.

Table 10.1 - Summary of Revised Conceptual Site Model & Risk Assessment

Potential Source	Potential Receptor	Plausible Pathway	Initial Risk Rating	Probability	Severity	Revised Risk Rating	Solution
Potentially contaminated made ground, near surface natural strata / perched groundwater	Human Health Site end-users, inc. maintenance and site workers (short term risk during construction)	Direct ingestion or dermal contact with soil, dust and/or vapour inhalation	**Moderate/Low**	Low likelihood	Mild	**Low**	No significant risk anticipated. Localised elevated contaminants have been identified in made ground deposit. Excavate and dispose, or re-compact under areas of hardstanding.
		Direct ingestion and/or dermal contact with liquid contaminants	**Very Low**	Low likelihood	Mild	**Low**	
		Direct ingestion and/or inhalation of asbestos fibres	**Moderate/Low**	Unlikely	Severe	**Moderate/Low**	No risk anticipated. *Revised risk rating cannot be downgraded given severity*
	Construction (Potable Water Supply Pipes)	Direct contact/leaching (tainting)	**Low**	Low likelihood	Mild	**Low**	No significant risk anticipated. Localised PAH in topsoil. Excavate and dispose.
	Construction (Foundations)	Direct contact/leaching	**Low**	Likely	Mild	**Moderate/Low**	Concrete specification; Design Sulphate classification of DS-2, along with an ACEC class of AC-3z.
	Controlled Waters	Surface run-off / lateral migration	**Low**	Unlikely	Mild	**Very Low**	Although elevated leachable contaminants have been identified, the risk associated with leachable contaminants is considered to be low. Remedial works are not required.
Hazardous Ground Gases; Adjacent burial ground site	Human Health	Inhalation (via ingress and accumulation)	**Moderate/Low**	Low likelihood	Medium	**Moderate/Low**	tbc subject to monitoring results

11 CONCLUSIONS AND RECOMMENDATIONS

11.1 General

11.1.1 This geo-environmental appraisal has been carried out in relation to the redevelopment of land off Old Lane, Scapegoat Hill, Golcar, Huddersfield HD7 4ND.

11.1.2 It has been assumed in the production of this report that the site is to be redeveloped for a residential site end use, with plant uptake.

11.2 Soil Contamination - Risk Evaluation

11.2.1 The revised Conceptual Site Model confirms that no significant potential contaminant linkages exist at the site in relation to existing on-site soils.

Human Health Receptors

11.2.2 Elevated arsenic, lead benzo(b)fluoranthene, benzo(a)pyrene and dibenzo(a,h)anthracene were elevated above the relevant GAC criteria. As the elevated contaminants were found to be marginally elevated above the relevant GAC criteria, potential unacceptable risk to human health in a residential end-use, with plant uptake is considered to be low.

11.2.3 Elevated leachable arsenic, copper and lead have been found within samples of topsoil and made ground across the site. Risk associated with elevated leachable contaminants is therefore considered to be moderate/low.

11.2.4 Any potential risks to construction workers must be specifically assessed as part of the health and safety evaluation for the works to be performed in accordance with prevailing legislation. Site practices must conform to the specific legislative requirements and follow appropriate guidance (e.g. HSE, 1991; CIRIA, 1996). The short-term risk (acute) to construction workers associated with the identified contamination should be considered as part of a construction risk assessment.

Controlled Waters Receptors

11.2.5 Elevated concentrations of arsenic, copper and lead have been found within samples of topsoil and made ground across the site. The Millstone Grit Group bedrock deposit is classified as a ‘Secondary (A) Aquifer’. Risk associated with elevated leachable contaminants is therefore considered to be moderate/low.

Ecological Receptors

11.2.6 There are no ecological receptors at the site.

Utilities

11.2.7 It is recommended that the results of the chemical testing and details of the proposed redevelopment of the site are provided to the appropriate utility companies to determine the necessity for service protection.

11.2.8 Risk to potable water supply pipes is considered to be low.

Potable Water Supplies

11.2.9 Risk to potable water supply pipes is considered to be low. On the basis of available test results it is likely that protective measures will be required. Consultation should be undertaken with the local water authority with respect to any precautions they may require, prior to construction.

Ground Gas Risk

11.2.10 The potential for ground gas generation will be reported under separate cover once the requisite period of monitoring has been completed.

Asbestos Containing Materials

11.2.11 No asbestos fibres were identified in the samples near surface soils analysed by the laboratory. Risks to construction workers and site end users are considered to be low.

Radon Precautions

11.2.12 No radon protection measures are required in construction.

11.3 Construction - Risk Evaluation

Site Preparation

11.3.1 A significant part of the enabling works will comprise the re-grading of the site to develop a suitable construction platform and to achieve finished ground levels. A topsoil strip will be required from beneath development areas.

11.3.2 These works will need to be undertaken to an approved earthworks specification.

Sulphate Attack

11.3.3 Soil sulphate concentrations measured during the investigations have been compared to levels within the BRE Special Paper SD1:2005. In considering the sulphate values, the site has been assessed as 'brownfield'.

11.3.4 The on-site soils are not considered to be at risk from containing pyrite.

11.3.5 Design Sulphate classification of DS-2 should be suitable along with an ACEC class of AC-3z. However, this does not make any necessary allowance for the requirements of structural strength, or requirements for durability of concrete. Further consultation should be made with the designing engineer with respect to the site specific sulphate resistant concrete to be used.

Mining Risk

11.3.6 The site is not located within a Coal Authority 'Coal Mining Reporting Area'. Risk associated with coal mining related subsidence is considered to be very low.

11.3.7 Non-coal mining has been recorded on the site for a non-specified vein mineral. However, as evidence of non-coal mining was not recorded during the site investigation works, risk is considered to be negligible.

Foundations

11.3.8 Made ground soils of any type are **not** suitable founding stratum.

11.3.9 The proposed new residential properties are likely to be constructed on traditional deep strip, or trench-fill foundation, founded on the near surface bedrock.

11.3.10 The widening, strengthening and reinforcement of foundations in accordance with NHBC Standards would be required where footings are found to straddle strata of different type (e.g. sand, clay, silt) or where soft and/or where locally unstable ground is encountered at founding depth.

Retaining Walls

11.3.11 Made ground soils of any type are **not** suitable founding stratum. Suggested material parameters have been summarised as Table 11.1.

Table 11.1 – Retaining Wall Design - Material Parameters

Design Parameter	Superficial Deposits	Mudstone	Siltstone	Sandstone
Unit Weight (kN/m^3)	16	22	22	24
Shear Strength	0	0	0	4
Friction Angle ø°	38	28	30	40
Dry Density (Mg/m^3)	-	2.29	2.00	2.09

11.3.12 Retaining walls should be designed in accordance with British Standards. Based on the above recommended material parameters, suggested design parameters have been summarised as Table 11.2.

Table 11.2 – Retaining Wall Design Parameters

Design Parameter	Value
Active earth pressure coefficient, Ka	0.34
Coefficient of friction	0.63
Passive earth pressure coefficient, Kp	4.56

Floor Slabs

11.3.13 Made ground have been encountered upto 0.75m bgl, however, this material is not located under the footprint of the proposed development. The existing topographical levels are to be reduced under the footprint of the proposed structures. As a result, it is considered that ground bearing floor slabs are suitable for the proposed development.

11.3.14 Where ground bearing slabs are implemented, care must be taken to ensure that shallow strata do not become heavily disturbed by site clearance/construction activities (especially during inclement weather). Where this occurs, this could result in an increased requirement for suspended floor slabs.

Precautions Near Trees

11.3.15 As superficial deposits across the site have been predominantly granular in nature, heave precautionary measures are not likely to be required. All foundations should be constructed in accordance with NHBC Standards (i.e. Chapter 4.2).

Drainage and Soakaways

11.3.16 Due to the site topography, and the presence of shallow bedrock and isolated deposits of cohesive superficial soils, a soakaway drainage system is not considered to be suitable.

Roads and Car Parks

11.3.17 No *in situ* CBR testing has been carried out to date as the final development levels at the site are unknown.

11.3.18 On the basis of visual observation, it is considered that the near surface soils are likely to have a minimum CBR value of around 2.5%, perhaps higher, but this should be confirmed.

11.3.19 Highways Agency document HD25 Interim Advice Note 73/06 Revision 1 (2009) states that where a subgrade has a CBR lower than 2.5%, it is considered unsuitable support for a pavement foundation since it would tend to deform under construction traffic and must be improved. All road design should be discussed with the local authority if highways are to be subject to a Section 38 agreement.

Ground Stability

11.3.20 No significant ground instability is anticipated within excavations into the near surface superficial deposits over the short term. Instability should be anticipated within the near surface if granular or weak strata are present, or where excavations are left open during prolonged periods of wet weather (e.g. in service trenches). This situation is likely to be exacerbated by water ingress. Allowance for instability in this material should be made where necessary.

11.3.21 Excavations within the near surface bedrock deposits are likely to be stable in the short term, however, to enable the long term stability of this material, suitably designed retaining walls will be required.

11.3.22 An adequate drainage system for surface water may need to be installed by a competent contractor in order to prevent surface water ponding or collection, both during and post construction, as this may lead to deterioration and weakening of the founding stratum.

11.3.23 Where excavations are proposed close to site boundaries and there is the possibility of weak/unstable ground passing across that boundary and beneath adjacent structures, a risk assessment of the integrity/stability should be undertaken prior to such works being carried out. Designed and engineered temporary/permanent measures should be adopted to ensure their continued stability where necessary.

11.3.24 An assessment of the stability of the slope in its current condition and proposed model is to be undertaken using computer design software (Limit State Geo version 3.4a). The results of this analysis will be reported under a separate cover.

Excavations

11.3.27 Near surface bedrock deposits have been encountered within 2m of the site surface. The proposed development includes alterations to the site topography in order to construct a suitable development platform. The peckering out of bedrock deposits should be allowed for, and the use of suitable excavation machinery. It should be noted that the advancement of these excavations may be slowed due to the strength of the near surface bedrock deposits.

11.3.28 It is unlikely that remnant foundations or road base will be encountered due to the limited phases of on-site historical development.

11.3.29 No man entry into unsupported excavations should be allowed without an appropriate risk assessment. Reference to CIRIA report 97 (1983) should be made to establish suitable means of support, or battering of excavation sides.

Outline Remediation Requirements

11.3.30 Elevated arsenic, and lead (TP3 at 0.60m) were elevated above the relevant GAC criteria. It is recommended that the identified hotspot material is excavated and either removed from site or re-located under areas of hardstanding. Elevated benzo(b)fluoranthene, benzo(a)pyrene and dibenzo(a,h)anthracene (TP2 at 0.30m bgl) were elevated above the relevant GAC criteria. It is recommended that the

identified hotspot material is excavated and removed from site as it comprises a deposit of topsoil and is organic in nature.

11.3.31 Confirmation of the chemical condition of any materials brought to site should be confirmed prior to importation.

Disposal of Soils

11.3.32 Should brightly coloured or odorous soil be encountered during the proposed construction works, Alan Wood and Partners should be notified immediately. An experienced geo-environmental engineer will visit site for further sampling, analysis and risk assessment, where required.

11.3.33 Any materials removed from site should be undertaken in accordance with the Duty of Care Regulations 1991 and the Hazardous Waste Regulations 2005. There will also be a requirement to classify the waste in accordance with the European Waste Catalogue. The waste should also be subject to Waste Acceptance Criteria (WAC) testing.

12 REGULATORY APPROVAL

12.1.1 The conclusions and recommendations presented in this report are considered reasonable on the basis of available information and the assessment of the site as carried out by Alan Wood and Partners.

12.1.2 It should be noted however that the works undertaken cannot be guaranteed to gain approval by the Regulatory Authorities and your Warranty Provider, so copies of this report should be made available to the relevant organisations (as appropriate) for their comment and approval, prior to undertaking any irrecoverable works associated with the site.

13 INFORMATION SOURCES

In addition to the specific references cited in the text, the following references have been referred to in the production of this report, where relevant to the defined project objectives.

1 BRE *BR211* (2007) *Radon: guidance on protective measures for new dwellings*;

2 BRE GBG 75 (2009), '*Radon Protection For New Large Buildings';*

3 BS5930 (1999), *Code of practice for site investigations*;

4 BS:8576 (2013), *Guidance on Investigations for Ground Gas - Permanent Gases and Volatile Organic Compounds (VOCs)*;

5 BSEN 1997-1 (2004), *Geotechnical Design Part 1 – General Rules*;

6 BSEN 1997-2 (2007), *Geotechnical Design Part 2 – Ground investigation and testing*;

7 Chartered Institute of Environmental Health (CIEH): *Professional Practice Note: Reviewing human health risk assessment reports invoking contaminant oral bioavailability measurements or estimates* (2009);

8 CIRIA C552 (2001), *Contaminated Land Risk Assessment, A Guide to Good Practice*;

9 CIRIA C665 (2007), *Assessing risks posed by hazardous ground gases to buildings*;

10 CL:AIRE / EIC / AGS: *Soil Generic Assessment Criteria for Human Health Risk Assessment* (updated January 2010 version);

11 Coal Authority, *www.coal.decc.gov.uk*;

12 DEFRA SP1010: *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination - Policy Companion Document*, December 2014;

13 DETR Circular 02/2000 (2000). *Environmental Protection Act 1990 Part 2A. Contaminated Land.* Department of the Environment, Transport and the Regions, Circular 02/2000, Dated 20th March 2000;

14 Emapsite GroundSure / GeoInsight Report & EnviroInsight Report;INSERT REFERENCES

15 Environment Agency (EA) & DEFRA: Model Procedures for the Management of Land Contamination – Contaminated Land Report 11 (CLR11) (2004);

16 Environment Agency, *www.environment-agency.org.uk*;

17 Environment Agency (2009). *Human Health Toxicological Assessment of Contaminants in Soil*, Science Report SC050021/SR2;

18 Environment Agency (2009).*Updated Technical Background to the CLEA Model*, Science Report SC050021/SR3;

19 Land Quality Management / CIEH: *The LQM/CIEH S4UL's for Human Health Risk Assessment*, Land Quality Press, Nottingham, 2015. Publication Number S4UL3286;

20 NHBC Chapter 4.2 (2018), *Building near trees,* NHBC Publication, July 2018.

FIGURES

DO NOT SCALE

Approximate Site Location

Approximate Red Line Site Boundary

Alan Wood & Partners

Client.	**Brierstone Ltd**		
Project.	**Scapegoat Hill**		
Drawing.	**Site Location Plan**		
Date. **29.03.18**		Scale.	**NTS**
Drawn by. **ST**	Check by.	Approved by.	
Status:	**FINAL**		
Job no. **40706**	Fig. no. **001**	Rev.	

Key

Rotary Cored BH Locations

Trail Pit / Hand Pit Locations

DO NOT SCALE

Alan Wood & Partners

Client.	**Brierstone Ltd**		
Project.	**Scapegoat Hill**		
Drawing.	**Borehole Location Plan**		
Date. **29.03.18**		Scale. **NTS**	
Drawn by. **ST**	Check by.	Approved by.	
Status:	**FINAL**		
Job no. **40706**	Fig. no. **001**	Rev.	

APPENDIX A

EMAPSITE: GROUNDSURE GEOINSIGHT REPORT

EmapSite

Masdar House, 1 Reading Road,
Eversley, RG27 0RP

Report Reference: EMS-466873_626779

Your Reference: EMS_466873_626779

Report Date 12 Mar 2018

Report Delivery Method: Email - pdf

Geo Insight

Address: ,

Dear Sir/ Madam,

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

If you would like further assistance regarding this report then please contact the emapsite customer services team on 0118 9736883 quoting the above report reference number.

Yours faithfully,

emapsite customer services team

Enc.
Groundsure Geo Insight

Geo Insight

Address:	**,**
Date:	**12 Mar 2018**
Reference:	**EMS-466873_626779**
Client:	**EmapSite**

NW N NE

W E

SW S SE

Aerial Photograph Capture date:	26-Mar-2012
Grid Reference:	409007,416372
Site Size:	0.34ha

Contents Page

Overview of Findings

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

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

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

Section 1: Geology 1:10,000 Scale		
1.1 Artificial Ground	1.1 Is there any Artificial Ground/ Made Ground present beneath the study site at 1:10,000 scale?	No
1.2 Superficial Geology and Landslips	1.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site at 1:10,000 scale?*	No
	1.2.2 Are there any records of landslip within 500m of the study site boundary at 1:10,000 scale?	Yes
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?	Yes

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?	Yes
	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?	Yes

Section 3: Radon

3. Radon	3.1Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is in a Radon Affected Area, as between 1 and 3% of properties are above the Action Level.
	3.2Radon Protection	No radon protective measures are necessary.

Section 4: Ground Workings	On-site	0-50m	51-250	251-500	501-1000
4.1 Historical Surface Ground Working Features from Small Scale Mapping	0	1	21	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	2	5	8

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

Section 8: Estimated Background Soil Chemistry	On-site	0-50m	51-250
8 Records of Background Soil Chemistry	6	3	0

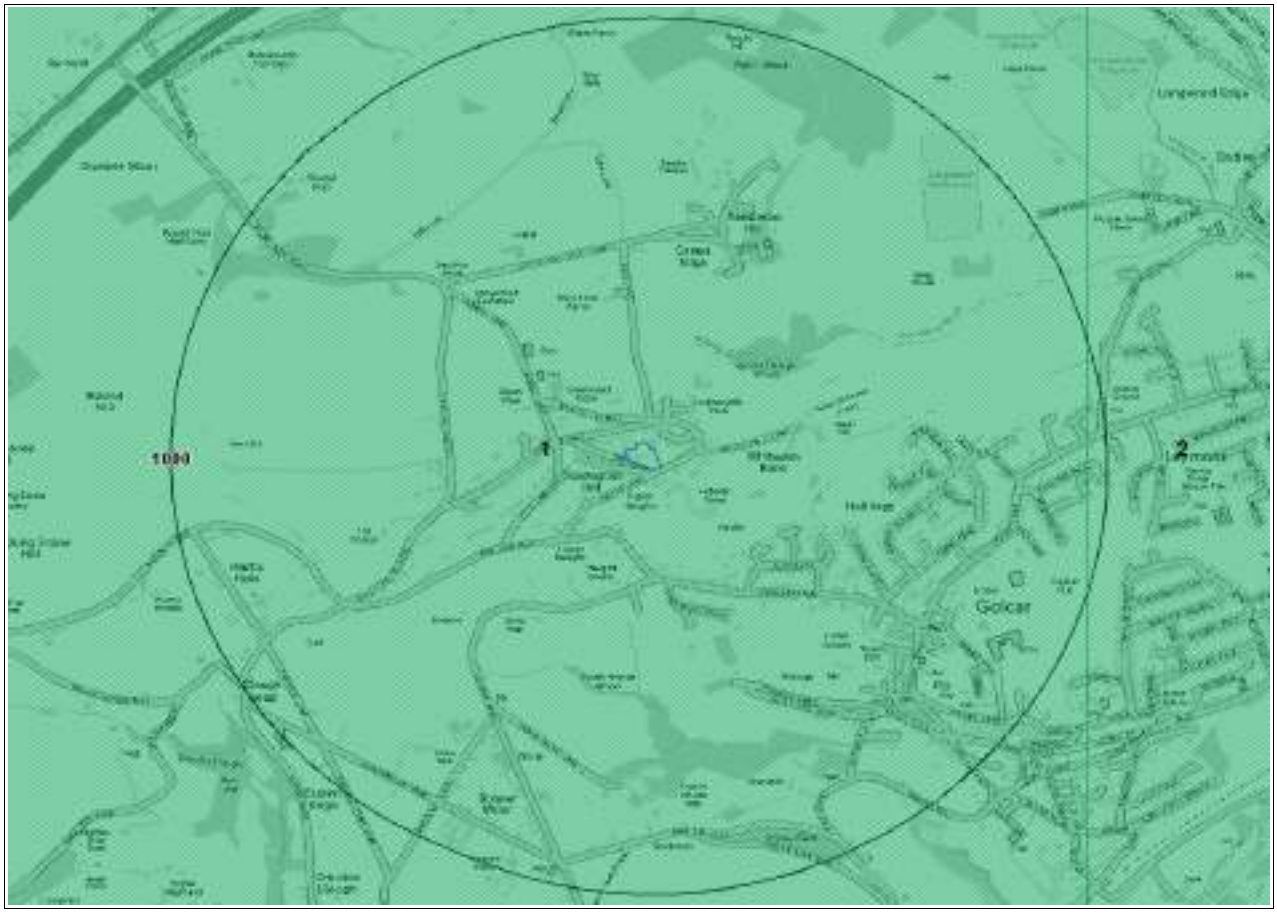
Section 9: Railways and Tunnels	On-site	0-50m	51-250	250-500
9.1 Tunnels	0	0	0	Not Searched
9.2 Historical Railway and Tunnel Features	0	0	0	Not Searched
9.3 Historical Railways	0	0	0	Not Searched
9.4 Active Railways	0	0	0	Not Searched
9.5 Railway Projects	0	0	0	0

1:10,000 Scale Availability

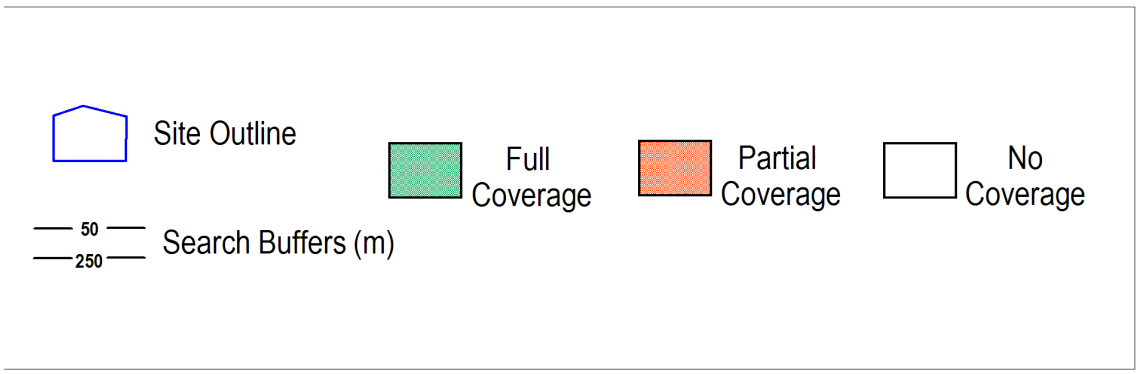
NW N NE

W E

SW S SE



1_10,000 Availability Legend



Availability of 1:10,000 Scale Geology Mapping

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

ID	Distance	Artificial Coverage	Superficial Coverage	Bedrock Coverage	Mass Movement Coverage
1	0.0	Some deposits are mapped	Full	Full	Some deposits are mapped
2	954.0	Some deposits are mapped	Full	Full	Some deposits are mapped
N3	1339.0	Some deposits are mapped	Full	Full	Some deposits are mapped
N4	1650.0	Some deposits are mapped	Full	Full	Some deposits are mapped

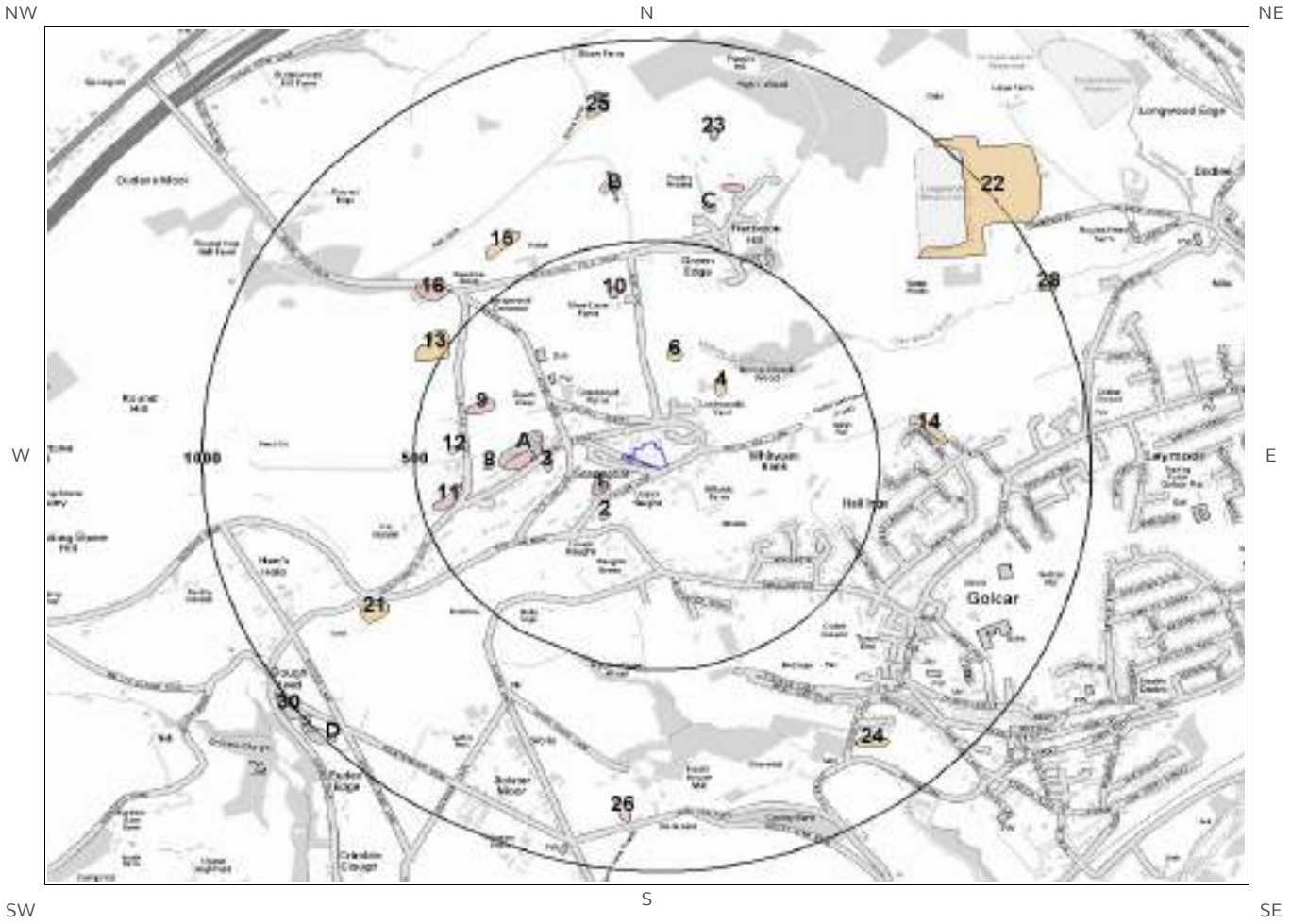
Guidance: The 1:10,000 scale geological interpretation is the most detailed generally available from BGS and is the scale at which most geological surveying is carried out in the field. The database is presented as four types of geology (artificial, mass movement, superficial and bedrock), although not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

The definitions of coverage are as follows:

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

1 Geology (1:10,000 scale).

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



Artificial Ground Legend

Site Outline

500
1000
Search Buffers (m)

Made Ground (undivided)

Disturbed Ground (undivided)

Worked Ground (undivided)

Landscaped Ground (undivided)

Infilled Ground

Reclaimed Ground

1. Geology 1:10,000 scale

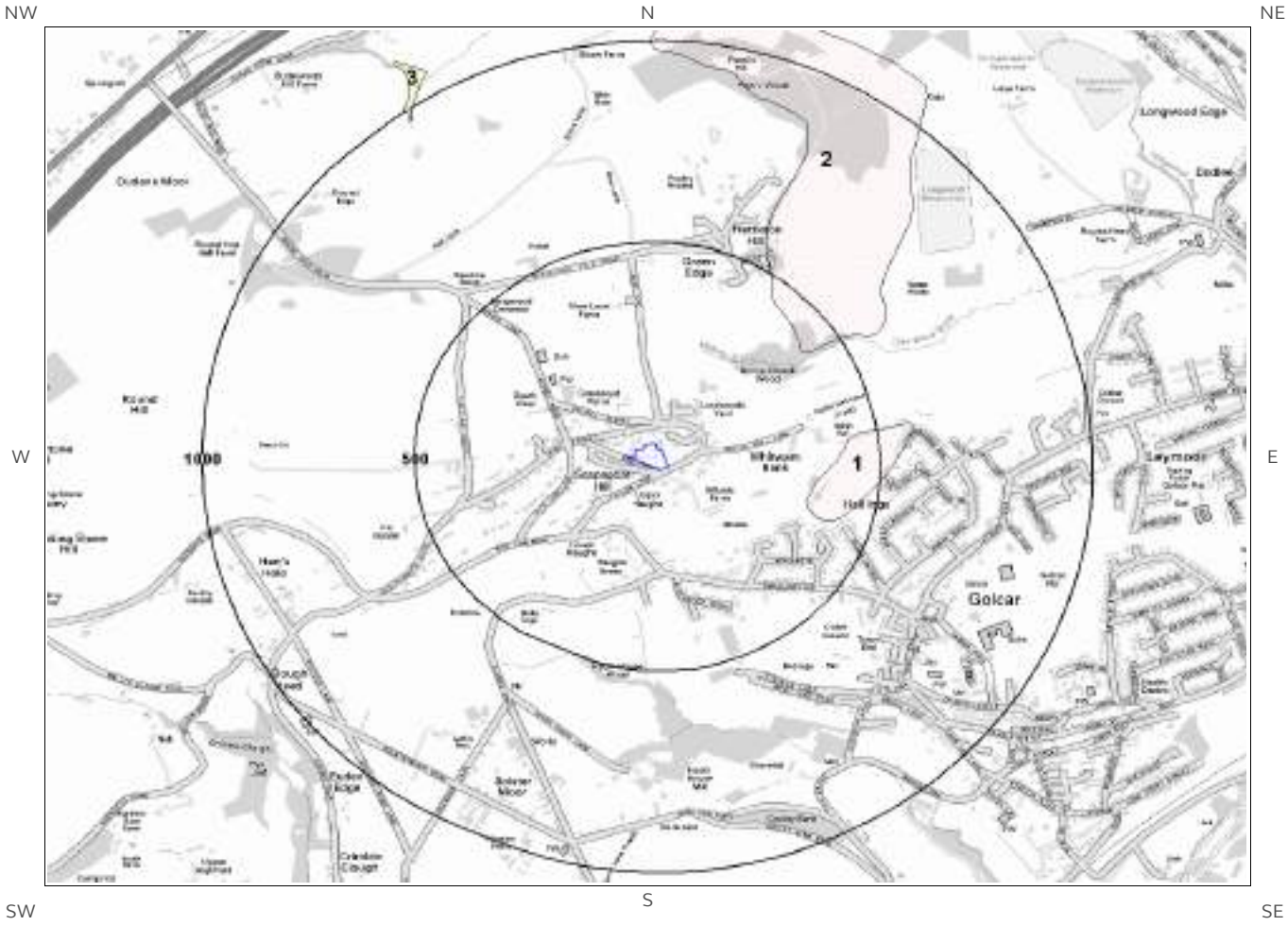
1.1 Artificial Ground

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

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

ID	Distance	Direction	LEX Code	Description	Rock Description
1	82.0	SW	WMGR-ARTDP	Infilled Ground	Artificial Deposit
2	144.0	SW	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
3	175.0	W	WMGR-ARTDP	Infilled Ground	Artificial Deposit
4	187.0	NE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
5A	198.0	W	WGR-VOID	Worked Ground (Undivided)	Void
6	208.0	N	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
7A	220.0	W	WMGR-ARTDP	Infilled Ground	Artificial Deposit
8	313.0	W	WMGR-ARTDP	Infilled Ground	Artificial Deposit
9	334.0	W	WMGR-ARTDP	Infilled Ground	Artificial Deposit
10	367.0	N	WMGR-ARTDP	Infilled Ground	Artificial Deposit
11	393.0	W	WMGR-ARTDP	Infilled Ground	Artificial Deposit
12	393.0	W	WMGR-ARTDP	Infilled Ground	Artificial Deposit
13	486.0	NW	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit

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



Artificial Ground Legend

Site Outline

500
1000
Search Buffers (m)

1.2 Superficial Deposits and Landslips

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

1.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary at 1:10,000 scale? No

Database searched and no data found.

1.2.2 Landslip

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

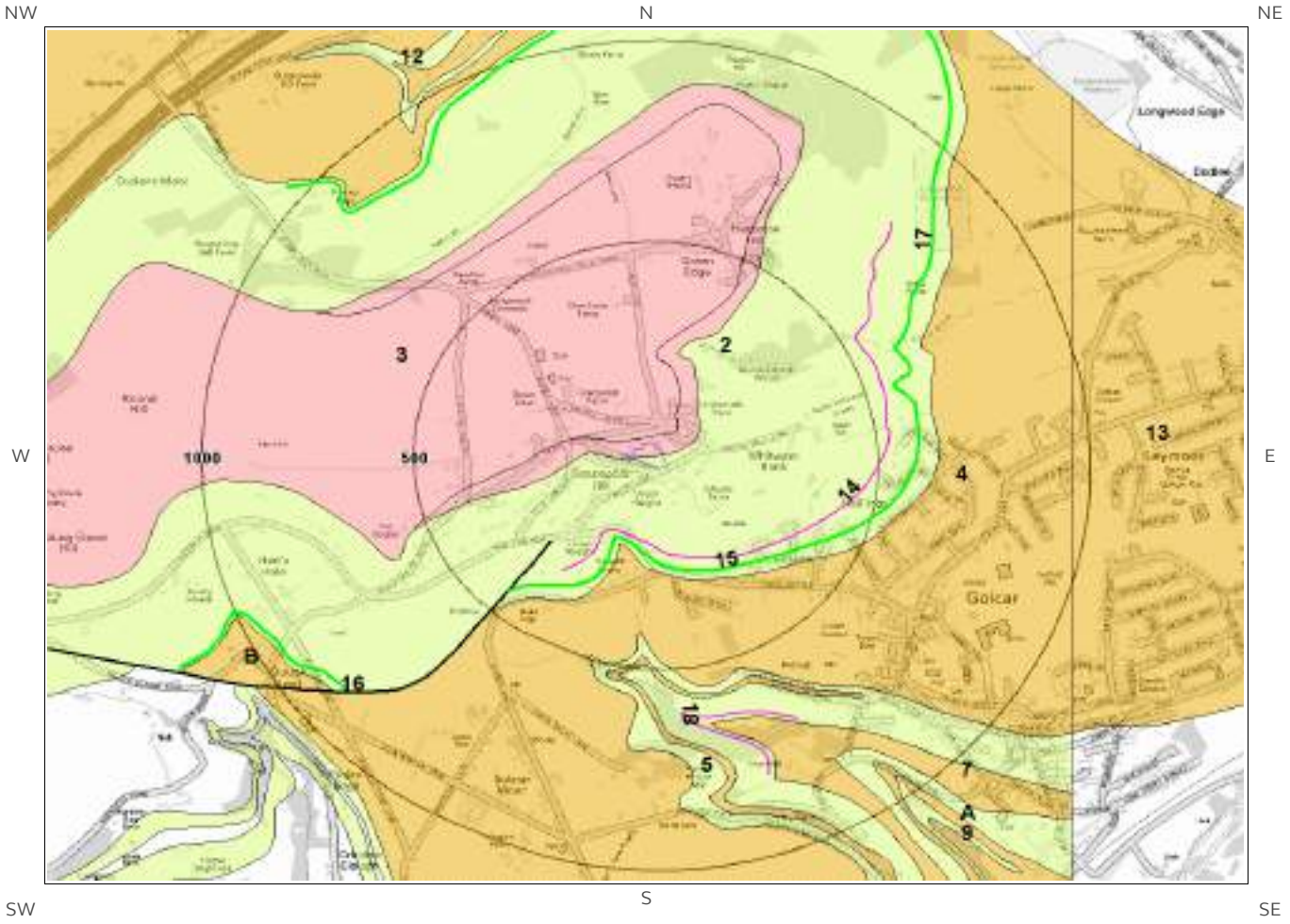
Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	339.0	E	SLIP-UKNOWN	Landslide Deposits	Unknown/unclassified Entry
2	410.0	NE	SLIP-UKNOWN	Landslide Deposits	Unknown/unclassified Entry

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

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

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



Bedrock and linear features Legend

Site Outline

500
1000
Search Buffers (m)

1.3 Bedrock and linear features

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

1.3.1 Bedrock/ Solid Geology

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

ID	Distance (m)	Direction	LEX Code	Description	Rock Age
1	0.0	On Site	RF-SDST	Rough Rock Flags - Sandstone	Yeadonian Sub-age
2	0.0	On Site	MG-MDSS	Millstone Grit Group [see Also Migr] - Mudstone, Siltstone And Sandstone	Namurian Age
3	13.0	N	RR-SDST	Rough Rock - Sandstone	Yeadonian Sub-age
4	205.0	SW	HDW-SDST	Huddersfield White Rock - Sandstone	Marsdenian Sub-age
5	409.0	S	MG-MDSS	Millstone Grit Group [see Also Migr] - Mudstone, Siltstone And Sandstone	Namurian Age
6	466.0	S	MGCZ-SDST	Unnamed Sandstone Of Marsdenian Age (in Millstone Grit Group) - Sandstone	Marsdenian Sub-age

1.3.2 Linear features

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

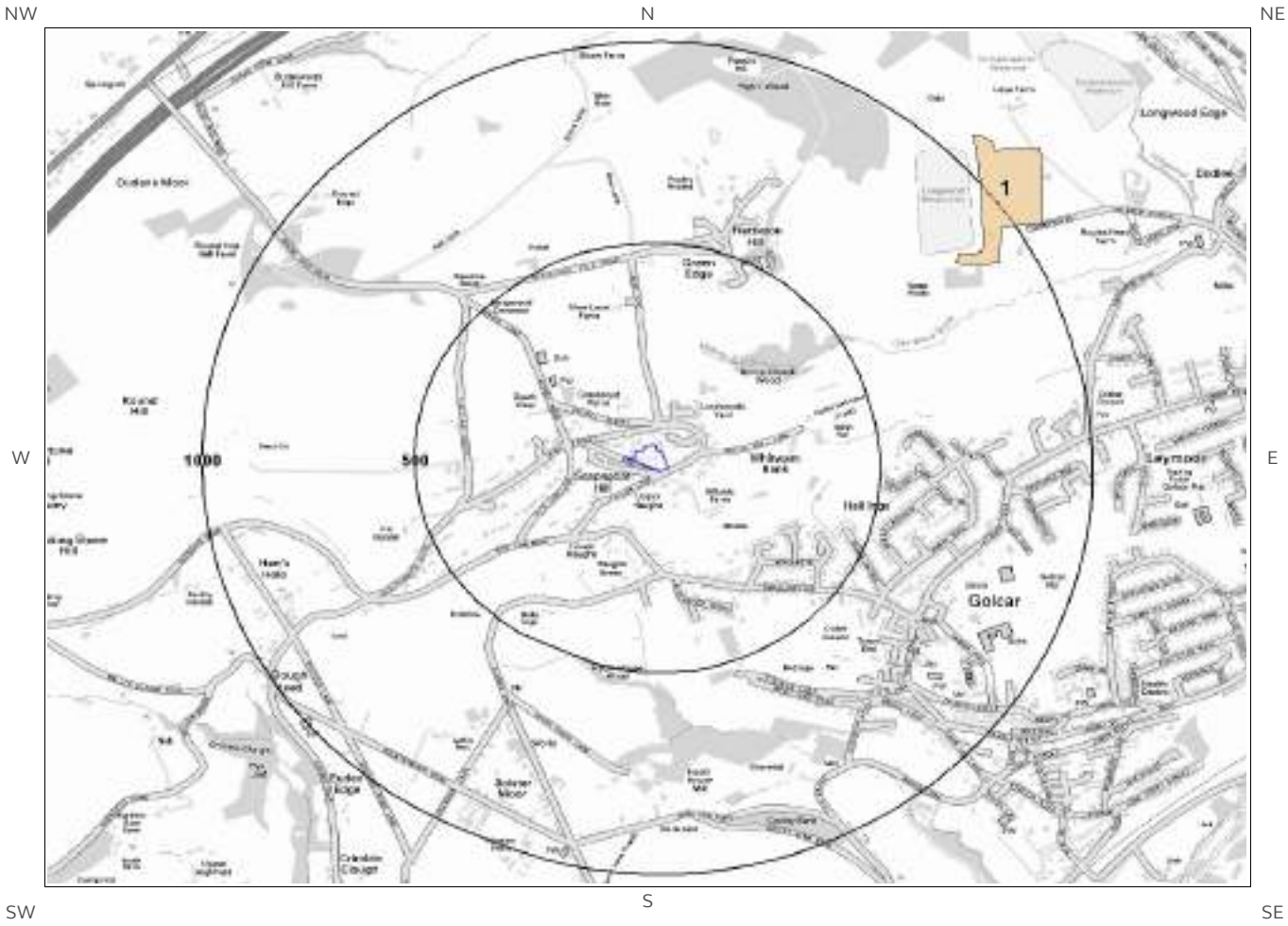
ID	Distance (m)	Direction	Category Description	Feature Description
14	178.0	S	FOSSIL_HORIZON	Fossil horizon, marine band
15	191.0	SW	ROCK	Coal seam, inferred
16	275.0	SW	FAULT	Normal fault, inferred; crossmarks on downthrow side

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

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

2 Geology 1:50,000 Scale

2.1 Artificial Ground map



Site Outline

500
1000
Search Buffers (m)

Made Ground (undivided)

Worked Ground (undivided)

Infilled Ground

Disturbed Ground (undivided)

Landscaped Ground (undivided)

Reclaimed Ground

2. Geology 1:50,000 scale

2.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 077

2.1.1 Artificial/ Made Ground

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

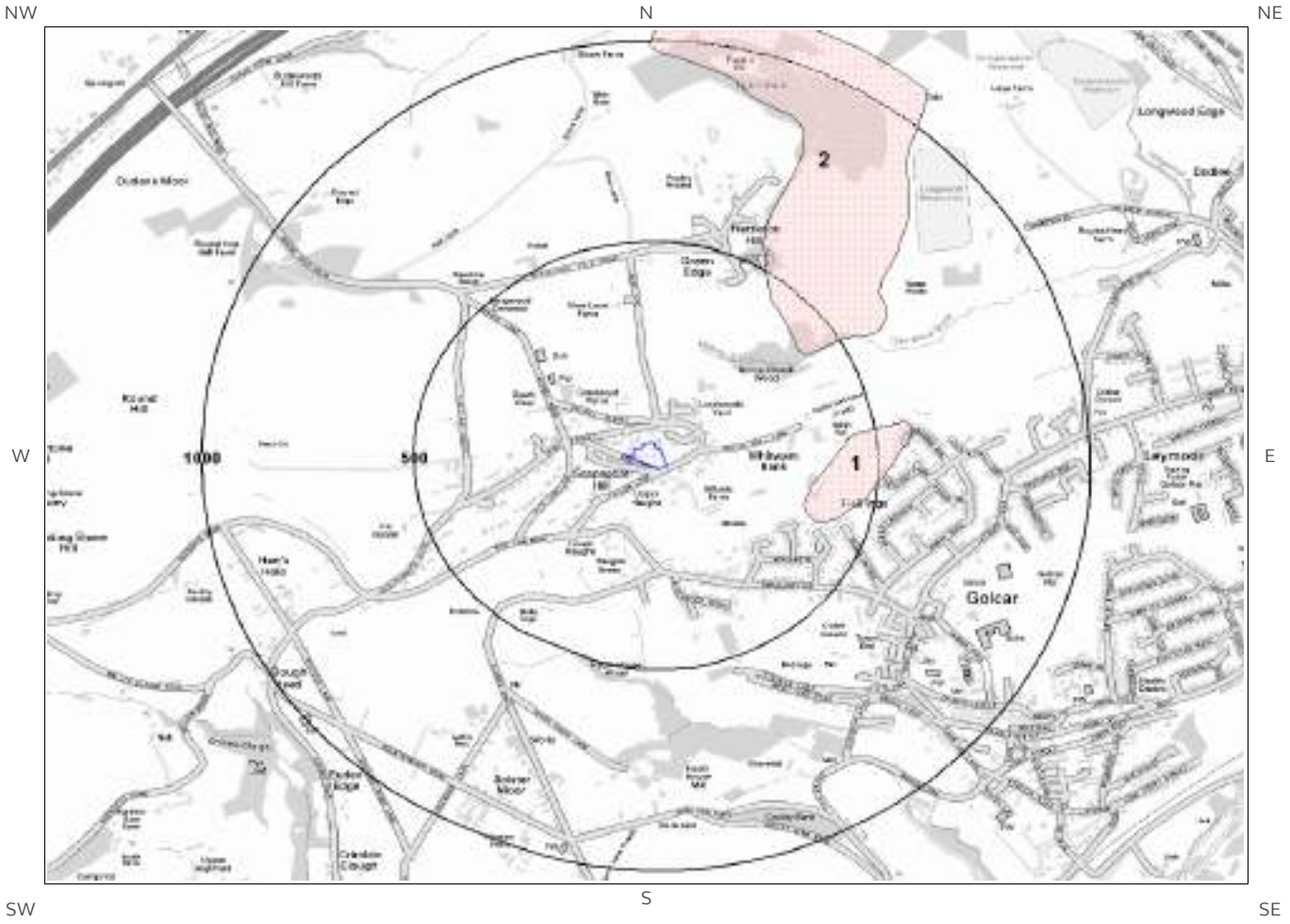
Database searched and no data found.

2.1.2 Permeability of Artificial Ground

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

Database searched and no data found.

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



Site Outline

500
1000
Search Buffers (m)

2.2 Superficial Deposits and Landslips

2.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary? No

Database searched and no data found.

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? Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	336.0	E	SLIP-UKNOWN	LANDSLIDE DEPOSITS	UNKNOWN/UNCLASSIFIED ENTRY
2	406.0	NE	SLIP-UKNOWN	LANDSLIDE DEPOSITS	UNKNOWN/UNCLASSIFIED ENTRY

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

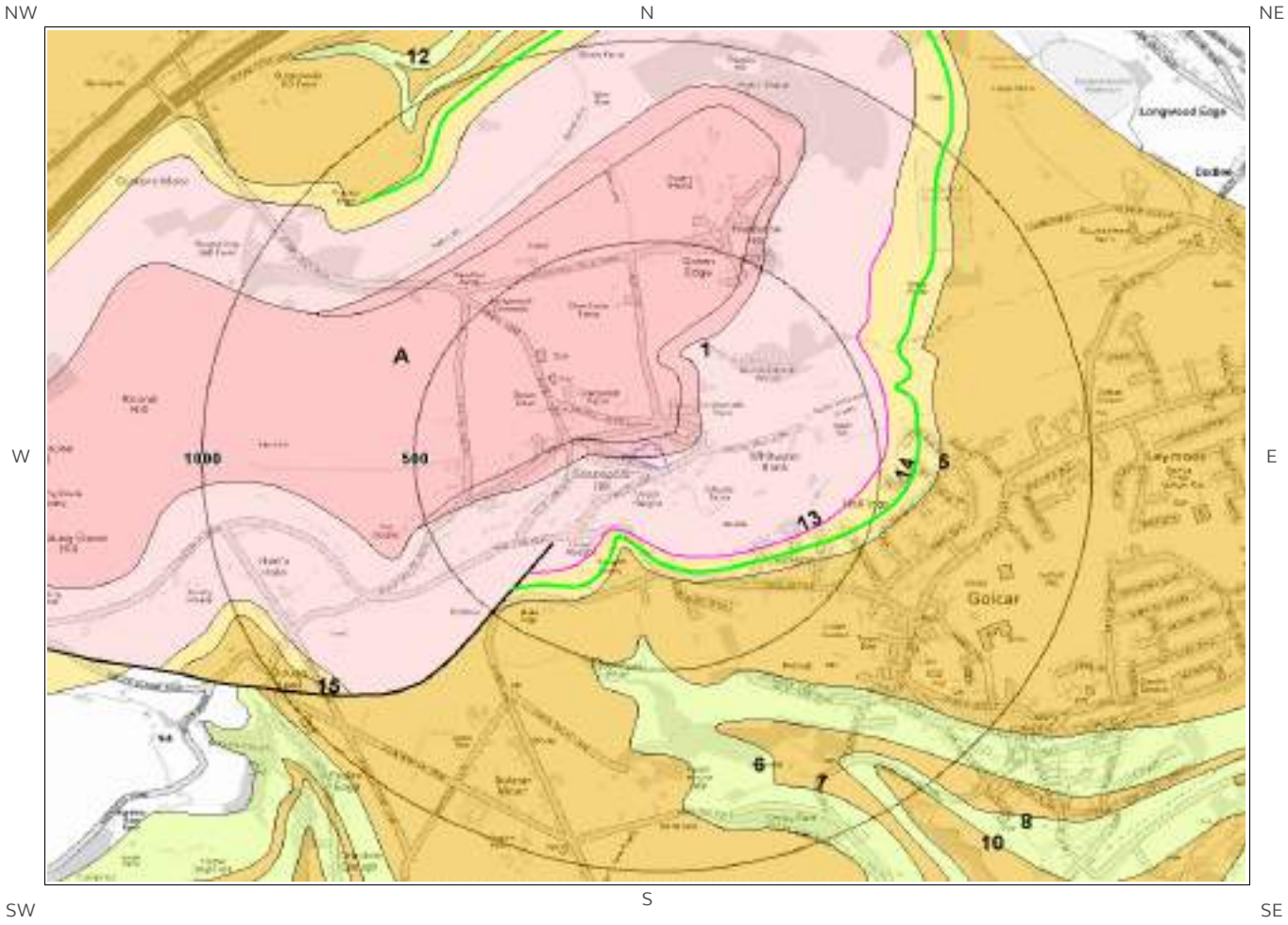
This Geology shows the main components as discrete layers, there are: Artificial/ Made Ground, Superficial/ Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

2.2.4 Landslip Permeability

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

Database searched and no data found.

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



Site Outline

500
1000
Search Buffers (m)

2.3 Bedrock, Solid Geology & linear features

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 077

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	ROSSE-MDSI	ROSSENDALE FORMATION - MUDSTONE AND SILTSTONE	NAMURIAN
2	0.0	On Site	RF-SDST	ROUGH ROCK FLAGS - SANDSTONE	NAMURIAN
3A	11.0	N	RR-SDST	ROUGH ROCK - SANDSTONE	NAMURIAN
4A	173.0	S	MARSD-MDSI	MARSDEN FORMATION - MUDSTONE AND SILTSTONE	NAMURIAN
5	211.0	SW	HDW-SDST	HUDDERSFIELD WHITE ROCK - SANDSTONE	NAMURIAN
6	411.0	S	MG-MDSS	MILLSTONE GRIT GROUP [SEE ALSO MIGR] - MUDSTONE, SILTSTONE AND SANDSTONE	NAMURIAN

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	High	Moderate
0.0	On Site	Fracture	Moderate	Low
11.0	N	Fracture	High	Moderate

2.3.3 Linear features

Are there any records of linear features within 500m of the study site boundary? Yes

ID	Distance	Direction	Category Description	Feature Description
13	173.0	S	FOSSIL_HORIZON	Marine band
14	189.0	SW	ROCK	Coal seam, inferred
15	277.0	SW	FAULT	Fault, inferred

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

This 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.

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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 in a Radon Affected Area, as between 1 and 3% of properties are above the Action Level.

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

3.2 Radon Protection

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

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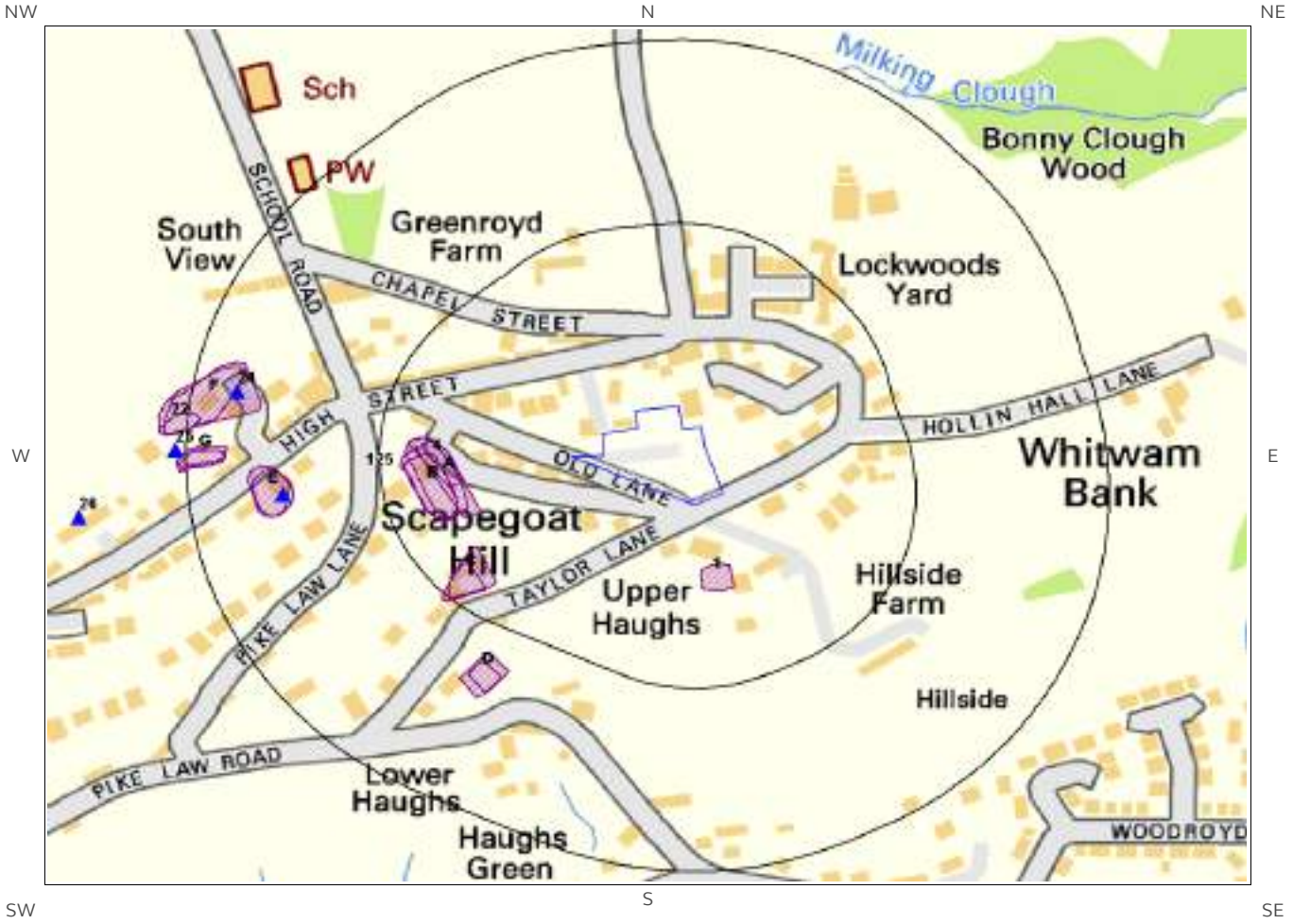
4 Ground Workings map



Ground Workings Legend

Site Outline

125
250
Search Buffers (m)

Historic Surface Ground Workings

Historic Underground Workings

Current Ground Workings

4 Ground Workings

4.1 Historical Surface Ground Working Features derived from Historical Mapping

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

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

ID	Distance (m)	Direction	NGR	Use	Date
1	42.0	S	409043 416289	Unspecified Heap	1905
2A	70.0	SW	408869 416357	Unspecified Ground Workings	1978
3A	74.0	W	408861 416356	Unspecified Pit	1951
4	74.0	W	408860 416368	Unspecified Ground Workings	1967
5B	80.0	W	408858 416351	Unspecified Pit	1890
6B	81.0	W	408857 416354	Unspecified Pit	1948
7B	81.0	W	408857 416354	Unspecified Pit	1905
8C	87.0	SW	408884 416293	Reservoir	1951
9C	98.0	SW	408879 416287	Reservoir	1948
10C	98.0	SW	408879 416287	Reservoir	1905
11D	144.0	SW	408895 416224	Reservoir	1951
12D	149.0	SW	408890 416221	Reservoir	1948
13D	149.0	SW	408890 416221	Reservoir	1905
14E	182.0	W	408756 416347	Unspecified Quarry	1905
15E	183.0	W	408753 416348	Unspecified Quarry	1890
16F	204.0	W	408717 416411	Unspecified Quarry	1948
17F	217.0	W	408710 416410	Unspecified Quarry	1890
18G	223.0	W	408712 416372	Unspecified Pit	1951
19G	224.0	W	408709 416366	Unspecified Pit	1890
20G	224.0	W	408710 416369	Unspecified Ground Workings	1948
21G	224.0	W	408710 416369	Unspecified Ground Workings	1905

ID	Distance (m)	Direction	NGR	Use	Date
22	242.0	W	408695 416394	Refuse Heap	1905

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
23E	189.0	W	408762 416346	Sandstone	Pike Law Lane	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
24	222.0	W	408732 416416	Sandstone	Pike Law Delf	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
25	257.0	W	408692 416376	Sandstone	Pike Law Delf	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
26	322.0	W	408630 416330	Sandstone	Pike Law Delf	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	363.0	W	408605 416488	Sandstone	Halfway Road	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	368.0	N	408914 416763	Sandstone	New Lane	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	442.0	W	408518 416470	Sandstone	Halfway Road	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	550.0	N	409193 416928	Sandstone	Nettleton Hill	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	591.0	N	409137 416985	Sandstone	Park	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased

ID	Distance (m)	Direction	NGR	Commodity Produced	Pit Name	Type of working	Status
Not shown	622.0	NW	408475 416775	Sandstone	Ings Moor	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	624.0	N	408917 417023	Sandstone	New Lane	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	626.0	N	408895 417022	Sandstone	New Lane	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	657.0	N	409184 417042	Sandstone	Nettleton Hiill	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	658.0	N	409130 417055	Sandstone	Nettleton Hill	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	764.0	N	409145 417160	Sandstone	Nettleton Hill	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased

5 Mining, Extraction & Natural Cavities map

Mining, Extraction and Natural Cavities Legend

Site Outline

Search Buffers (m) — 250 — 500

Historical Mining

Non-Coal Mining Cavities

Natural Cavities (point data)

Natural Cavities (polygon data)

Non-Coal Mining

- Highly likely
- Likely
- Unlikely
- Highly unlikely
- Rare

5 Mining, Extraction & Natural Cavities

5.1 Historical Mining

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

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

Database searched and no data found.

5.2 Coal Mining

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

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

Database searched and no data found.

5.3 Johnson Poole and Bloomer

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

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

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

5.4 Non-Coal Mining

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

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

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

ID	Distance (m)	Direction	Name	Commodity	Assessment of likelihood
1	0.0	On Site	Not available	Vein Mineral	Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered

ID	Distance (m)	Direction	Name	Commodity	Assessment of likelihood
Not shown	954.0	E	Not available	Vein Mineral	Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered

5.5 Non-Coal Mining Cavities

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

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

Database searched and no data found.

5.6 Natural Cavities

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

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

Database searched and no data found.

5.7 Brine Extraction

This data provides information from the 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.

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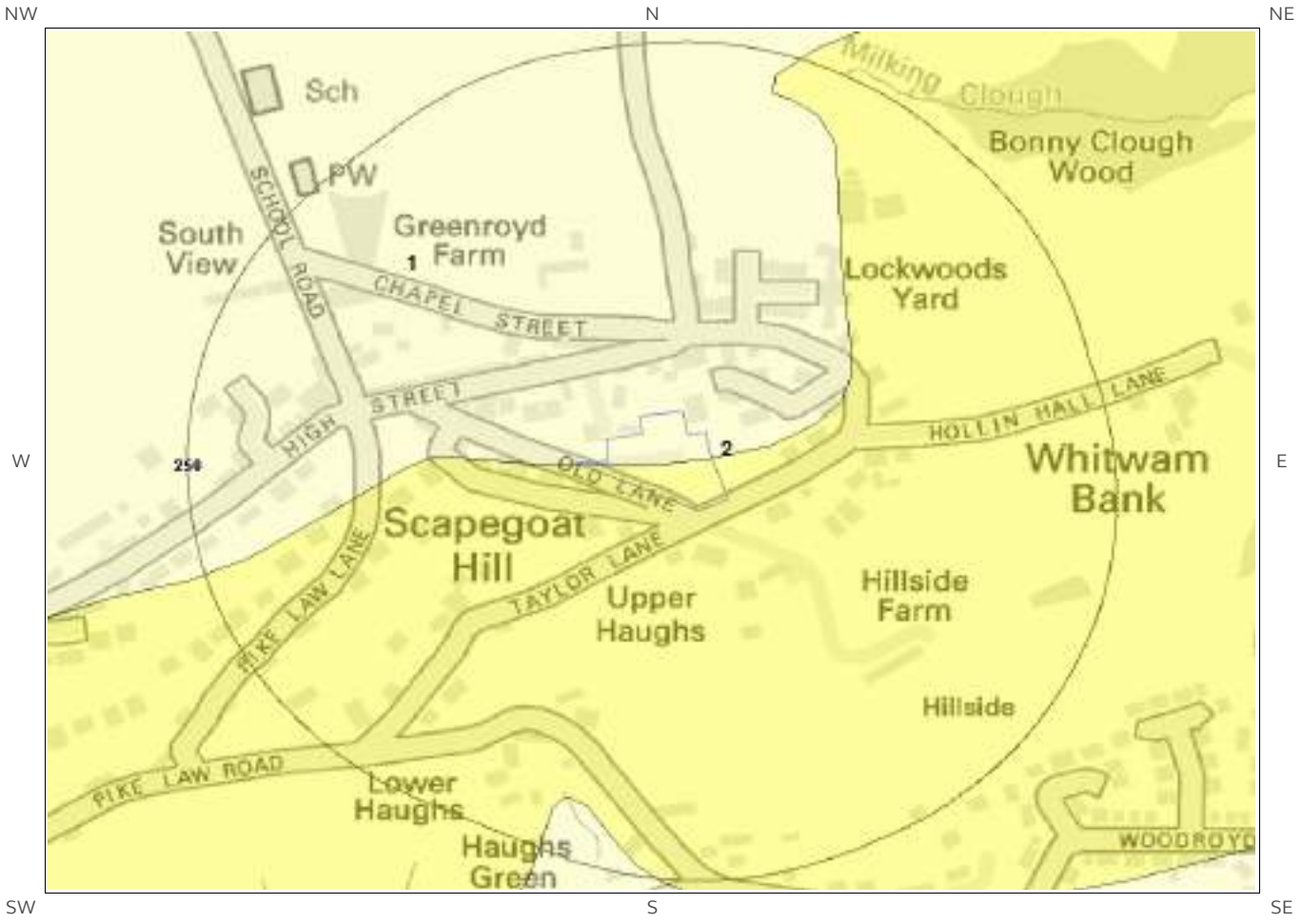
6 Natural Ground Subsidence

6.1 Shrink-Swell Clay map



Shrink Swell Clay Legend

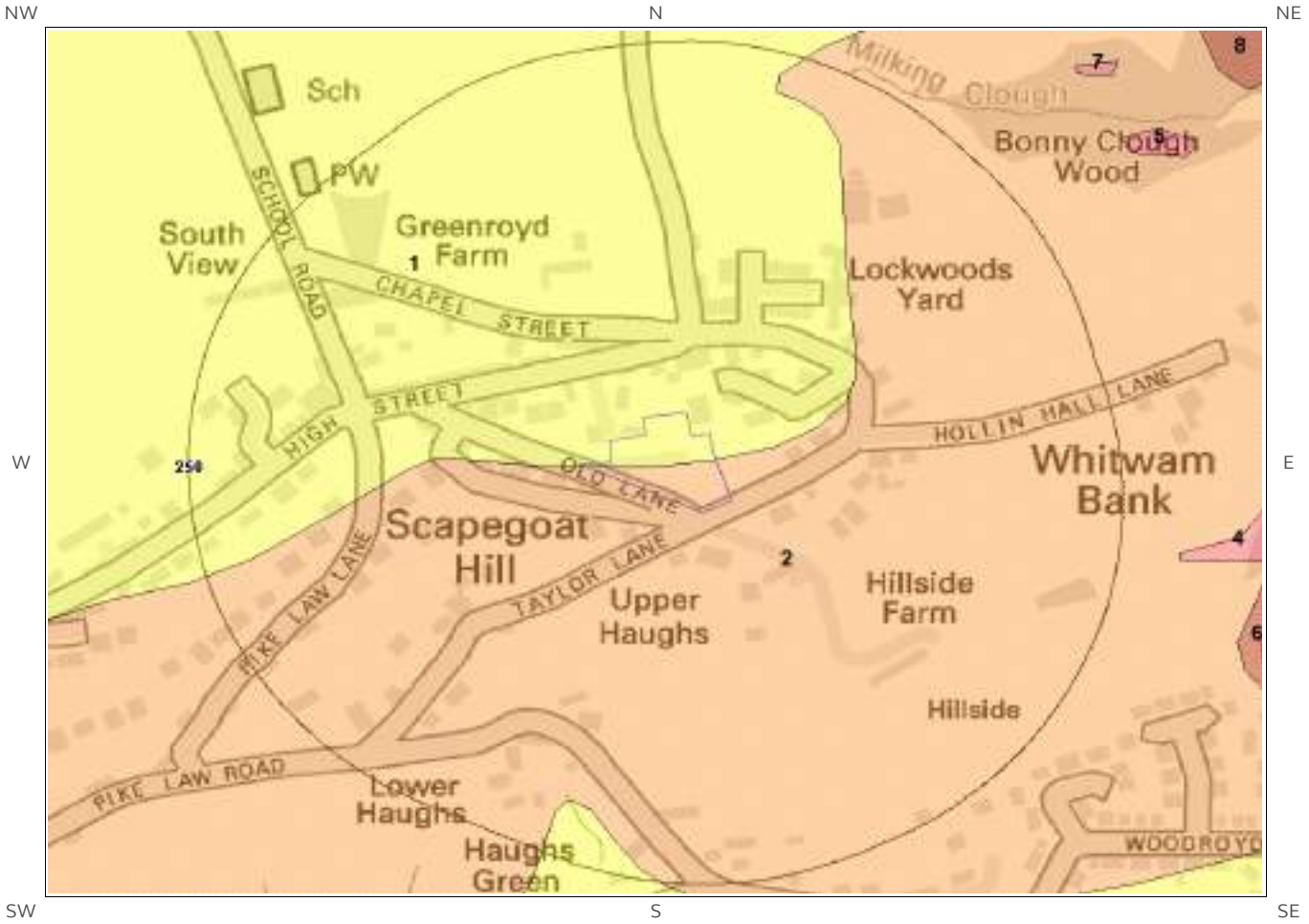
Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

6.2 Landslides map



Landslides Legend

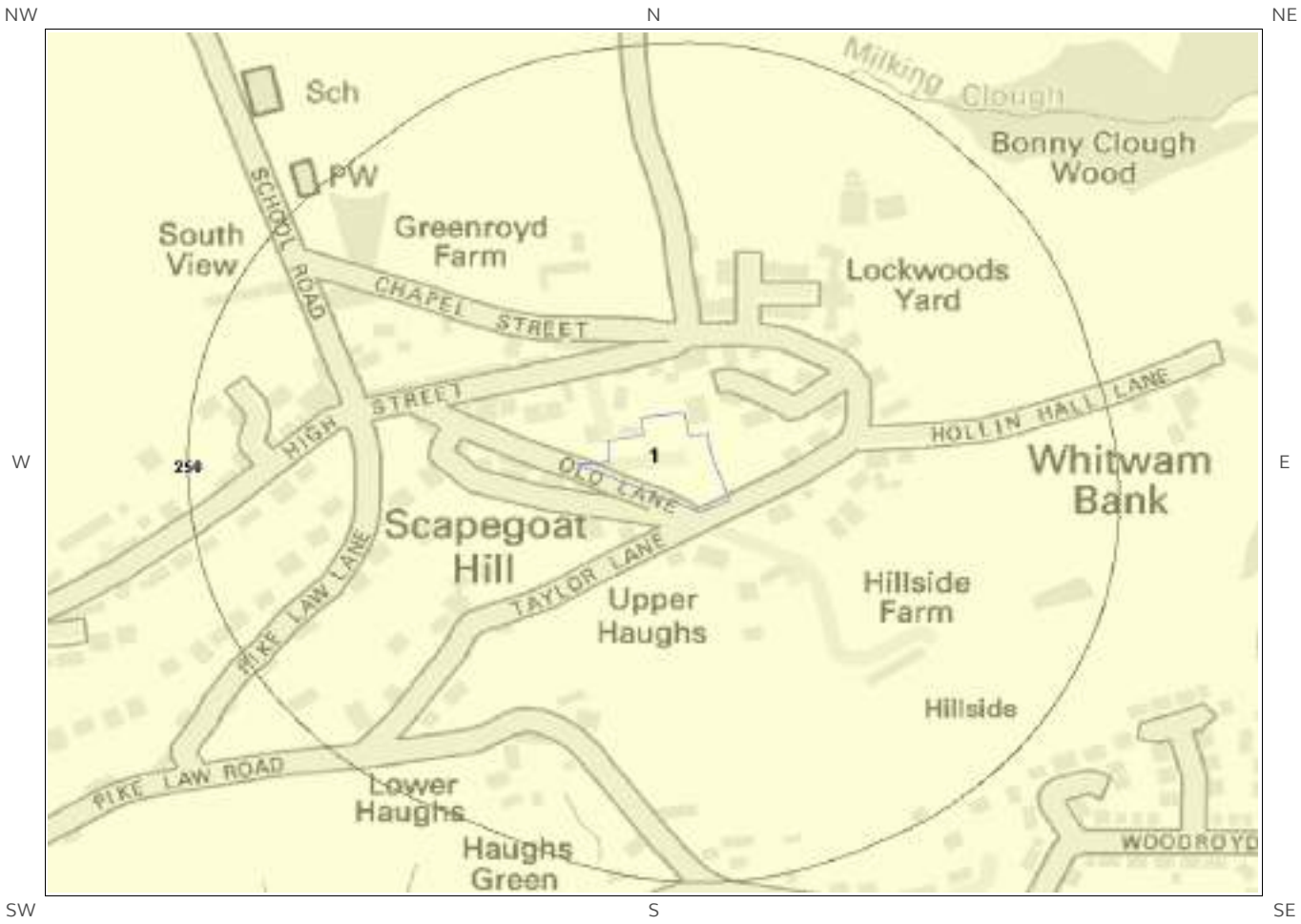
Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

6.3 Ground Dissolution of Soluble Rocks map



Ground Dissolution Soluble Rocks Legend

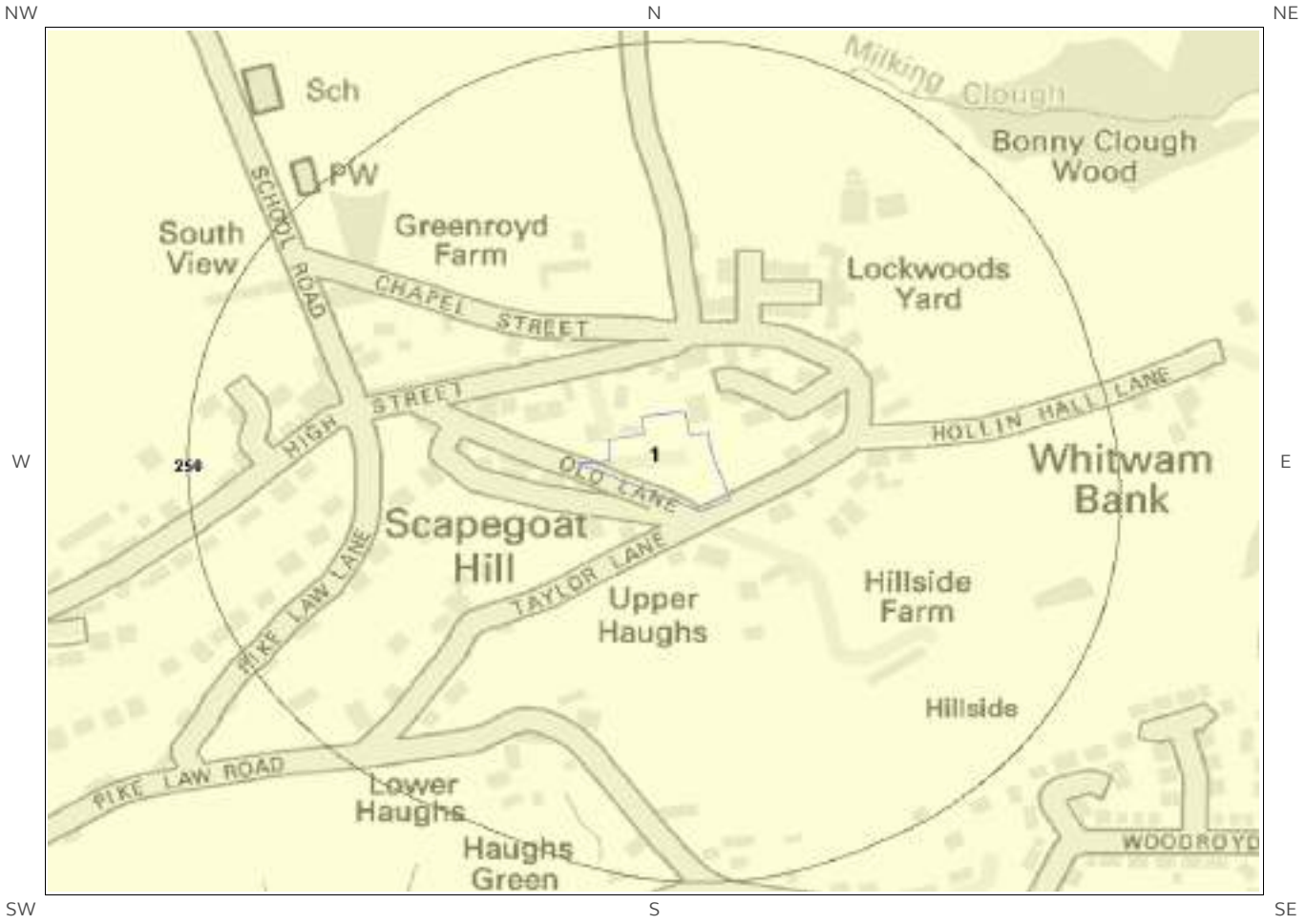
Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

6.4 Compressible Deposits map



Compressible Deposits Legend

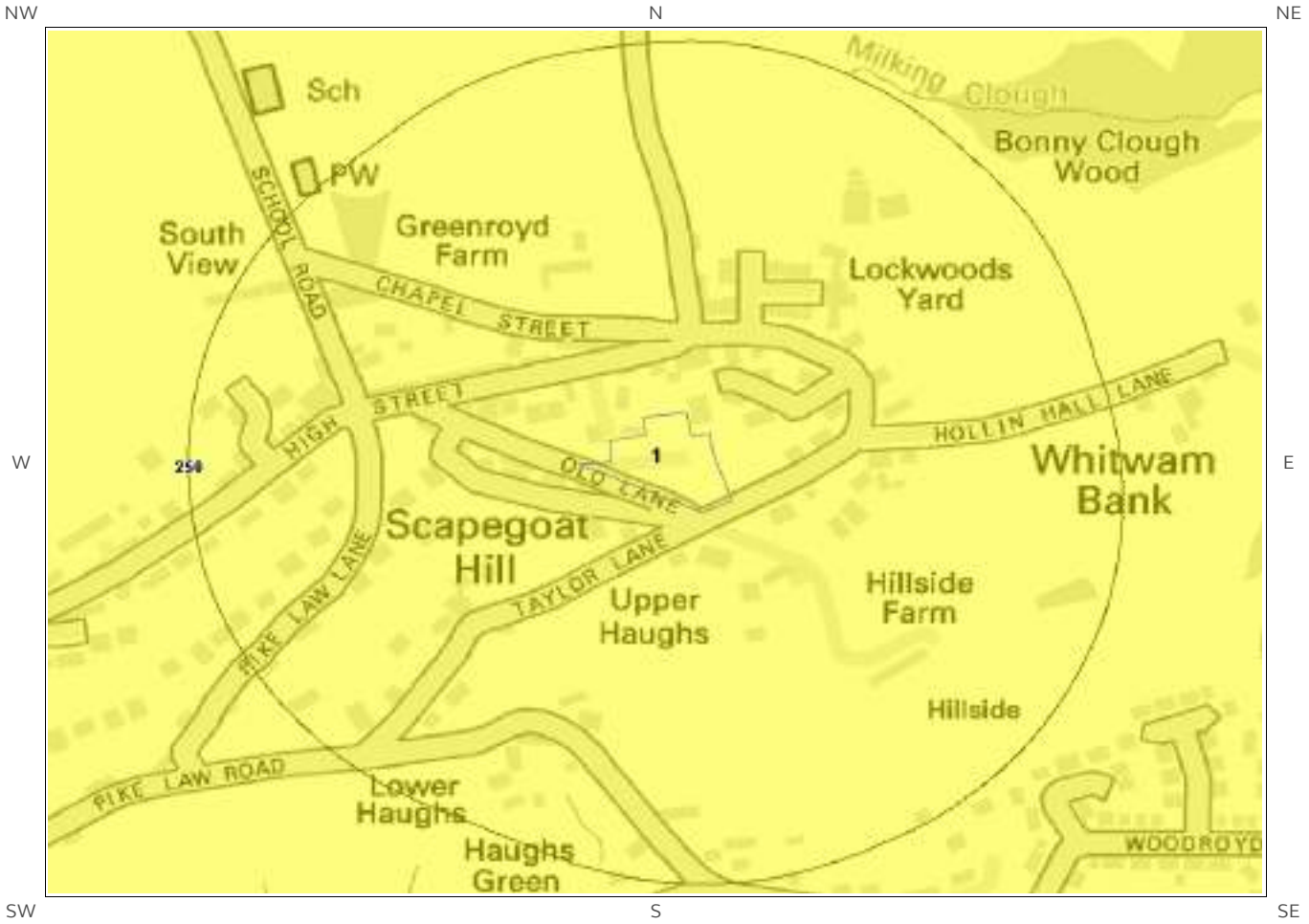
Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

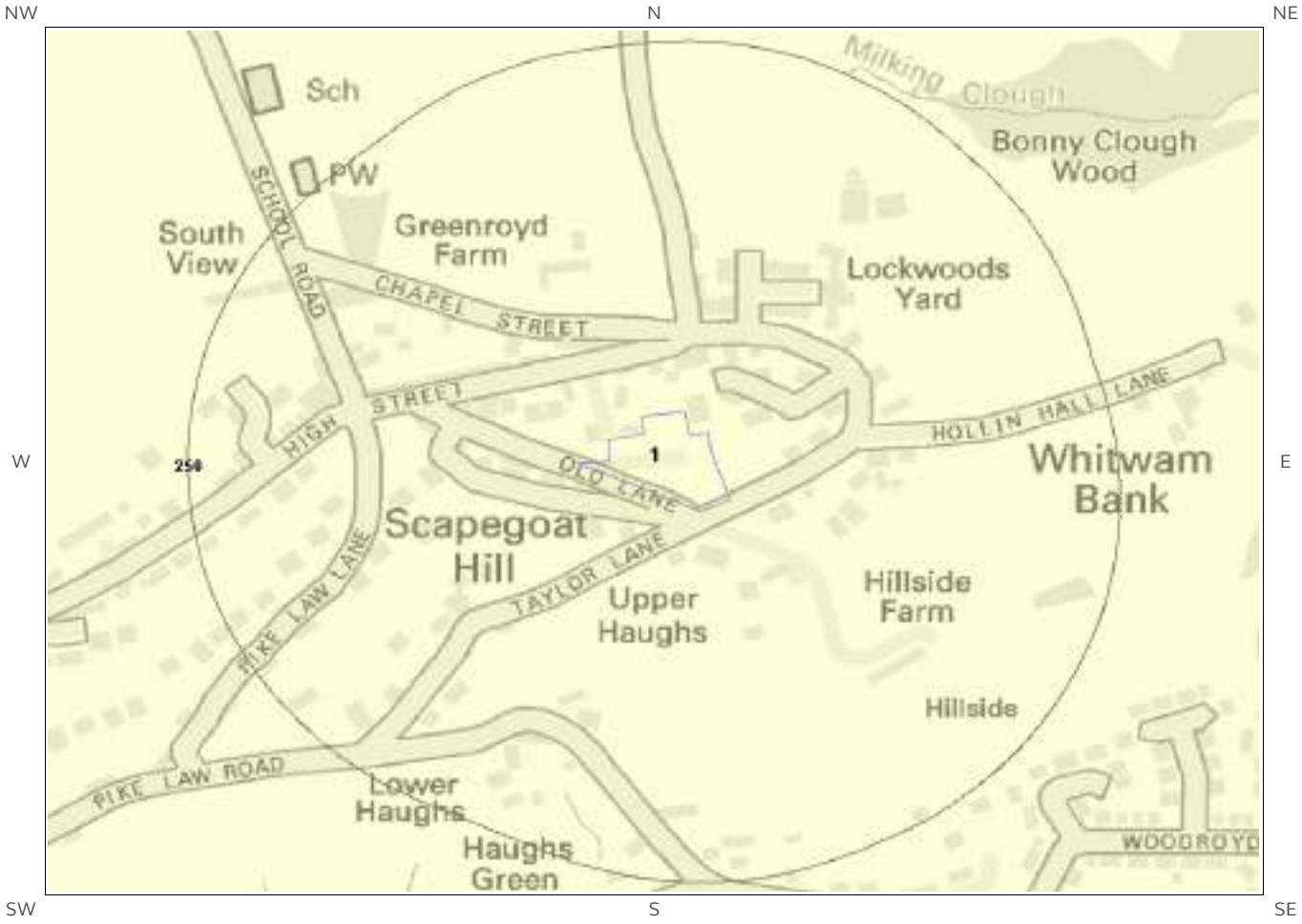
Low
Moderate
High

6.5 Collapsible Deposits map



Collapsible Deposits Legend

6.6 Running Sand map



Running Sand Legend

Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

6 Natural Ground Subsidence

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

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

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

6.1 Shrink-Swell Clays

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

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
2	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.
2	0.0	On Site	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property - no significant increase in insurance risk due to natural slope instability problems.

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

6.3 Ground Dissolution of Soluble Rocks

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

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

6.4 Compressible Deposits

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

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

6.5 Collapsible Deposits

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

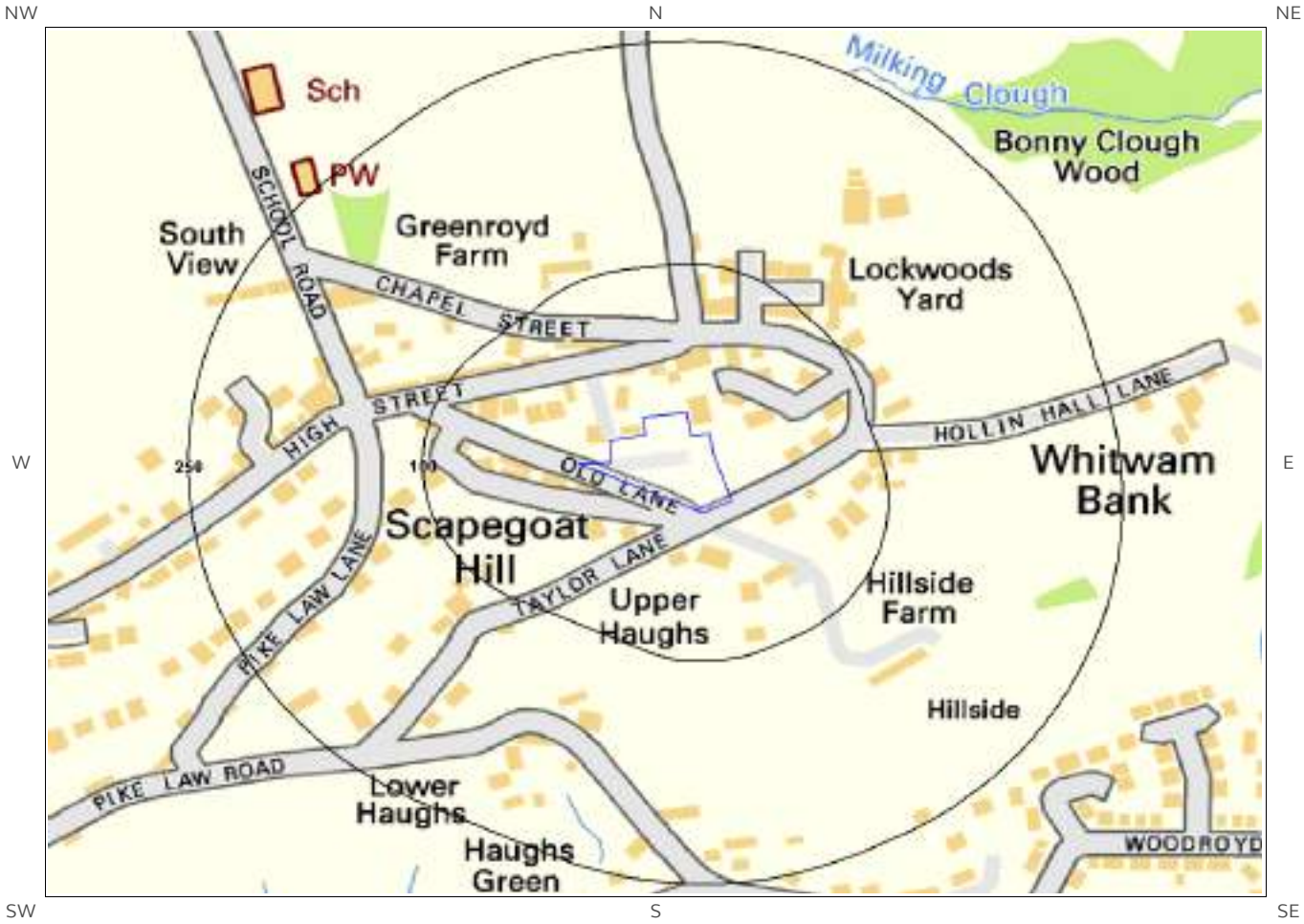
ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible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

6.6 Running Sands

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

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

7 Borehole Records map



Borehole Records Legend

Site Outline

Borehole Locations

125
250
Search Buffers (m)

7 Borehole Records

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

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

Database searched and no data found.

8 Estimated Background Soil Chemistry

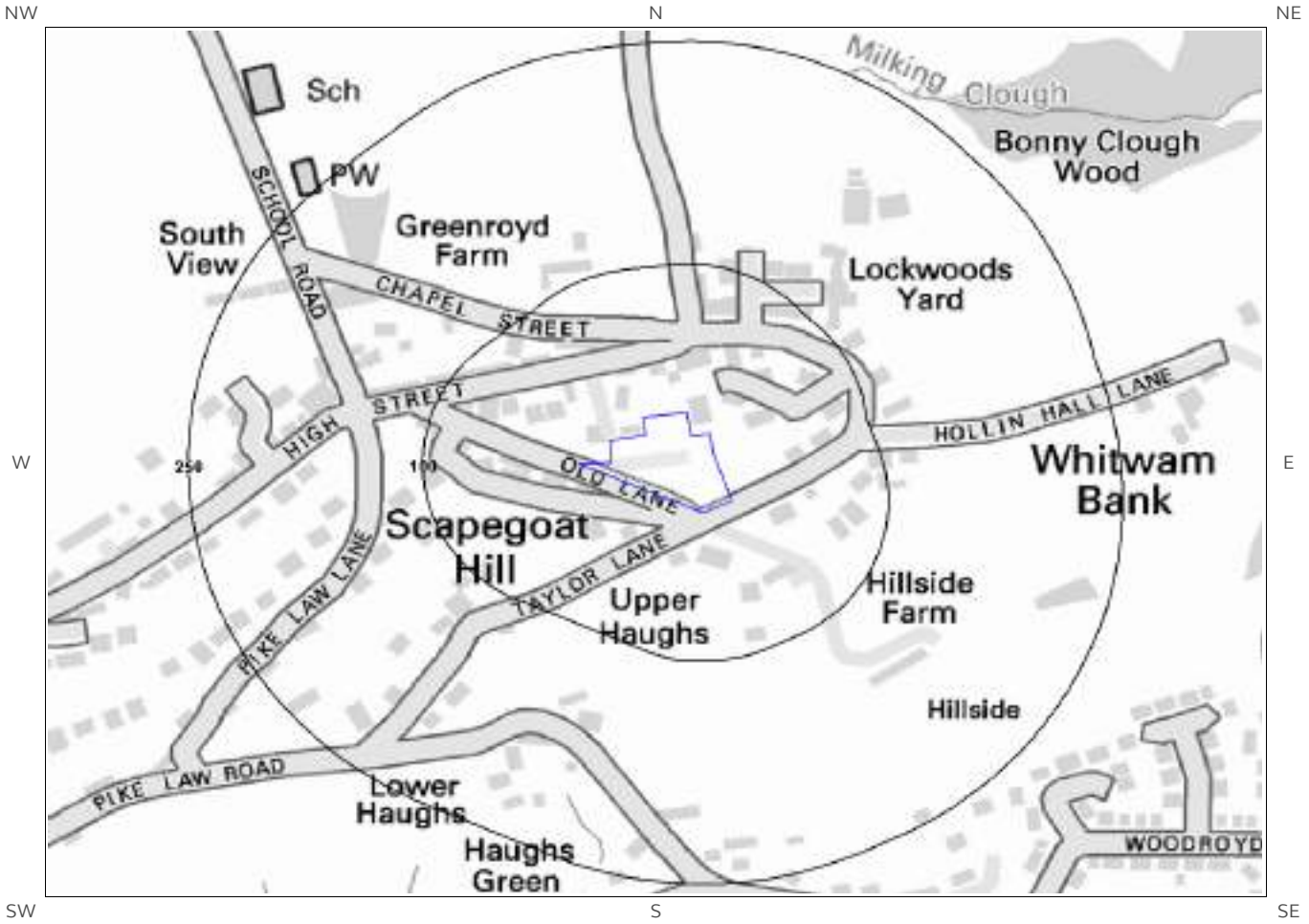
Records of background estimated soil chemistry within 250m of the study site boundary: 9

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.

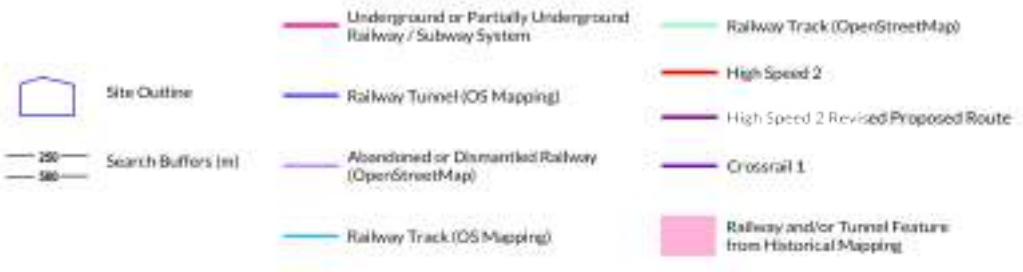
Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	RuralSoil	25 - 35 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	200 - 300 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	200 - 300 mg/kg
0.0	On Site	RuralSoil	25 - 35 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	200 - 300 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg	200 - 300 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	25 - 35 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	100 - 200 mg/kg
11.0	N	RuralSoil	25 - 35 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	100 - 200 mg/kg
12.0	N	RuralSoil	25 - 35 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	200 - 300 mg/kg
12.0	N	RuralSoil	25 - 35 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	200 - 300 mg/kg

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

9 Railways and Tunnels map



Railways and Tunnels Legend



9 Railways and Tunnels

9.1 Tunnels

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

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

Database searched and no data found.

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

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

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

Database searched and no data found.

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

9.2 Historical Railway and Tunnel Features

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

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

Database searched and no data found.

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

9.3 Historical Railways

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

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

Database searched and no data found.

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

9.4 Active Railways

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

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

Database searched and no data found.

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

9.5 Railway Projects

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

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

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

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

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

Contact Details

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British Geological Survey Enquiries

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Fax: 0115 936 3276.
Email:**enquiries@bgs.ac.uk**
Web:**www.bgs.ac.uk**
BGS Geological Hazards Reports and general geological enquiries

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Leicestershire
LE12 6HX

The Coal Authority

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

Public Health England

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

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Standard Terms and Conditions

Groundsure's Terms and Conditions can be viewed online at this link:
https://www.groundsure.com/terms-and-conditions-march-2018/

APPENDIX B

EMAPSITE: GROUNDSURE ENVIROINSIGHT REPORT

EmapSite

Masdar House, 1 Reading Road,
Eversley, RG27 0RP

Groundsure Reference:	EMS-466873_626780
Your Reference:	EMS_466873_626780
Report Date	12 Mar 2018
Report Delivery Method:	Email - pdf

Enviro Insight

Address: ,

Dear Sir/ Madam,

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

If you would like further assistance regarding this report then please contact the emapsite customer services team on 0118 9736883 quoting the above report reference number.

Yours faithfully,

emapsite customer services team

Enc.
Groundsure Enviroinsight

Enviro Insight

Address:	**,**
Date:	**12 Mar 2018**
Reference:	**EMS-466873_626780**
Client:	**EmapSite**

NW N NE

W E

SW S SE

Aerial Photograph Capture date:	26-Mar-2012
Grid Reference:	409007,416372
Site Size:	0.34ha

Report Reference: EMS-466873_626780
Client Reference: EMS_466873_626780

Contents Page

Overview of Findings

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

Section 1: Historical Industrial Sites	On-site	0-50	51-250	251-500
1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping	0	1	24	34
1.2 Additional Information – Historical Tank Database	0	0	0	6
1.3 Additional Information – Historical Energy Features Database	0	0	2	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	0
1.6 Potentially Infilled Land	0	1	28	39

Section 2: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	0
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	0
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	0	0	0
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	0	0	0	0
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
2.1.8 Records of Licensed Discharge Consents	0	0	0	4
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	2
3.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	0	0
3.1.4 Records of Landfills in Local Authority and Historical Mapping Records	0	0	0	0	3	1
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	1	2

Section 4: Current Land Use	On-site	0-50m	51-250	251-500
4.1 Current Industrial Sites Data	0	0	6	Not searched
4.2 Records of Petrol and Fuel Sites	0	0	0	0
4.3 National Grid Underground Electricity Cables	0	0	0	0
4.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 5: Geology

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

Section 6: Hydrogeology and Hydrology

	0-500m
6.1 Records of Strata Classification in the Superficial Geology within 500m of the study site	None identified
6.2 Records of Strata Classification in the Bedrock Geology within 500m of the study site	Identified

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
6.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	11
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	1	21
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	1	7
6.6 Source Protection Zones (within 500m of the study site)	0	0	0	0	Not searched	Not searched
6.7 Source Protection Zones within Confined Aquifer	0	0	0	0	Not searched	Not searched
6.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	1	0	0	1	Not searched	Not searched

Section 6: Hydrogeology and Hydrology

	0-500m					
	On-site	0-50m	51-250	251-500	501-1000	1000-1500
6.9 Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site	No	No	No	No	No	No
6.10 Detailed River Network entries within 500m of the site	0	0	3	17	Not searched	Not searched
6.11 Surface water features within 250m of the study site	No	No	Yes	Not searched	Not searched	Not searched

Section 7: Flooding

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

Section 8: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	0
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
8.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
8.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
8.5 Records of Ramsar sites	0	0	0	0	0	0
8.6 Records of Ancient Woodlands	0	0	0	0	0	3
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	0	0	0	0	0	0
8.14 Records of Green Belt land	0	1	0	0	1	2

Section 9: Natural Hazards

9.1 Maximum risk of natural ground subsidence	Very Low
9.1.1 Maximum Shrink-Swell hazard rating identified on the study site	Very Low
9.1.2 Maximum Landslides hazard rating identified on the study site	Low
9.1.3 Maximum Soluble Rocks hazard rating identified on the study site	Negligible
9.1.4 Maximum Compressible Ground hazard rating identified on the study site	Negligible
9.1.5 Maximum Collapsible Rocks hazard rating identified on the study site	Very Low
9.1.6 Maximum Running Sand hazard rating identified on the study site	Negligible
9.2 Radon	
9.2.1 Radon Affected Area rating	The site is in a Radon Affected Area, as between 1 and 3% of properties are above the Action Level.
9.2.2 Radon protection measures requirements	No radon protective measures are necessary.

Section 10: Mining

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

Using this report

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

1. Historical Industrial Sites

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

2. Environmental Permits, Incidents and Registers

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

3. Landfills and Other Waste Sites

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

4. Current Land Uses

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

5. Geology

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

6. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction 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.

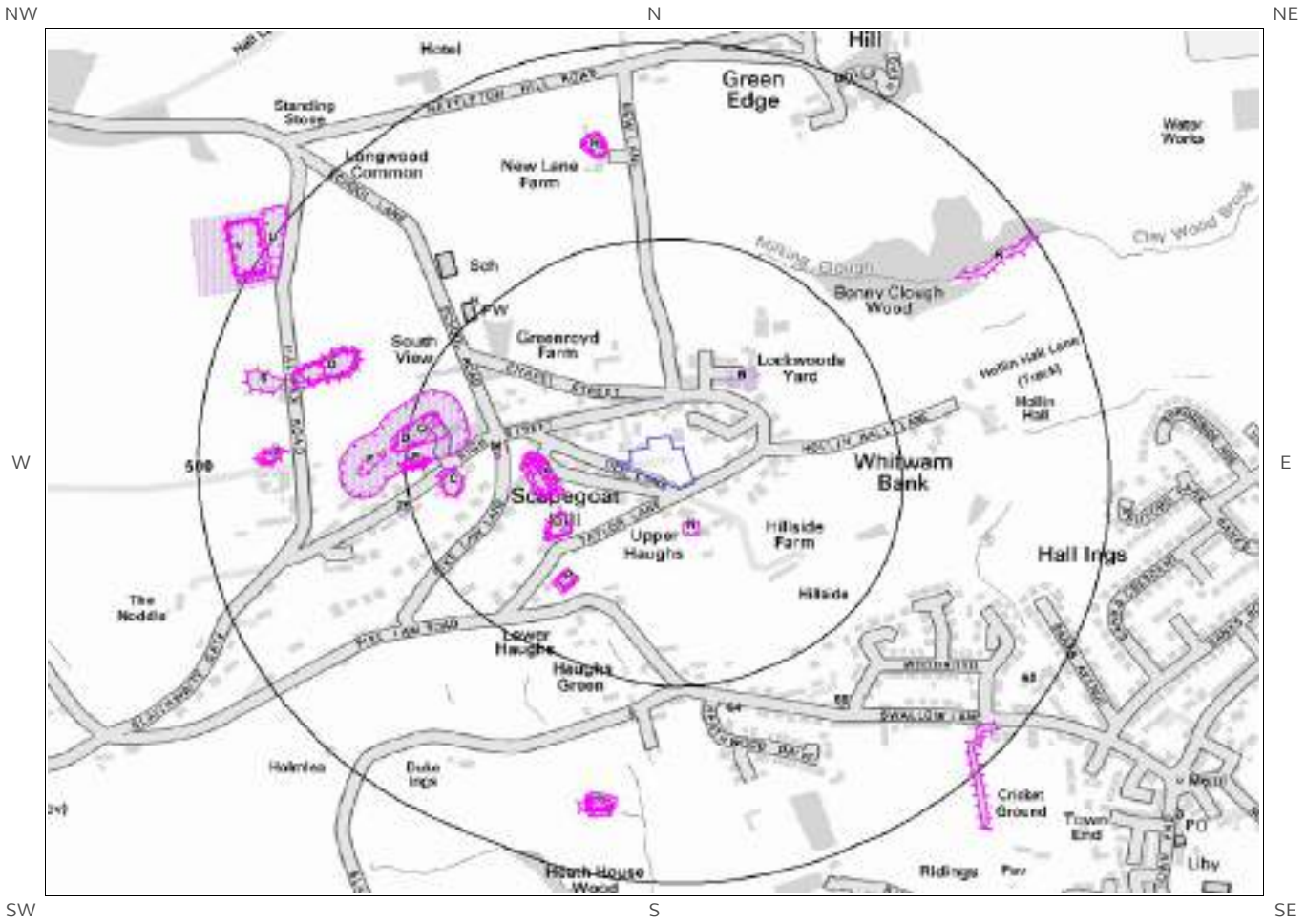
Note: Maps

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



Site Outline

250
500
Search Buffers (m)

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

Industrial Land Use

Potentially Infilled Land

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

Energy Features

Petrol Stations

Tanks

Garages

1. Historical Industrial Sites

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

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

Records of sites with a potentially contaminative past land use within 500m of the search boundary: 59

ID	Distance [m]	Direction	Use	Date
1N	42	S	Unspecified Heap	1905
2A	70	SW	Unspecified Ground Workings	1978
3A	74	W	Unspecified Pit	1951
4A	74	W	Unspecified Ground Workings	1967
5A	75	W	Unspecified Pit	1938
6A	75	W	Unspecified Pit	1938
7A	80	W	Unspecified Pit	1890
8A	81	W	Unspecified Pit	1948
9A	81	W	Unspecified Pit	1905
10B	92	NE	Unspecified Yard	1967
11B	105	NE	Unspecified Yard	1993
12B	105	NE	Unspecified Yard	1978
13D	178	W	Unspecified Quarry	1951
14C	182	W	Unspecified Quarry	1905
15C	183	W	Unspecified Quarry	1890
16D	204	W	Unspecified Quarry	1948
17D	217	W	Unspecified Quarry	1890
18E	222	W	Unspecified Pit	1938
19E	222	W	Unspecified Pit	1938
20E	223	W	Unspecified Pit	1951
21E	224	W	Unspecified Pit	1890
22E	224	W	Unspecified Ground Workings	1905
23E	224	W	Unspecified Ground Workings	1948
24D	242	W	Refuse Heap	1905
25	248	W	Police Station	1978
26F	275	W	Unspecified Ground Workings	1948
27F	275	W	Unspecified Ground Workings	1905
28L	289	S	Unspecified Tank	1905
29G	332	W	Unspecified Pit	1951
30G	334	W	Unspecified Pit	1948

31G	334	W	Unspecified Quarry	1905
32G	335	NW	Unspecified Pit	1938
33G	335	NW	Unspecified Pit	1938
34G	338	W	Unspecified Pit	1978
35G	338	W	Unspecified Pit	1993
36G	338	W	Unspecified Pit	1967
37H	360	N	Unspecified Pit	1948
38H	363	N	Unspecified Pit	1951
39H	364	N	Unspecified Pit	1938
40H	364	N	Unspecified Pit	1938
41I	397	S	Unspecified Pit	1978
42I	397	S	Unspecified Pit	1967
43I	397	S	Unspecified Pit	1993
44J	398	W	Unspecified Pit	1951
45R	398	NE	Unspecified Ground Workings	1948
46J	402	W	Unspecified Pit	1938
47J	402	W	Unspecified Pit	1938
48I	402	S	Unspecified Pit	1938
49I	402	S	Unspecified Pit	1938
50I	402	S	Unspecified Pit	1951
51I	403	S	Unspecified Pit	1890
52J	404	W	Unspecified Pit	1905
53J	404	W	Unspecified Pit	1948
54J	406	W	Unspecified Pit	1890
55I	407	S	Unspecified Pit	1948
56S	411	W	Unspecified Quarry	1890
57T	461	SE	Unspecified Ground Workings	1905
58V	464	NW	Water Works	1951
59U	468	NW	Unspecified Heap	1951

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: 6

ID	Distance (m)	Direction	Use	Date
60K	261	NW	Unspecified Tank	1980
61K	262	NW	Unspecified Tank	1991
62L	285	S	Unspecified Tank	1893
63L	286	S	Unspecified Tank	1907

64	287	S	Unspecified Tank	1893
65	472	SE	Unspecified Tank	1980

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: 3

ID	Distance (m)	Direction	Use	Date
66M	136	W	Electricity Substation	1980
67M	142	W	Electricity Substation	1991
68	325	SE	Electricity Substation	1980

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: 0

Database searched and no data found.

1.6 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 68

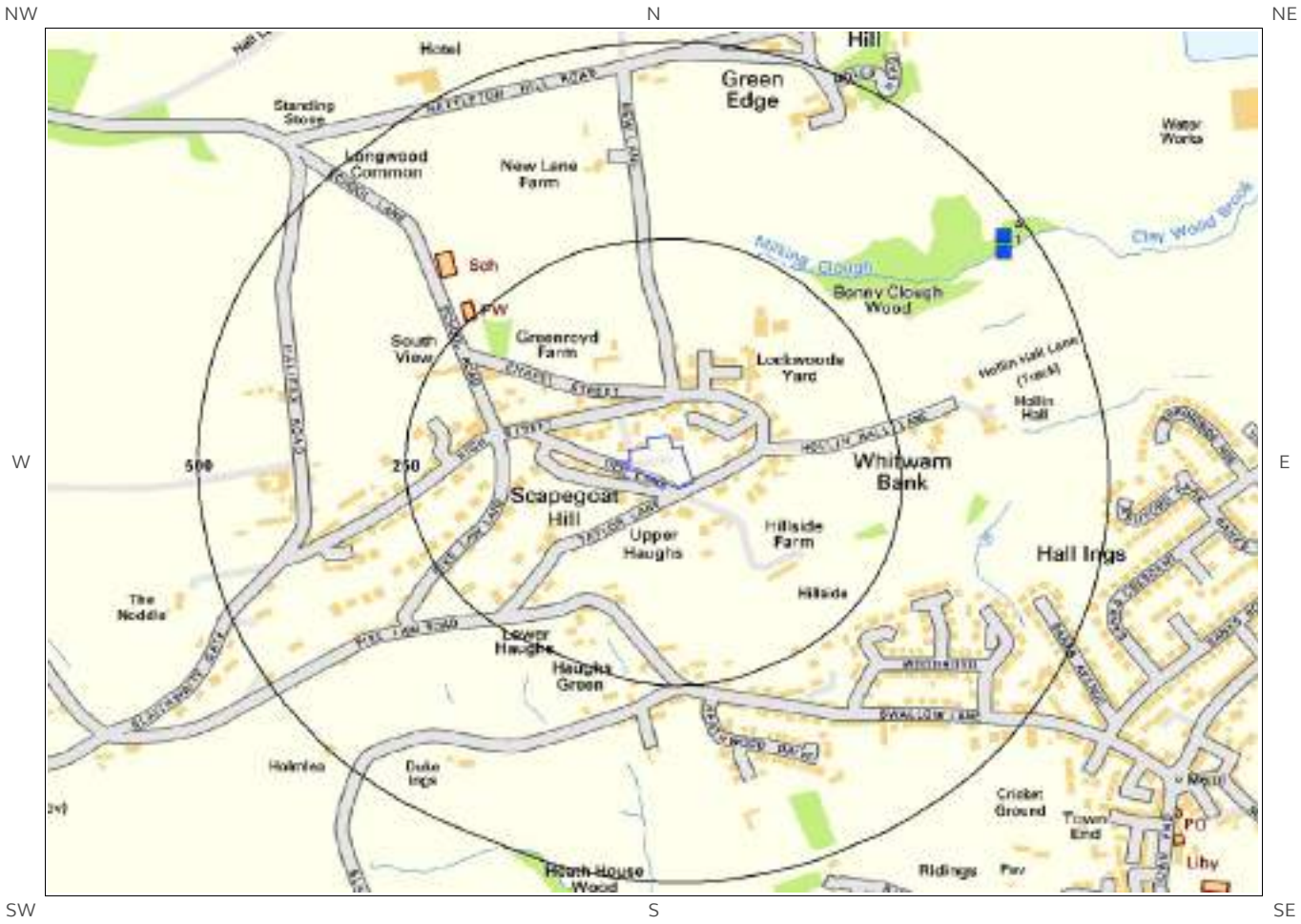
The following Historical Potentially Infilled Features derived from the Historical Mapping information is provided by Groundsure:

ID	Distance(m)	Direction	Use	Date
69N	42	S	Unspecified Heap	1905
70A	70	SW	Unspecified Ground Workings	1978
71A	74	W	Unspecified Pit	1951

72A	74	W	Unspecified Ground Workings	1967
73A	75	W	Unspecified Pit	1938
74A	75	W	Unspecified Pit	1938
75A	80	W	Unspecified Pit	1890
76A	81	W	Unspecified Pit	1905
77A	81	W	Unspecified Pit	1948
78O	87	SW	Reservoir	1938
79O	87	SW	Reservoir	1951
80O	98	SW	Reservoir	1948
81O	98	SW	Reservoir	1905
82P	144	SW	Reservoir	1951
83P	145	SW	Reservoir	1938
84P	149	SW	Reservoir	1948
85P	149	SW	Reservoir	1905
86D	178	W	Unspecified Quarry	1951
87C	182	W	Unspecified Quarry	1905
88C	183	W	Unspecified Quarry	1890
89Q	204	W	Unspecified Quarry	1948
90Q	217	W	Unspecified Quarry	1890
91E	222	W	Unspecified Pit	1938
92E	222	W	Unspecified Pit	1938
93E	223	W	Unspecified Pit	1951
94E	224	W	Unspecified Pit	1890
95E	224	W	Unspecified Ground Workings	1905
96E	224	W	Unspecified Ground Workings	1948
97D	242	W	Refuse Heap	1905
98F	275	W	Unspecified Ground Workings	1948
99F	275	W	Unspecified Ground Workings	1905
100G	332	W	Unspecified Pit	1951
101G	334	W	Unspecified Quarry	1905
102G	334	W	Unspecified Pit	1948
103G	335	NW	Unspecified Pit	1938
104G	335	NW	Unspecified Pit	1938
105G	338	W	Unspecified Pit	1967
106G	338	W	Unspecified Pit	1978
107G	338	W	Unspecified Pit	1993
108H	360	N	Unspecified Pit	1948
109H	363	N	Unspecified Pit	1951
110H	364	N	Unspecified Pit	1938
111H	364	N	Unspecified Pit	1938
112I	397	S	Unspecified Pit	1967
113I	397	S	Unspecified Pit	1978

114I	397	S	Unspecified Pit	1993
115J	398	W	Unspecified Pit	1951
116R	398	NE	Unspecified Ground Workings	1948
117J	402	W	Unspecified Pit	1938
118J	402	W	Unspecified Pit	1938
119I	402	S	Unspecified Pit	1938
120I	402	S	Unspecified Pit	1938
121I	402	S	Unspecified Pit	1951
122I	403	S	Unspecified Pit	1890
123J	404	W	Unspecified Pit	1905
124J	404	W	Unspecified Pit	1948
125J	406	W	Unspecified Pit	1890
126I	407	S	Unspecified Pit	1948
127S	411	W	Unspecified Quarry	1890
128T	461	SE	Unspecified Ground Workings	1905
129U	468	NW	Unspecified Heap	1951
130V	484	NW	Reservoir	1951
131V	484	NW	Covered Reservoir	1978
132V	484	NW	Covered Reservoir	1993
133V	484	NW	Water Body	1967
134V	485	NW	Reservoir	1905
135V	485	NW	Reservoir	1948
136V	486	NW	Reservoir	1938

2. Environmental Permits, Incidents and Registers Map



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

2. Environmental Permits, Incidents and Registers

2.1 Industrial Sites Holding Licences and/or Authorisations

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

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

0

Database searched and no data found.

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

0

Database searched and no data found.

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

0

Database searched and no data found.

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

0

Database searched and no data found.

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

0

Database searched and no data found.

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

0

Database searched and no data found.

2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:

0

Database searched and no data found.

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

4

The following Licensed Discharge Consents records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
1	460	NE	409420 416640	Address: NETTLETON HILL CSO, OFF HOLLIN HALL ROAD, GOLCAR, HUDDERSFIELD Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: WRA8609 Permit Version: 2	Receiving Water: CLAY WOOD BROOK Status: MODIFIED - (WRA 91 SCHED 10 - AS AMENDED BY ENV ACT 1995) Issue date: 15/08/2005 Effective Date: 15-Aug-2005 Revocation Date: -
2A	471	NE	409420 416660	Address: UNDEFINED SITE, SEE OUTLET NGR OR COMMENTS, FOR MORE INFO ABOUT THE SITE, (DO NOT CHANGE THESE DETAILS), NK Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: S/CB/51 Permit Version: 3	Receiving Water: VARIES WITH OUTLET Status: REVISED BY NOTICE, AT DIRECTION OF SEC. OF STATE - 37(2) Issue date: 25/01/1995 Effective Date: 25-Jan-1995 Revocation Date: 05/03/1995
3A	471	NE	409420 416660	Address: UNDEFINED SITE, SEE OUTLET NGR OR COMMENTS, FOR MORE INFO ABOUT THE SITE, (DO NOT CHANGE THESE DETAILS), NK Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: S/CB/51 Permit Version: 2	Receiving Water: VARIES WITH OUTLET Status: REVISED BY NOTICE, AT DIRECTION OF SEC. OF STATE - 37(2) Issue date: 02/07/1993 Effective Date: 02-Jul-1993 Revocation Date: 24/01/1995
4A	471	NE	409420 416660	Address: UNDEFINED SITE, SEE OUTLET NGR OR COMMENTS, FOR MORE INFO ABOUT THE SITE, (DO NOT CHANGE THESE DETAILS), NK Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: S/CB/51 Permit Version: 1	Receiving Water: VARIES WITH OUTLET Status: TRANSFERRED FROM R(PP)A 1951-1961 Issue date: 27/05/1963 Effective Date: 27-May-1963 Revocation Date: 01/07/1993

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

0

Database searched and no data found.

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

0

Database searched and no data found.

2.2 Dangerous or Hazardous Sites

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

Database searched and no data found.

2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents

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

0

Database searched and no data found.

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

0

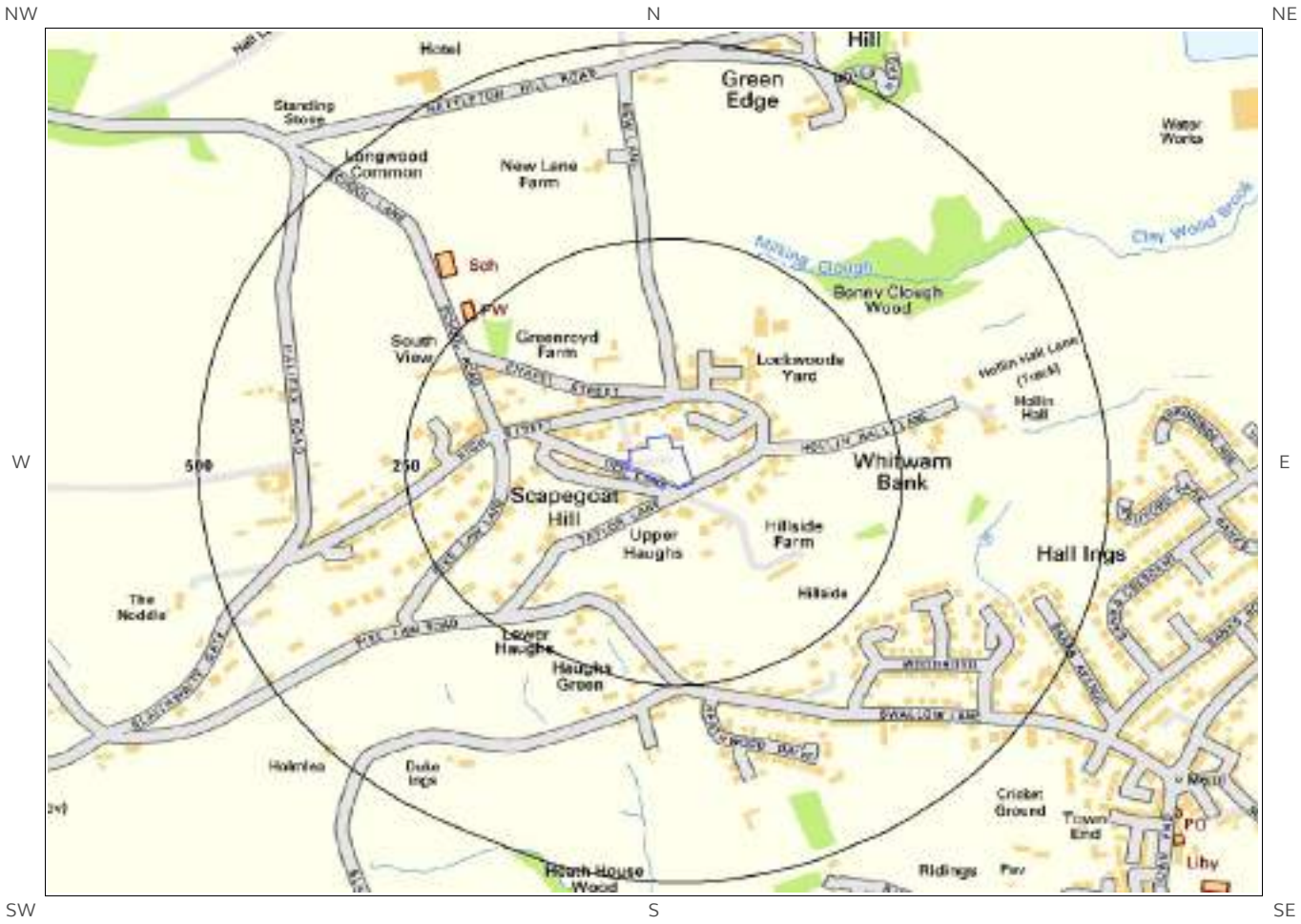
Database searched and no data found.

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

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

Database searched and no data found.

3. Landfill and Other Waste Sites Map



Site Outline

250
500
Search Buffers (m)

EA/NRW Active Landfill

EA/NRW Historic Landfill

BGS / DoE Survey Landfill

Historic and Planned Waste Sites

EA/NRW Licensed Waste Site

Local Authority/Historical Mapping Landfill Records

3. Landfill and Other Waste Sites

3.1 Landfill Sites

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

0

Database searched and no data found.

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

2

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

ID	Distance (m)	Direction	NGR	Details	
Not shown	1039	E	410000 416700	Site Address: Land at Leymoor Dyeworks, Parkwood Road, Leymoor, Huddersfield Waste Licence: Yes Site Reference: 4700/0122 Waste Type: Inert, Industrial, Commercial Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 27-Sep-1979 Licence Surrendered: 25-Apr-1994 Licence Holder Address: Parkwood Mills, Longwood, Huddersfield Operator: - Licence Holder: The Parkwood Mills Company Limited First Recorded: 01-Jan-1970 Last Recorded: 31-Dec-1992
Not shown	1135	W	407600 416200	Site Address: Rockingstone Quarry, Wholestone Moor, Golcar, Huddersfield Waste Licence: Yes Site Reference: 48, NE4654 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: YQ1/L/JOH001	Licence Issue: 03-Aug-1977 Licence Surrendered: 13-Oct-2000 Licence Holder Address: Crossland Hill, Huddersfield, West Yorkshire Operator: - Licence Holder: Johnsons Wellfield Quarries Limited First Recorded: 31-Dec-1900 Last Recorded: -

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

0

Database searched and no data found.

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

4

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

ID	Distance (m)	Direction	NGR	Site Address	Source	Data Type
Not shown	682	S	408992 415651	Refuse Tip	1961 mapping	Polygon
Not shown	975	NE	409934 416793	Refuse Tip	1961 mapping	Polygon
Not shown	976	SW	408256 415668	Refuse Tip	1961 mapping	Polygon
Not shown	1023	NE	409986 416810	Refuse Tip	1961 mapping	Polygon

3.2 Other Waste Sites

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

0

Database searched and no data found.

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

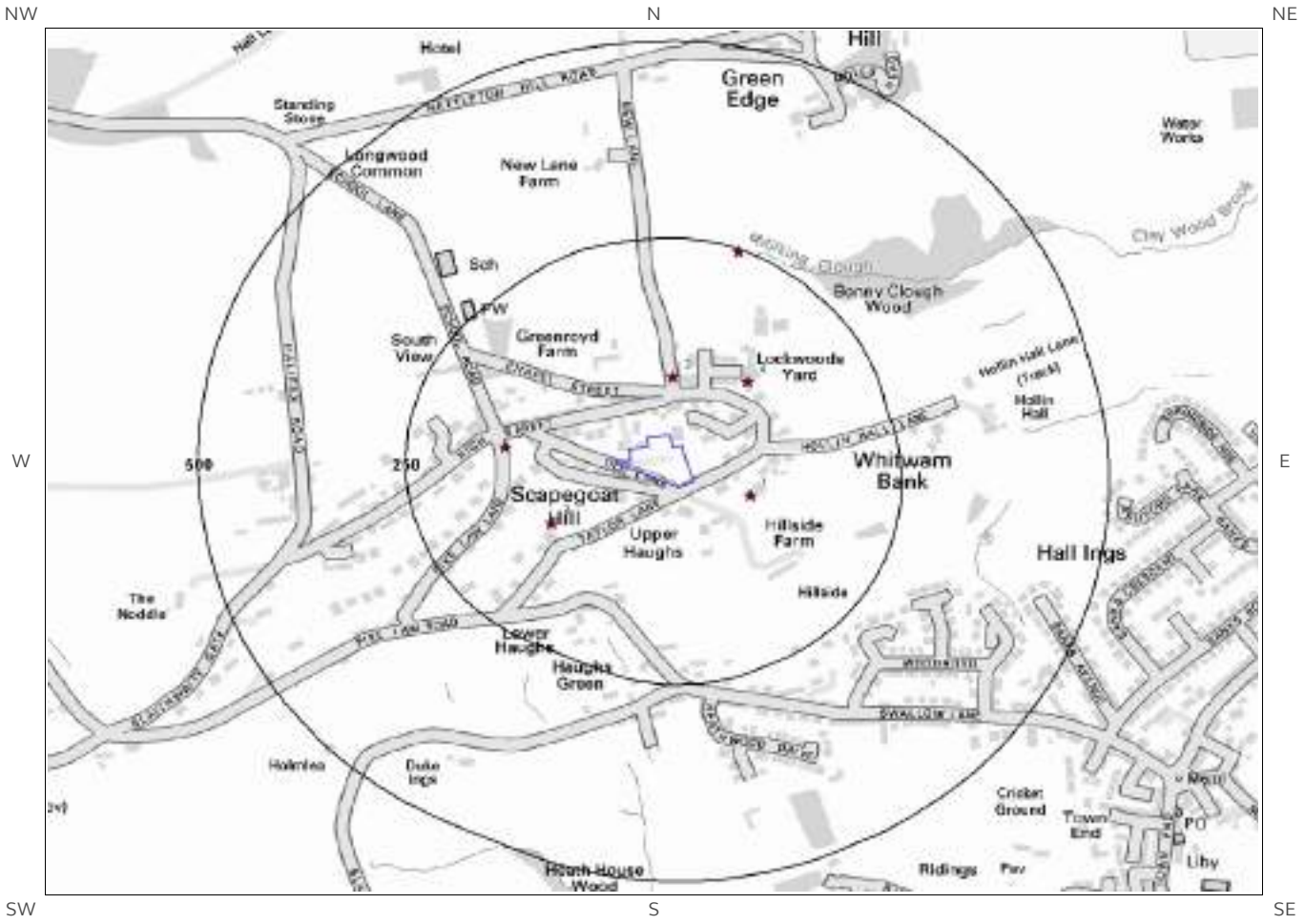
3

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

ID	Distance (m)	Direction	NGR	Details	
Not shown	982	SW	408555 415473	Site Address: 33, Bolster Moor Road, Bolster Moor, Huddersfield, West Yorkshire, HD7 4JU Type: Incinerator Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: HEA008 EPR reference: EA/EPR/SP3396ZL/A001 Operator: Mr Christopher Haigh / Mrs Jeanette Alison Haigh Waste Management licence No: 65536 Annual Tonnage: 438.0	Issue Date: 28/08/2007 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Expired Site Name: Heaven Scent Correspondence Address: 33, Bolster Moor Road, Bolster Moor, Huddersfield, West Yorkshire, HD7

ID	Distance (m)	Direction	NGR	Details	
Not shown	1459	W	407500 416200	Site Address: Wholestone Moor, Golcar, Huddersfield, X99 9XX Type: Landfill taking Non-Biodegradeable Wastes Size: Unknown Environmental Permitting Regulations (Waste) Licence Number: JOH001 EPR reference: - Operator: Johnsons Wellfield Quarries Limited Waste Management licence No: 60987 Annual Tonnage: 0.0	Issue Date: 03/08/1977 Effective Date: - Modified: - Surrendered Date: 13/10/2000 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Rockingstone Quarry Correspondence Address: Crossland Hill, Huddersfield, W Yorks, HD4 7AB
Not shown	1459	W	407500 416200	Site Address: Wholestone Moor, Golcar, Huddersfield, West Yorkshire, X99 9XX Type: Landfill taking Non-Biodegradeable Wastes Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: JOH001 EPR reference: EA/EPR/UP3095ZY/S002 Operator: Johnsons Wellfield Quarries Limited Waste Management licence No: 60987 Annual Tonnage: 150000.0	Issue Date: 03/08/1977 Effective Date: - Modified: - Surrendered Date: 13/10/2000 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Rockingstone Quarry Correspondence Address: Wholestone Moor, Golcar, Huddersfield, West Yorkshire, X99

4. Current Land Use Map



Site Outline

Search Buffers (m)

250

500

Current Industrial Sites

Petrol & Fuel Sites

Electricity Transmission Cables

Gas Transmission Pipelines

4. Current Land Uses

4.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site: 6

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

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1	70	E	Scapetech Ltd	409114 416330	48, Taylor Lane, Golcar, Huddersfield, HD7 4PQ	Civil Engineers	Engineering Services
2	74	N	Rayson UK	409020 416480	16, High Street, Golcar, Huddersfield, HD7 4NJ	Agricultural Machinery and Goods	Industrial Products
3	107	SW	Pennine Labelling Solutions Ltd	408874 416294	7a, Taylor Lane, Golcar, Huddersfield, HD7 4PQ	Office and Shop Equipment	Industrial Products
4	113	NE	Eric Townend Farm Machinery	409110 416474	3, Lockwoods Yard, Golcar, Huddersfield, HD7 4PE	Agricultural Machinery and Goods	Industrial Products
5	132	W	Electricity Sub Station	408819 416392	HD7	Electrical Features	Infrastructure and Facilities
6	248	N	Spoil Heap	409100 416640	HD7	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: 0

Database searched and no data found.

4.3 National Grid High Voltage Underground Electricity Transmission Cables

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

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

Database searched and no data found.

4.4 National Grid High Pressure Gas Transmission Pipelines

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

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

Database searched and no data found.

5. Geology

5.1 Artificial Ground and Made Ground

Database searched and no data found.

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

5.2 Superficial Ground and Drift Geology

Database searched and no data found.

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

5.3 Bedrock and Solid Geology

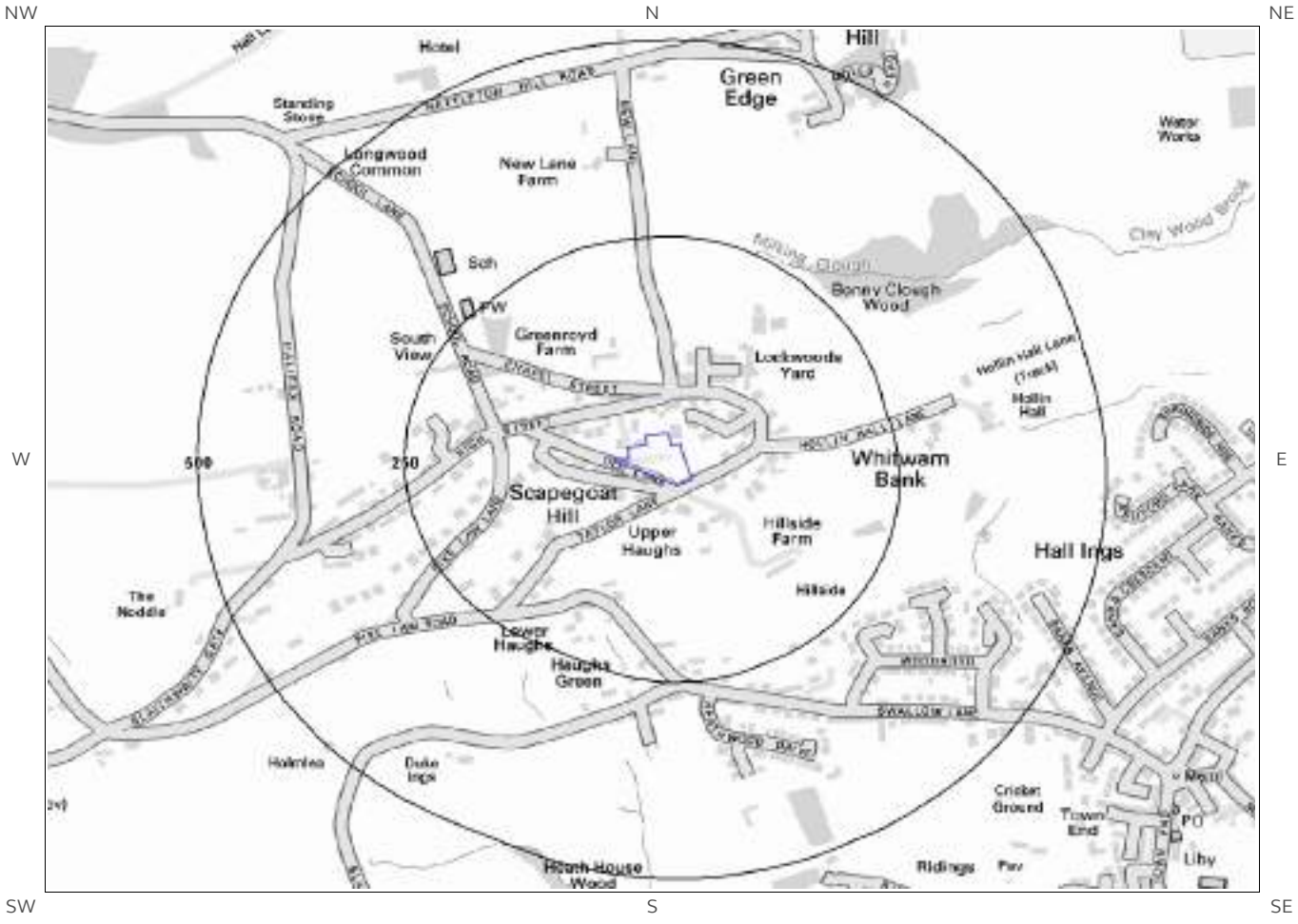
The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
ROSSE-MDSI	ROSSENDALE FORMATION	MUDSTONE AND SILTSTONE
RF-SDST	ROUGH ROCK FLAGS	SANDSTONE
RR-SDST	ROUGH ROCK	SANDSTONE

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

6 Hydrogeology and Hydrology

6a. Aquifer Within Superficial Geology



Site Outline

250
500
Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

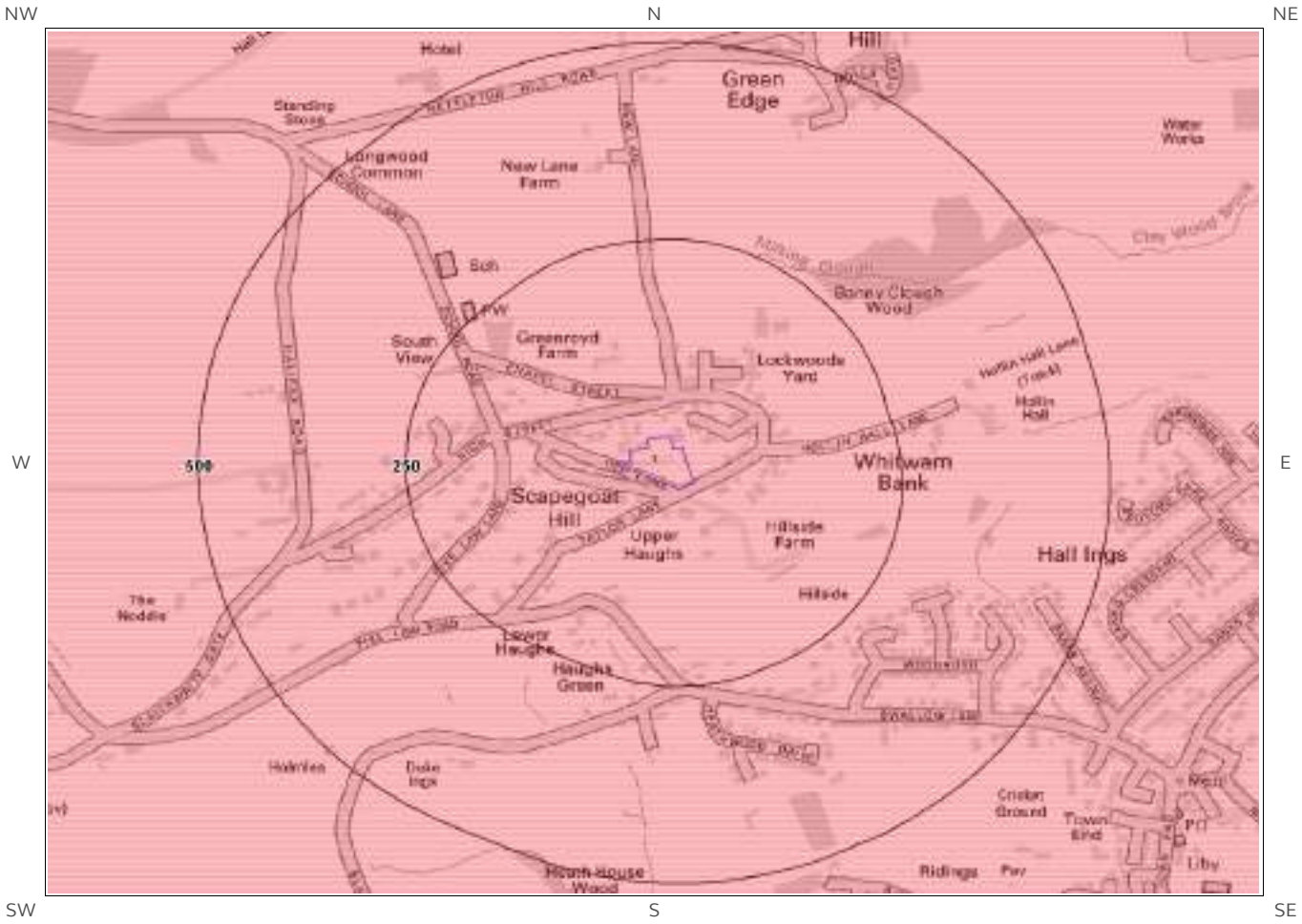
Secondary (B) Aquifer - Lower Permeability Layers

Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

6b. Aquifer Within Bedrock Geology and Abstraction Licenses



Site Outline

250
500
Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

Secondary (B) Aquifer - Lower Permeability Layers

Groundwater Abstraction Licence

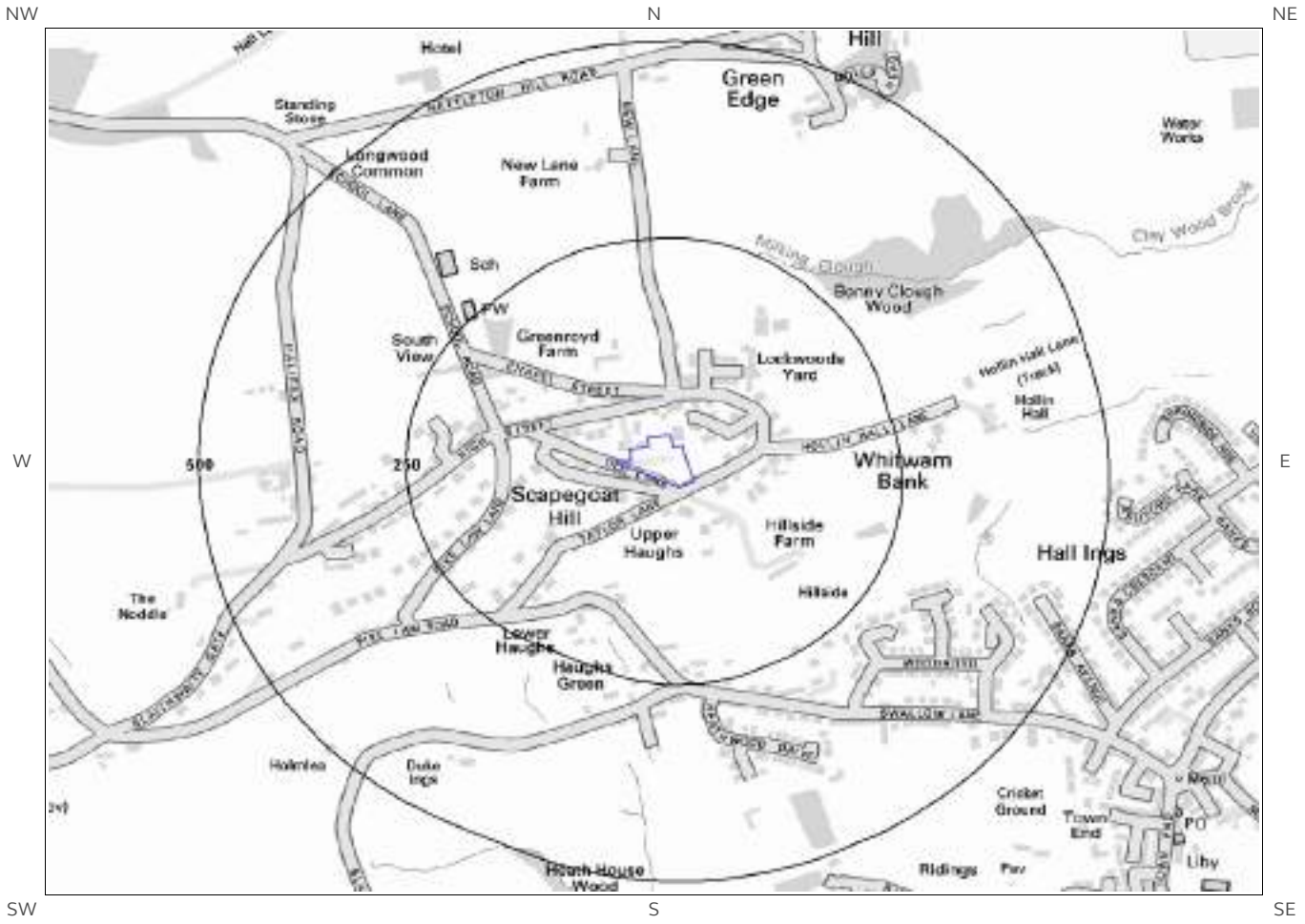
Secondary Aquifer - Undifferentiated Layers

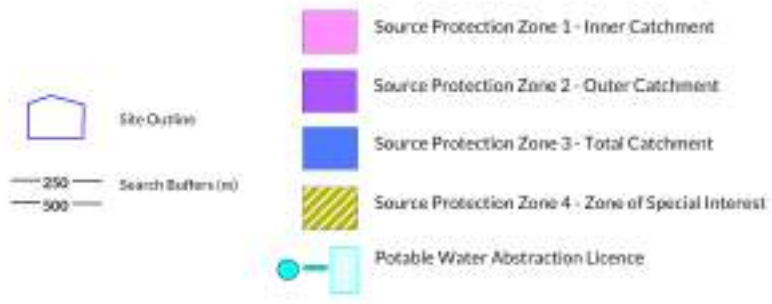
Unproductive

Unknown (lakes and landslip)

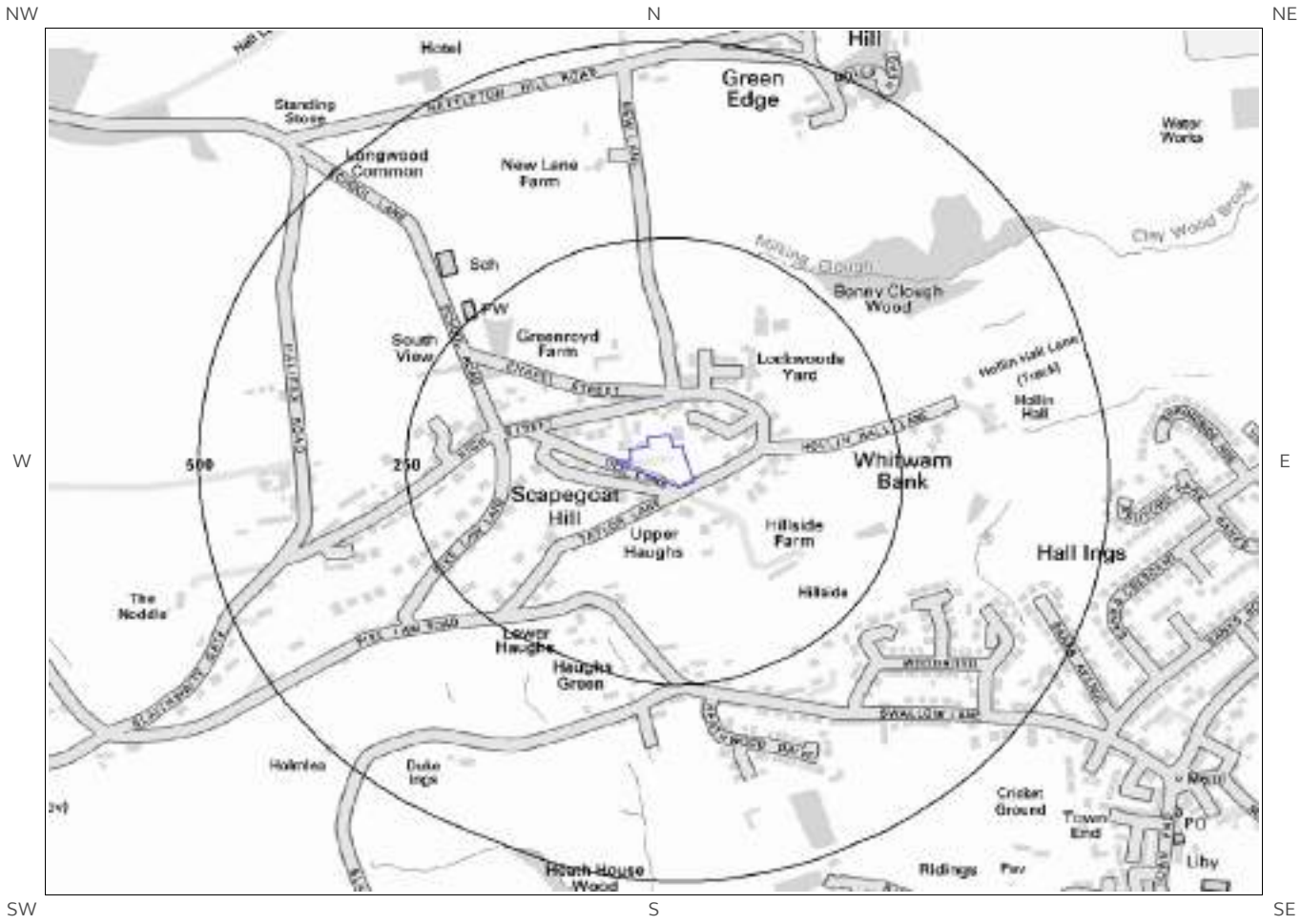
Surface Water Abstraction Licence

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





6d. Hydrogeology – Source Protection Zones within confined aquifer



Site Outline

250
500
Search Buffers (m)

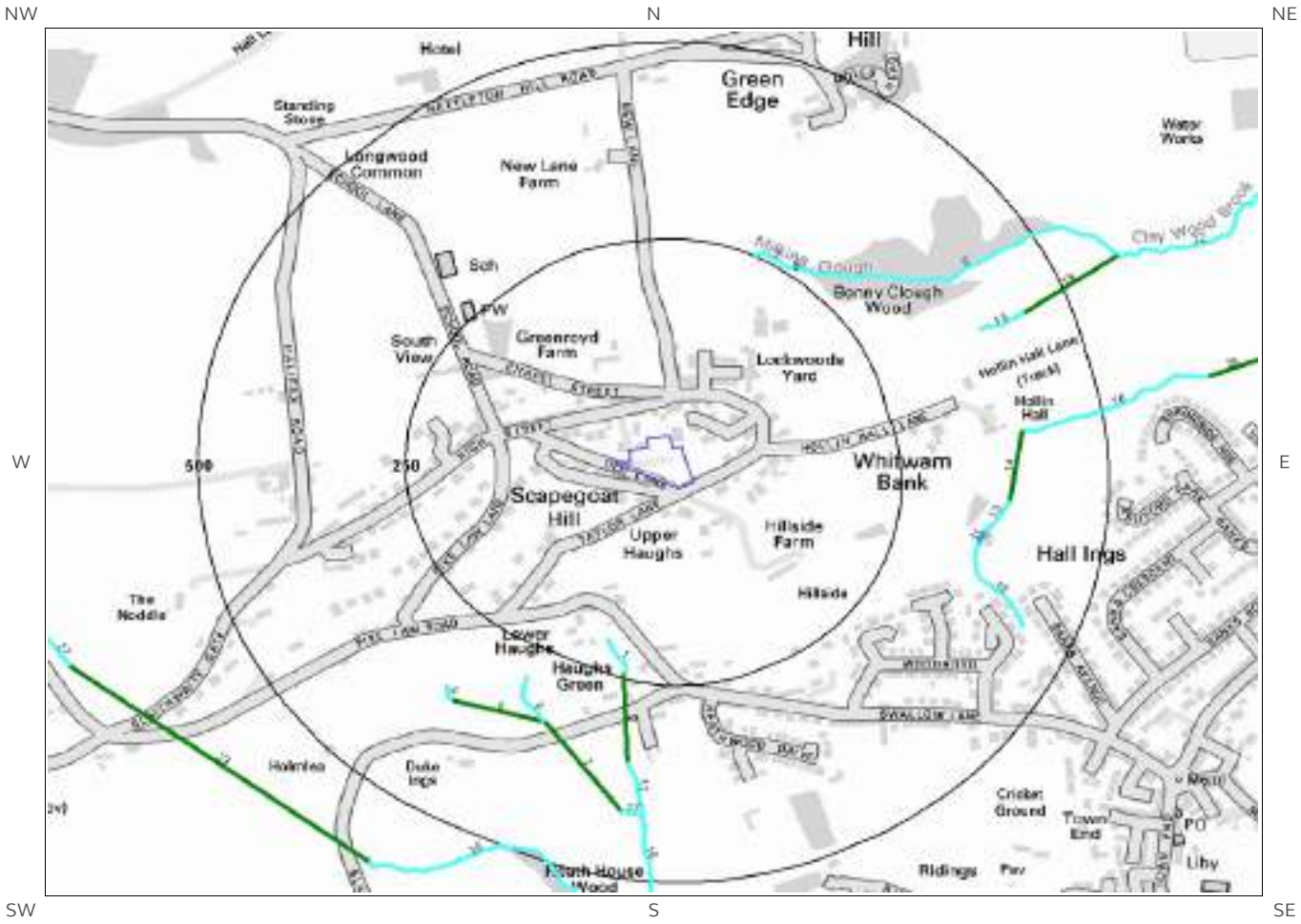
Source Protection Zone 1 - Inner Catchment

Source Protection Zone 2C - Outer Catchment within Confined Aquifer

Source Protection Zone 3C - Total Catchment within Confined Aquifer

Potable Water Abstraction Licence

6e. Hydrology – Detailed River Network and River Quality



6.Hydrogeology and Hydrology

6.1 Aquifer within Superficial Deposits

Records of strata classification within the superficial geology at or in proximity to the property No

Database searched and no data found.

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.

6.2 Aquifer within Bedrock Deposits

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

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

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

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

6.3 Groundwater Abstraction Licences

Groundwater Abstraction Licences within 2000m of the study site Identified

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

ID	Distance (m)	Direction	NGR	Details	
Not shown	1182	NE	410100 416900	Status: Historical Licence No: 2/27/11/117 Details: General Farming & Domestic Direct Source: Groundwaters Point: Spring Data Type: Point Name: SHEARD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 1444 Original Start Date: 28/4/1966 Expiry Date: - Issue No: 100 Version Start Date: 28/4/1966 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1182	NE	410100 416900	Status: Historical Licence No: 2/27/11/117 Details: General Farming & Domestic Direct Source: Groundwaters Point: Spring - Longwood Data Type: Point Name: SHEARD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 01444 Original Start Date: 28/4/1966 Expiry Date: - Issue No: 100 Version Start Date: 28/4/1966 Version End Date:
Not shown	1230	NW	408421 417494	Status: Active Licence No: NE/027/0011/003 Details: Spray Irrigation - Direct Direct Source: Groundwaters Point: Borehole - Millstone Grit - Huddersfield Data Type: Point Name: OUTLANE GOLF CLUB LTD	Annual Volume (m^3): 6750 Max Daily Volume (m^3): 45 Original Application No: NPSWR004044 Original Start Date: 23/8/2010 Expiry Date: 31/3/2027 Issue No: 1 Version Start Date: 23/8/2010 Version End Date:
Not shown	1245	NW	408400 417500	Status: Historical Licence No: 2/27/11/185 Details: Spray Irrigation - Direct Direct Source: Groundwaters Point: Borehole - Outlane Golf Club - Millstone Grit Data Type: Point Name: OUTLANE GOLF CLUB LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 06946 Original Start Date: 3/4/2000 Expiry Date: 31/10/2009 Issue No: 1 Version Start Date: 3/4/2000 Version End Date:
Not shown	1245	NW	408400 417500	Status: Historical Licence No: 2/27/11/185 Details: Spray Irrigation - Direct Direct Source: Groundwaters Point: Borehole - Millstone Grit - Huddersfield Data Type: Point Name: OUTLANE GOLF CLUB LTD	Annual Volume (m^3): 6750 Max Daily Volume (m^3): 45 Original Application No: 6946 Original Start Date: 3/4/2000 Expiry Date: 31/10/2009 Issue No: 1 Version Start Date: 3/4/2000 Version End Date:
Not shown	1759	SE	409740 414730	Status: Historical Licence No: 2/27/11/191 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Groundwaters Point: Borehole-coal Measures-titanic Mills-linthwaite Data Type: Point Name: LOWRY HOMES PLC	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 08137 Original Start Date: 12/3/2005 Expiry Date: 31/12/2010 Issue No: 1 Version Start Date: 12/3/2005 Version End Date:
Not shown	1759	SE	409740 414730	Status: Historical Licence No: 2/27/11/191 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Groundwaters Point: Borehole-millstone Grit-titanic Mills-linthwaite Data Type: Point Name: LOWRY HOMES PLC	Annual Volume (m^3): 54000 Max Daily Volume (m^3): 150 Original Application No: 8137 Original Start Date: 12/3/2005 Expiry Date: 31/12/2010 Issue No: 2 Version Start Date: 8/2/2008 Version End Date:
Not shown	1759	SE	409740 414730	Status: Active Licence No: NE/027/0011/007 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Groundwaters Point: Borehole-millstone Grit-titanic Mills-linthwaite Data Type: Point Name: PROPERTY RENAISSANCE LTD	Annual Volume (m^3): 43070 Max Daily Volume (m^3): 118 Original Application No: NPS/WR/005539 Original Start Date: 21/2/2011 Expiry Date: 31/3/2027 Issue No: 1 Version Start Date: 21/2/2011 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1853	S	408800 414500	Status: Historical Licence No: 2/27/11/019 Details: General Farming & Domestic Direct Source: Groundwaters Point: Borehole-millstone Grit-golcar Data Type: Point Name: P & R WHITWAM	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 01740 Original Start Date: 14/12/1965 Expiry Date: - Issue No: 101 Version Start Date: 30/6/2000 Version End Date:
Not shown	1902	SE	409800 414600	Status: Historical Licence No: 2/27/11/045 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Groundwaters Point: Borehole - Millstone Grit - Linthwaite Data Type: Point Name: JAMES DYSON LTD	Annual Volume (m^3): 175000 Max Daily Volume (m^3): 650 Original Application No: 3193 Original Start Date: 20/1/1966 Expiry Date: - Issue No: 101 Version Start Date: 17/1/2002 Version End Date:
Not shown	1955	SE	410100 414700	Status: Historical Licence No: 2/27/11/057 Details: General Farming & Domestic Direct Source: Groundwaters Point: Springs Data Type: Point Name: ROBERTS	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 00891 Original Start Date: 27/1/1966 Expiry Date: - Issue No: 100 Version Start Date: 27/1/1966 Version End Date:

6.4 Surface Water Abstraction Licences

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

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

ID	Distance (m)	Direction	NGR	Details	
Not shown	903	NE	409700 417000	Status: Historical Licence No: 2/27/11/066 Details: Potable Water Supply - Direct Direct Source: Surface Water Point: Longwood Upper And Lower Reservoirs Data Type: Line Name: YORKSHIRE WATER SERVICES LTD	Annual Volume (m^3): 818297.12 Max Daily Volume (m^3): 2241.91 Application No: 2249 Original Start Date: 27/1/1966 Expiry Date: - Issue No: 100 Version Start Date: 27/1/1966 Version End Date:
Not shown	1050	NE	410000 416800	Status: Historical Licence No: 2/27/11/123 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Surface Water Point: Claywood Brook Data Type: Point Name: PARKWOOD MILLS CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: 158902 Original Start Date: 26/5/1966 Expiry Date: - Issue No: 100 Version Start Date: 26/5/1966 Version End Date:
Not shown	1397	E	410330 416910	Status: Historical Licence No: 2/27/11/123 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Surface Water Point: Clay Wood Brook-parkwood Road-longwood Data Type: Point Name: PARKWOOD MILLS CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: 0158902 Original Start Date: 26/5/1966 Expiry Date: - Issue No: 102 Version Start Date: 30/8/2002 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1450	SW	407625 415781	Status: Active Licence No: NE/027/0011/015 Details: Hydroelectric Power Generation Direct Source: Surface Water Point: Crimble Clough At Waller Clough, Huddersfield Data Type: Point Name: Garside	Annual Volume (m^3): 145152 Max Daily Volume (m^3): 484 Application No: NPS/WR/012798 Original Start Date: 18/7/2013 Expiry Date: 31/3/2027 Issue No: 1 Version Start Date: 18/7/2013 Version End Date:
Not shown	1458	E	410400 416900	Status: Historical Licence No: 2/27/11/115 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Surface Water Point: Clay Wood Brook/oakscar Reservoir Data Type: Point Name: PARKWOOD MILLS CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: 01588 Original Start Date: 28/4/1966 Expiry Date: - Issue No: 101 Version Start Date: 22/4/2002 Version End Date:
Not shown	1680	S	409400 414700	Status: Historical Licence No: 2/27/11/013 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Surface Water Point: Spring-linthwaite-huddersfield Data Type: Point Name: COLNE VALLEY SPINNING CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: 01622 Original Start Date: 14/12/1965 Expiry Date: - Issue No: 101 Version Start Date: 16/7/2002 Version End Date:
Not shown	1699	SE	410200 415100	Status: Historical Licence No: 2/27/11/042 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Surface Water Point: River Colne - Linthwaite Data Type: Point Name: HARTFORD HOLDINGS LTD	Annual Volume (m^3): 31822 Max Daily Volume (m^3): 159.11 Application No: 3842 Original Start Date: 20/1/1966 Expiry Date: - Issue No: 100 Version Start Date: 17/5/1989 Version End Date:
Not shown	1699	SE	410200 415100	Status: Historical Licence No: 2/27/11/042 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Surface Water Point: River Colne Data Type: Point Name: HARTFORD HOLDINGS LTD	Annual Volume (m^3): 31822 Max Daily Volume (m^3): 159.11 Application No: 3842 Original Start Date: 20/1/1966 Expiry Date: - Issue No: 100 Version Start Date: 17/5/1989 Version End Date:
Not shown	1699	SE	410200 415100	Status: Active Licence No: 2/27/11/042 Details: Process Water Direct Source: Surface Water Point: River Colne - Linthwaite Data Type: Point Name: HARTFORD HOLDINGS LTD	Annual Volume (m^3): 31822 Max Daily Volume (m^3): 159.11 Application No: 3842 Original Start Date: 20/1/1966 Expiry Date: - Issue No: 100 Version Start Date: 17/5/1989 Version End Date:
Not shown	1711	SE	410400 415300	Status: Active Licence No: 2/27/11/006 Details: Process Water Direct Source: Surface Water Point: River Colne Data Type: Point Name: HARTFORD HOLDINGS LTD	Annual Volume (m^3): 30117 Max Daily Volume (m^3): 146.38 Application No: 475 Original Start Date: 1/12/1965 Expiry Date: - Issue No: 100 Version Start Date: 17/3/1989 Version End Date:
Not shown	1711	SE	410400 415300	Status: Historical Licence No: 2/27/11/006 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Surface Water Point: River Colne Data Type: Point Name: HARTFORD HOLDINGS LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: 475 Original Start Date: 1/12/1965 Expiry Date: - Issue No: 100 Version Start Date: 17/3/1989 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1711	SE	410400 415300	Status: Historical Licence No: 2/27/11/006 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Surface Water Point: River Colne Data Type: Point Name: HARTFORD HOLDINGS LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: 00475 Original Start Date: 1/12/1965 Expiry Date: - Issue No: 100 Version Start Date: 17/3/1989 Version End Date:
Not shown	1711	SE	410400 415300	Status: Active Licence No: 2/27/11/006 Details: Boiler Feed Direct Source: Surface Water Point: River Colne Data Type: Point Name: HARTFORD HOLDINGS LTD	Annual Volume (m^3): 30117 Max Daily Volume (m^3): 146.38 Application No: 475 Original Start Date: 1/12/1965 Expiry Date: - Issue No: 100 Version Start Date: 17/3/1989 Version End Date:
Not shown	1830	S	409600 414600	Status: Historical Licence No: 2/27/11/013 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Surface Water Point: River Colne Data Type: Point Name: COLNE VALLEY SPINNING CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: 1622 Original Start Date: 14/12/1965 Expiry Date: - Issue No: 100 Version Start Date: 14/12/1965 Version End Date:
Not shown	1830	S	409600 414600	Status: Active Licence No: 2/27/11/013(A) Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Surface Water Point: River Colne-linthwaite Data Type: Point Name: PROPERTY RENAISSANCE LTD	Annual Volume (m^3): 9092 Max Daily Volume (m^3): 45.45 Application No: 1622(A) Original Start Date: 16/7/2002 Expiry Date: - Issue No: 1 Version Start Date: 1/4/2008 Version End Date:
Not shown	1830	S	409600 414600	Status: Historical Licence No: 2/27/11/013 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Surface Water Point: River Colne Data Type: Point Name: COLNE VALLEY SPINNING CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: 1622 Original Start Date: 14/12/1965 Expiry Date: - Issue No: 100 Version Start Date: 14/12/1965 Version End Date:
Not shown	1830	S	409600 414600	Status: Historical Licence No: 2/27/11/013 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Surface Water Point: River Colne-linthwaite Data Type: Point Name: COLNE VALLEY SPINNING CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: 1622 Original Start Date: 14/12/1965 Expiry Date: - Issue No: 100 Version Start Date: 14/12/1965 Version End Date:
Not shown	1830	S	409600 414600	Status: Historical Licence No: 2/27/11/013 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Surface Water Point: River Colne-linthwaite Data Type: Point Name: COLNE VALLEY SPINNING CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: 1622 Original Start Date: 14/12/1965 Expiry Date: - Issue No: 100 Version Start Date: 14/12/1965 Version End Date:
Not shown	1847	S	409200 414500	Status: Historical Licence No: 2/27/11/111 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Surface Water Point: River Colne-westwood Mills-linthwaite Data Type: Point Name: MICHAEL WILSON RESTORATIONS	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: 00651 Original Start Date: 28/4/1966 Expiry Date: - Issue No: 101 Version Start Date: 10/12/2002 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1943	S	408900 414400	Status: Historical Licence No: 2/27/11/011 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Household Direct Source: Surface Water Point: River Colne Data Type: Point Name: COLLINS & PRESTWICH & CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: 00456 Original Start Date: 14/12/1965 Expiry Date: - Issue No: 100 Version Start Date: 14/12/1965 Version End Date:
Not shown	1958	S	409700 414500	Status: Historical Licence No: 2/27/11/111 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Surface Water Point: River Colne - Linthwaite Data Type: Point Name: MICKMAN	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: 00651 Original Start Date: 28/4/1966 Expiry Date: - Issue No: 100 Version Start Date: 1/1/1991 Version End Date:
Not shown	1958	S	409700 414500	Status: Historical Licence No: 2/27/11/111 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Surface Water Point: River Colne Data Type: Point Name: MICKMAN	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: 651 Original Start Date: 28/4/1966 Expiry Date: - Issue No: 100 Version Start Date: 1/1/1991 Version End Date:

6.5 Potable Water Abstraction Licences

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

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

ID	Distance (m)	Direction	NGR	Details	
Not shown	903	NE	409700 417000	Status: Historical Licence No: 2/27/11/066 Details: Potable Water Supply - Direct Direct Source: Surface Water Point: Longwood Upper And Lower Reservoirs Data Type: Line Name: YORKSHIRE WATER SERVICES LTD	Annual Volume (m^3): 818297.12 Max Daily Volume (m^3): 2241.91 Original Application No: 2249 Original Start Date: 27/1/1966 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:
Not shown	1680	S	409400 414700	Status: Historical Licence No: 2/27/11/013 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Surface Water Point: Spring-linthwaite-huddersfield Data Type: Point Name: COLNE VALLEY SPINNING CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 01622 Original Start Date: 14/12/1965 Expiry Date: - Issue No: 101 Version Start Date: Version End Date:
Not shown	1759	SE	409740 414730	Status: Historical Licence No: 2/27/11/191 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Groundwaters Point: Borehole-millstone Grit-titanic Mills-linthwaite Data Type: Point Name: LOWRY HOMES PLC	Annual Volume (m^3): 54000 Max Daily Volume (m^3): 150 Original Application No: 8137 Original Start Date: 12/3/2005 Expiry Date: 31/12/2010 Issue No: 2 Version Start Date: Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1759	SE	409740 414730	Status: Active Licence No: NE/027/0011/007 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Groundwaters Point: Borehole-millstone Grit-titanic Mills-linthwaite Data Type: Point Name: PROPERTY RENAISSANCE LTD	Annual Volume (m^3): 43070 Max Daily Volume (m^3): 118 Original Application No: NPS/WR/005539 Original Start Date: 21/2/2011 Expiry Date: 31/3/2027 Issue No: 1 Version Start Date: Version End Date:
Not shown	1759	SE	409740 414730	Status: Historical Licence No: 2/27/11/191 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Groundwaters Point: Borehole-coal Measures-titanic Mills-linthwaite Data Type: Point Name: LOWRY HOMES PLC	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 08137 Original Start Date: 12/3/2005 Expiry Date: 31/12/2010 Issue No: 1 Version Start Date: Version End Date:
Not shown	1830	S	409600 414600	Status: Historical Licence No: 2/27/11/013 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Surface Water Point: River Colne-linthwaite Data Type: Point Name: COLNE VALLEY SPINNING CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 1622 Original Start Date: 14/12/1965 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:
Not shown	1830	S	409600 414600	Status: Historical Licence No: 2/27/11/013 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Surface Water Point: River Colne Data Type: Point Name: COLNE VALLEY SPINNING CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 1622 Original Start Date: 14/12/1965 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:
Not shown	1943	S	408900 414400	Status: Historical Licence No: 2/27/11/011 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Household Direct Source: Surface Water Point: River Colne Data Type: Point Name: COLLINS & PRESTWICH & CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 00456 Original Start Date: 14/12/1965 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:

6.6 Source Protection Zones

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

Database searched and no data found.

6.7 Source Protection Zones within Confined Aquifer

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

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

Database searched and no data found.

6.8 Groundwater Vulnerability and Soil Leaching Potential

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

Distance (m)	Direction	Classification	Soil Vulnerability Category	Description
0	On Site	Minor Aquifer/High Leaching Potential	H3	Coarse textured or moderately shallow soils which readily transmit non-adsorbed pollutants and liquid discharges but have some ability to attenuate adsorbed pollutants because of their clay or organic matter content.
273	SE	Minor Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.

6.9 River Quality

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

6.9.1 Biological Quality:

Database searched and no data found.

6.9.2 Chemical Quality:

Database searched and no data found.

6.10 Detailed River Network

Detailed River Network entries within 500m of the study site — Identified

The following Detailed River Network records are represented on the Hydrology Map (6e):

ID	Distance (m)	Direction	Details	
1	209	SW	River Name: - Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
2	244	S	River Name: - Welsh River Name: - Alternative Name: -	River Type: Culvert Main River Status: Currently Undefined
3	250	NE	River Name: Clay Wood Brook Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
4	259	NE	River Name: Clay Wood Brook Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
5	262	NE	River Name: Clay Wood Brook Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
6	289	SW	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
7	335	SW	River Name: - Welsh River Name: - Alternative Name: -	River Type: Culvert Main River Status: Currently Undefined
8	335	SW	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Culvert Main River Status: Currently Undefined
9	346	SW	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
10	350	E	River Name: - Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
11	351	E	River Name: - Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
12	353	S	River Name: - Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
13	356	E	River Name: - Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
14	381	E	River Name: - Welsh River Name: - Alternative Name: -	River Type: Culvert Main River Status: Currently Undefined
15	388	E	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
16	401	E	River Name: - Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
17	415	S	River Name: - Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined

ID	Distance (m)	Direction	Details	
18	420	S	River Name: - Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
19	445	E	River Name: - Welsh River Name: - Alternative Name: -	River Type: Culvert Main River Status: Currently Undefined
20	492	S	River Name: - Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined

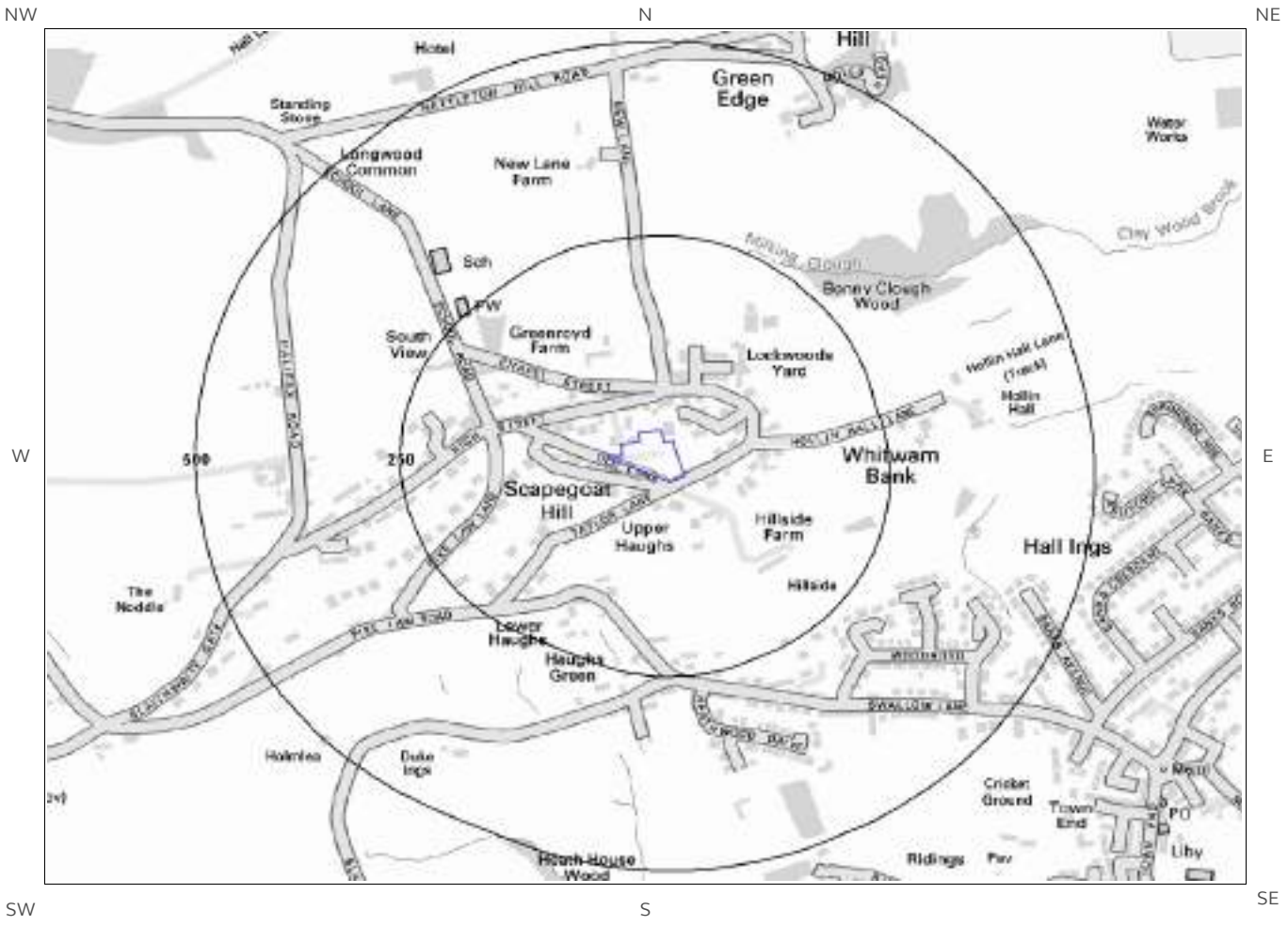
6.11 Surface Water Features

Surface water features within 250m of the study site Identified

The following surface water records are not represented on mapping:

Distance (m)	Direction
209	SW
250	NE

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



Site Outline

100
250
Search Buffers (m)

Zone 2 Floodplain

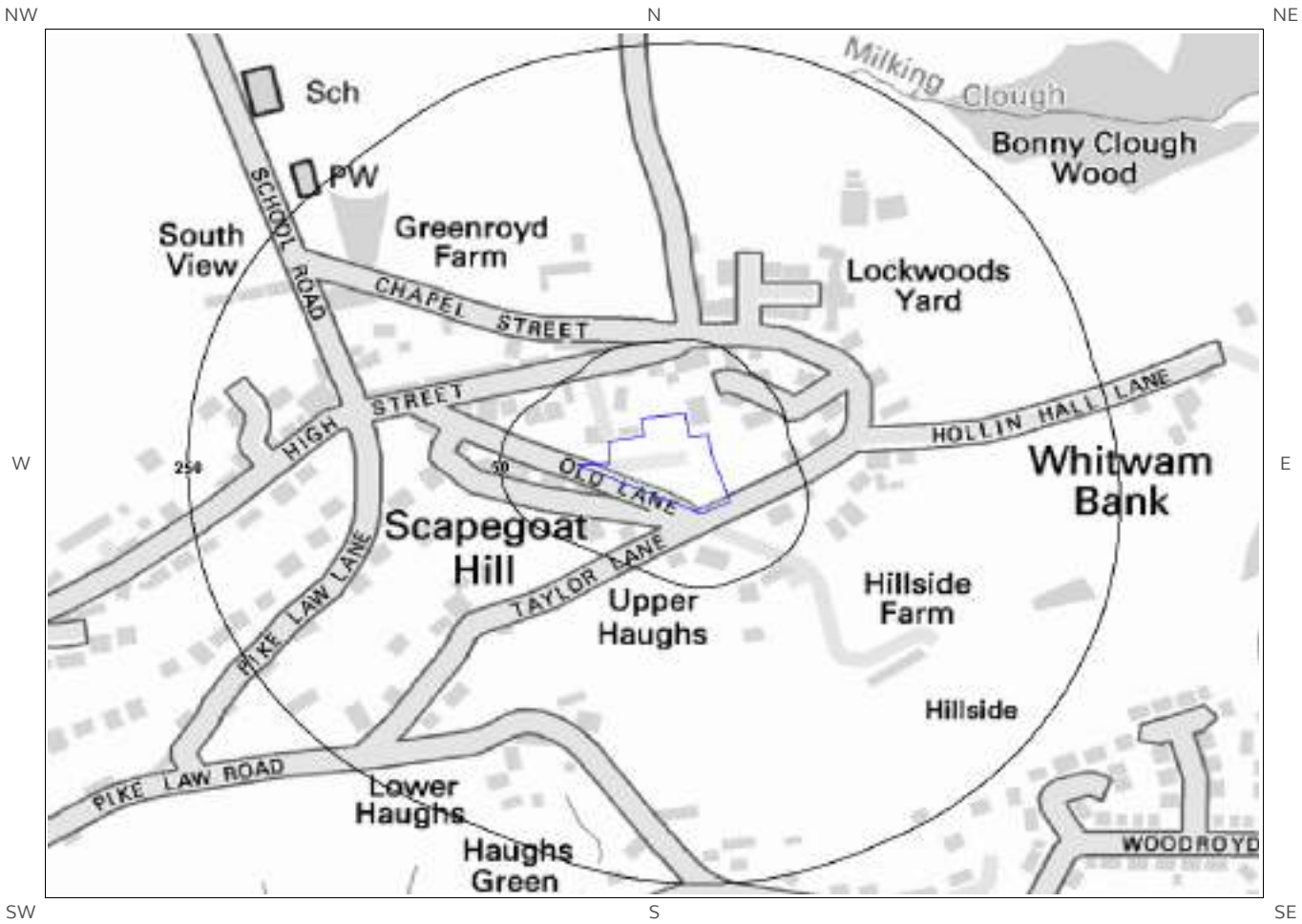
Zone 3 Floodplain

Flood Defences

Area used for Flood Storage

Area Benefiting from Flood Defences

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



Site Outline

100
250
Search Buffers (m)

RoFRaS Rating

- Very Low
- Low
- Medium
- High

7 Flooding

7.1 River and Coastal Zone 2 Flooding

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

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

Database searched and no data found.

7.2 River and Coastal Zone 3 Flooding

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

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

Database searched and no data found.

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

Highest risk of flooding onsite — Very Low

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

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

7.4 Flood Defences

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

Database searched and no data found.

7.5 Areas benefiting from Flood Defences

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

7.6 Areas benefiting from Flood Storage

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

7.7 Groundwater Flooding Susceptibility Areas

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

	Identified
Clearwater Flooding or Superficial Deposits Flooding	Clearwater Flooding

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

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

Limited potential

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

7.8 Groundwater Flooding Confidence Areas

British Geological Survey confidence rating in this result	Low

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

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

8. Designated Environmentally Sensitive Sites Map

Site Outline

100
250
Search Buffers (m)

AONB

National Park

SSSI

Special Protection Areas

Nitrate Vulnerable Zones

Green Belt

Environmentally Sensitive Areas

Special Areas of Conservation

World Heritage Sites

Nitrate Sensitive Areas

Ancient Woodland

National Nature Reserve

Local Nature Reserves

Ramsar Sites

8. Designated Environmentally Sensitive Sites

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:

0

Database searched and no data found.

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

0

Database searched and no data found.

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

0

Database searched and no data found.

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

0

Database searched and no data found.

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

0

Database searched and no data found.

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

3

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

ID	Distance (m)	Direction	Ancient Woodland Name	Data Source
Not shown	1091	N	UNKNOWN	Ancient Replanted Woodland
Not shown	1646	NW	UNKNOWN	Ancient and Semi-Natural Woodland
Not shown	1978	W	UNKNOWN	Ancient Replanted Woodland

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

0

Database searched and no data found.

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

0

Database searched and no data found.

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

0

Database searched and no data found.

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

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:

0

Database searched and no data found.

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

4

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

ID	Distance	Direction	Green Belt Name	Local Authority Name
4	12	SE	Liverpool, Manchester and West Yorks Greenbelt	Kirklees District (B)
5	971	E	Liverpool, Manchester and West Yorks Greenbelt	Kirklees District (B)
6	1364	SE	Liverpool, Manchester and West Yorks Greenbelt	Kirklees District (B)
7	1539	NW	Liverpool, Manchester and West Yorks Greenbelt	Calderdale District (B)

9. Natural Hazards Findings

9.1 Detailed BGS GeoSure Data

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

9.1.1 Shrink Swell

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

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

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

Hazard
Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property no significant increase in insurance risk due to natural slope instability problems.

9.1.3 Soluble Rocks

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

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

Hazard
Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

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

9.1.4 Compressible Ground

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

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

Hazard
No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

9.1.5 Collapsible Rocks

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

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

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

9.1.6 Running Sand

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

Radon Affected Area assessment: The site is in a Radon Affected Area, as between 1 and 3% 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

Radon protection measures requirements for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment: No radon protective measures are necessary.

10. Mining

10.1 Coal Mining

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

Database searched and no data found.

10.2 Non-Coal Mining

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

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

Distance (m)	Direction	Name	Commodity	Assessment of likelihood
0.0	On Site	Not available	Vein Mineral	Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered

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

10.3 Brine Affected Areas

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

Contact Details

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sales@emapsite.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: Kirklees Council
Phone: 01484 221 000
Web: http://www.kirklees.gov.uk/
Address: Civic Centre 3, Market Street, Huddersfield, HD1 1WG

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

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APPENDIX C

EMAPSITE: GROUNDSURE HISTORICAL ORDANCE SURVEY PLANS

County Series 1:10,560 scale

VEGETATION

Fir Wood

Deciduous Wood

Mixed Wood

Brushwood

Orchard

Reeds

Rough Pasture

Furze

Marsh

Osiers

ROADS

Railway over Road

Road over Railway

Road over River or Canal

Level Crossing

Railway over River

Road over Stream

Sunken Road

Raised Road

RAILWAYS

Double Lines of Railway

Single Lines of Railway and Tramway

GENERAL FEATURES

Gravel Pit

Sand Pit

Quarry

Shingle

Other Pits

Antiquities, Site of

Arrow, showing direction of flow of water

Trigonometrical Station

BOUNDARIES

County Boundary

Parliamentary Division Boundary

Parish Boundary

Union Boundary

200 Contours

Rural District Boundary

National Grid 1:10,000 scale

HEIGHTS (METRES)

Values are given in metres above mean sea level at Newlyn.

Surface heights determined by: ground survey • 163m; air survey

Bench marks and their values are shown on large scale maps, and bench mark lists containing fuller and possibly later levelling information are obtainable from the Director General, Ordnance Survey.

Contours are at 5 metres vertical interval.

ROCK FEATURES

Loose rock

Boulders

Outcrop

Scree

Vertical face

CONVERSION SCALE

Metres - Feet

2000 Metres – 6500 Feet

6000

5000

1500

4000

ABBREVIATIONS

BP,BS	Boundary Post or Stone
Ch	Church
CH	Club House
F Sta	Fire Station
FB	Foot Bridge
Fn	Fountain
GP	Guide Post
MP,MS	Mile Post or Stone
P	Pole or Post
Pol Sta	Police Station
PO	Post Office
PC	Public Convenience
PH	Public House
S	Stone
Spr	Spring
TCB	Telephone Call Box
TCP	Telephone Call Post
TH	Town Hall
W	Well
Y	Youth hostel

ROADS

Road

Track (Where unfenced shown by pecked lines.)

Path

RAILWAYS

Cutting, Embankment, Road over, Road under, Level crossing, Foot Bridge

Multiple track

Single track

Siding, tramway or mineral line

Standard gauge

Narrow gauge

GENERAL FEATURES

Antiquity, (site of)

Boulders

Building

Pylon

Pole

Electricity transmission line

Glasshouse

Triangulation station

Direction of flow of water

Lake, loch or pond

Sloping masonry

Chalk pit, clay pit or quarry

Gravel pit

Sand pit

Refuse or slag heap

Shingle

Sand

VEGETATION

Bracken, rough grassland

Scrub

Heath

Marsh

Saltings

Reeds

Coppice

Orchard

Coniferous trees

Non-coniferous trees

In some areas bracken ( ) and rough grassland ( ) are shown separately.

GroundSure

Historical Map Pack Legend

County Series & National Grid

1:10,560 scale

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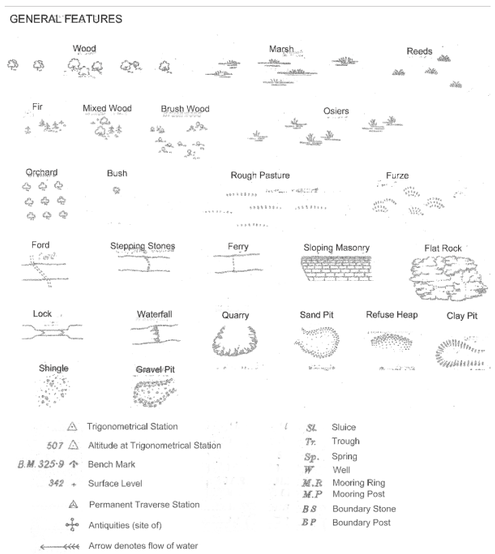
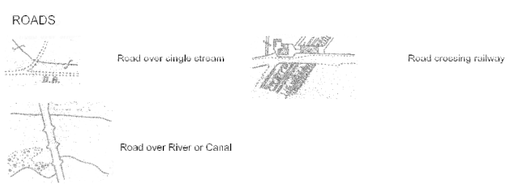
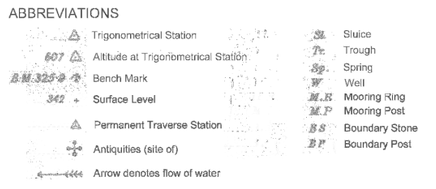
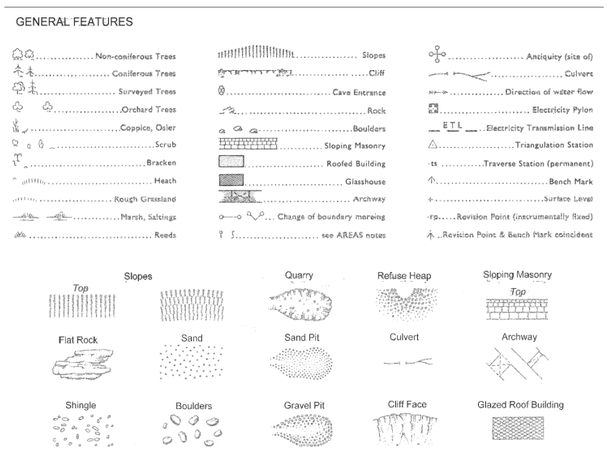
County Series 1:2,500 scale

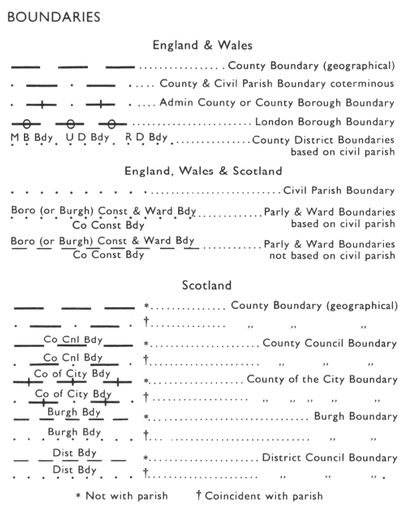


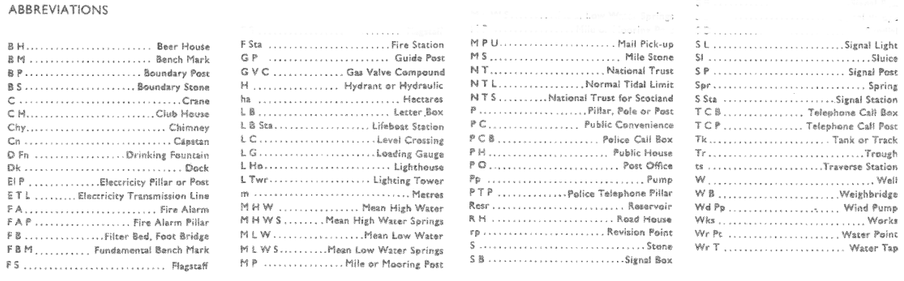




National Grid 1:2,500 / 1:1,250 scale







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Historical Map Pack Legend

County Series

1:1,250 scale

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County Series & National Grid

1:2,500 scale

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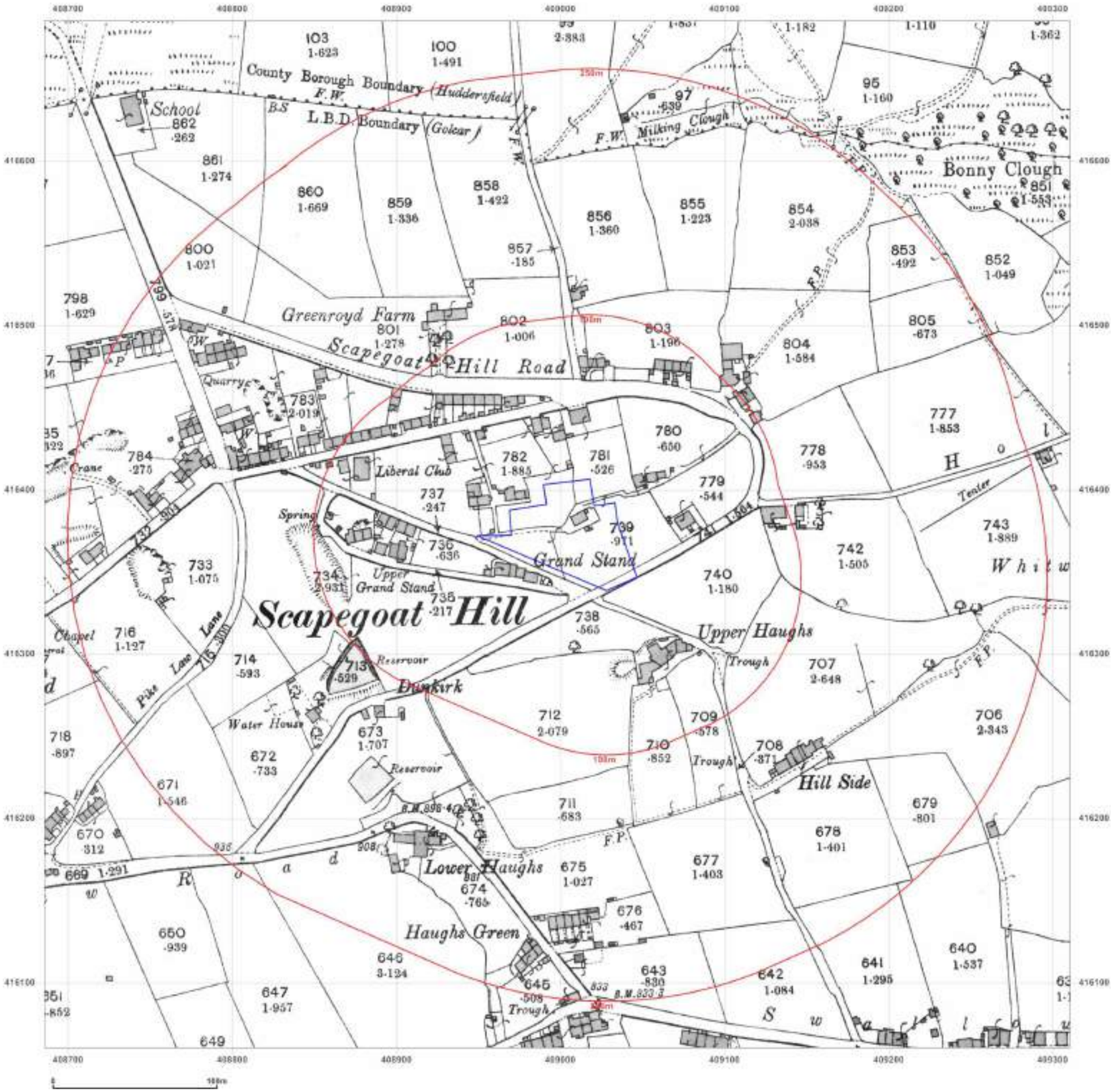

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Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: County Series

Map date: **1893**

Scale: 1:2,500

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Surveyed 1893
Revised 1893
Edition N/A
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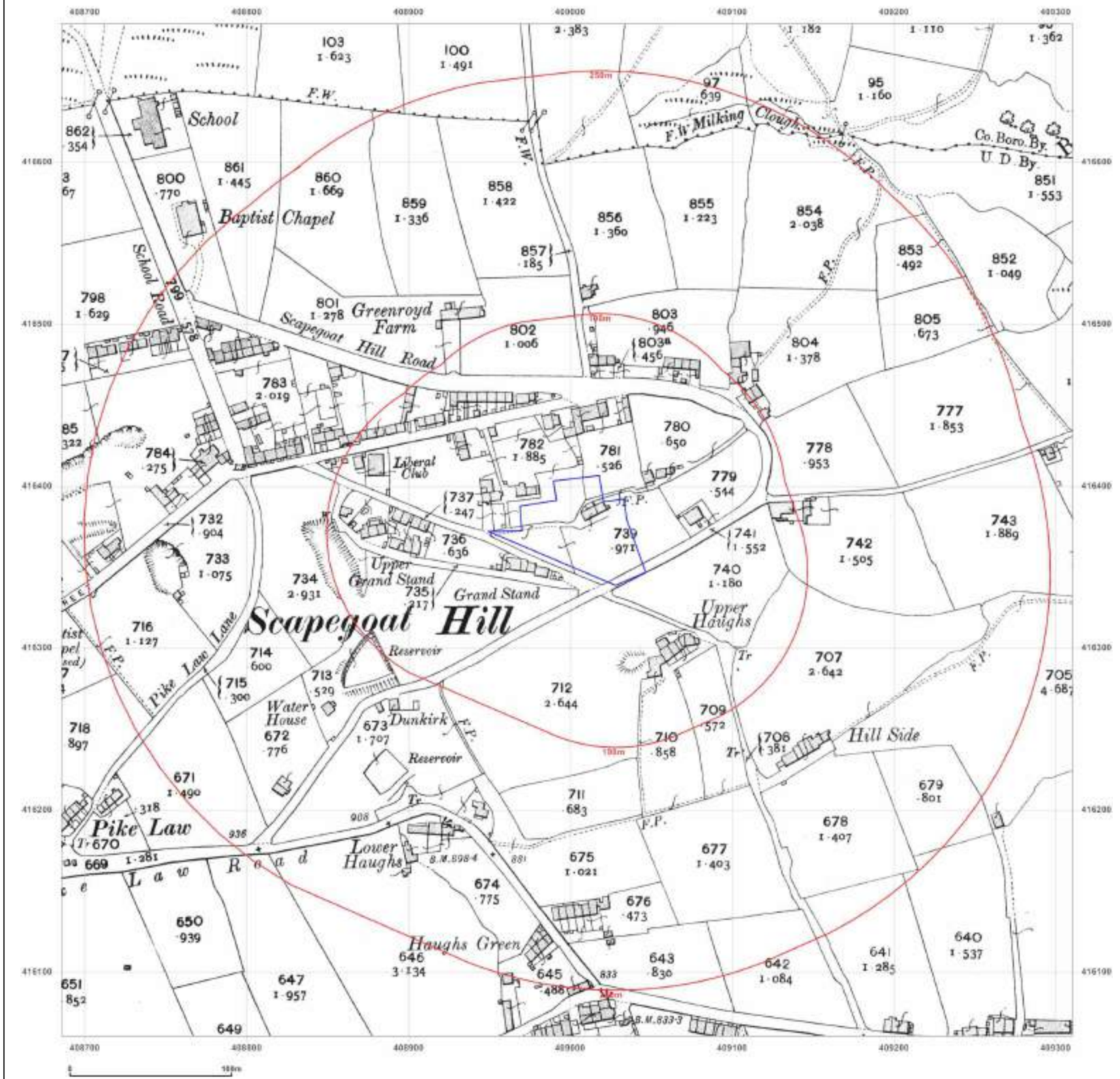

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Grid Ref: 408998, 416373

Map Name: County Series
Map date: **1907**
Scale: 1:2,500
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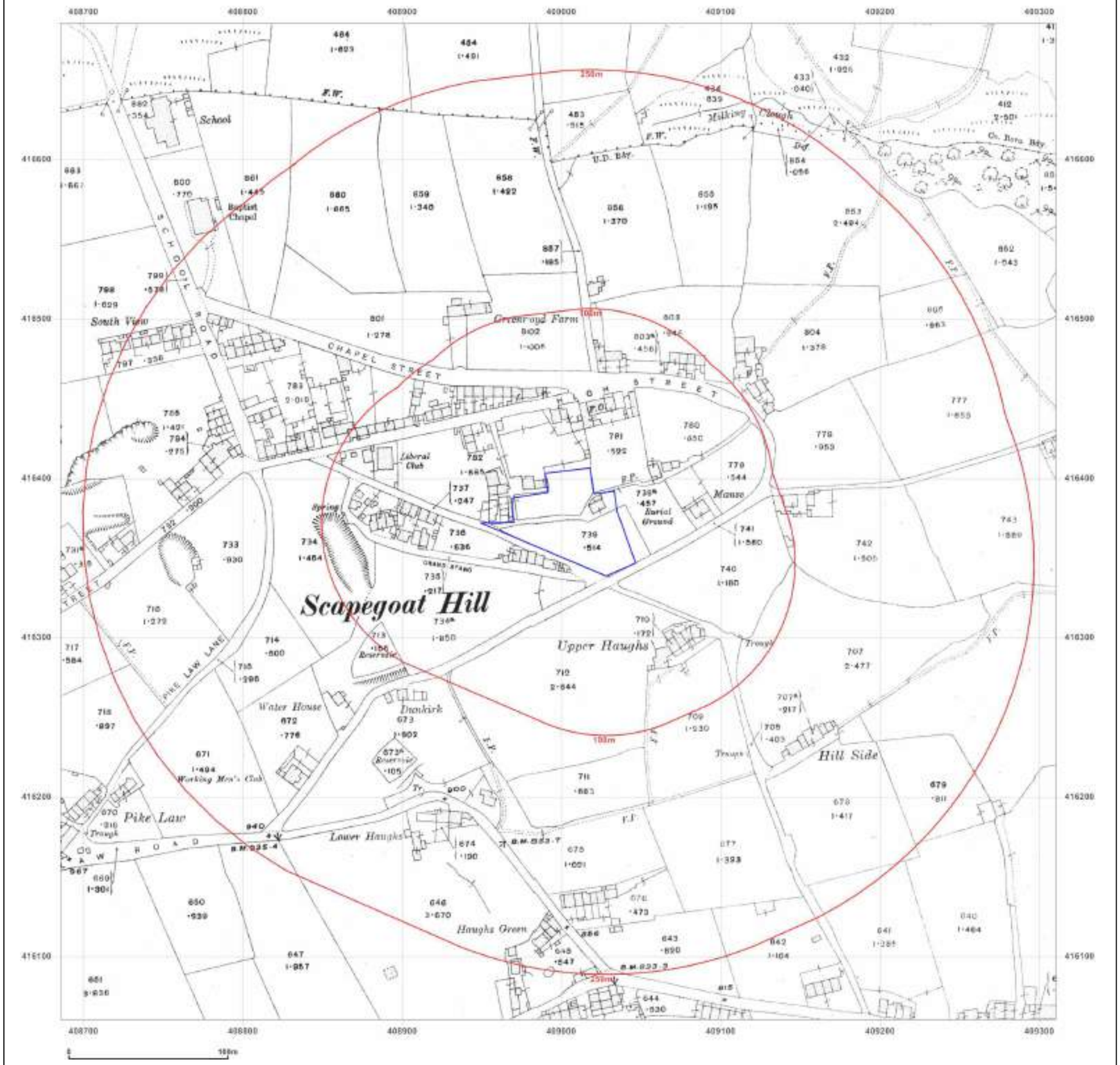

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Map Name: County Series

Map date: **1919**

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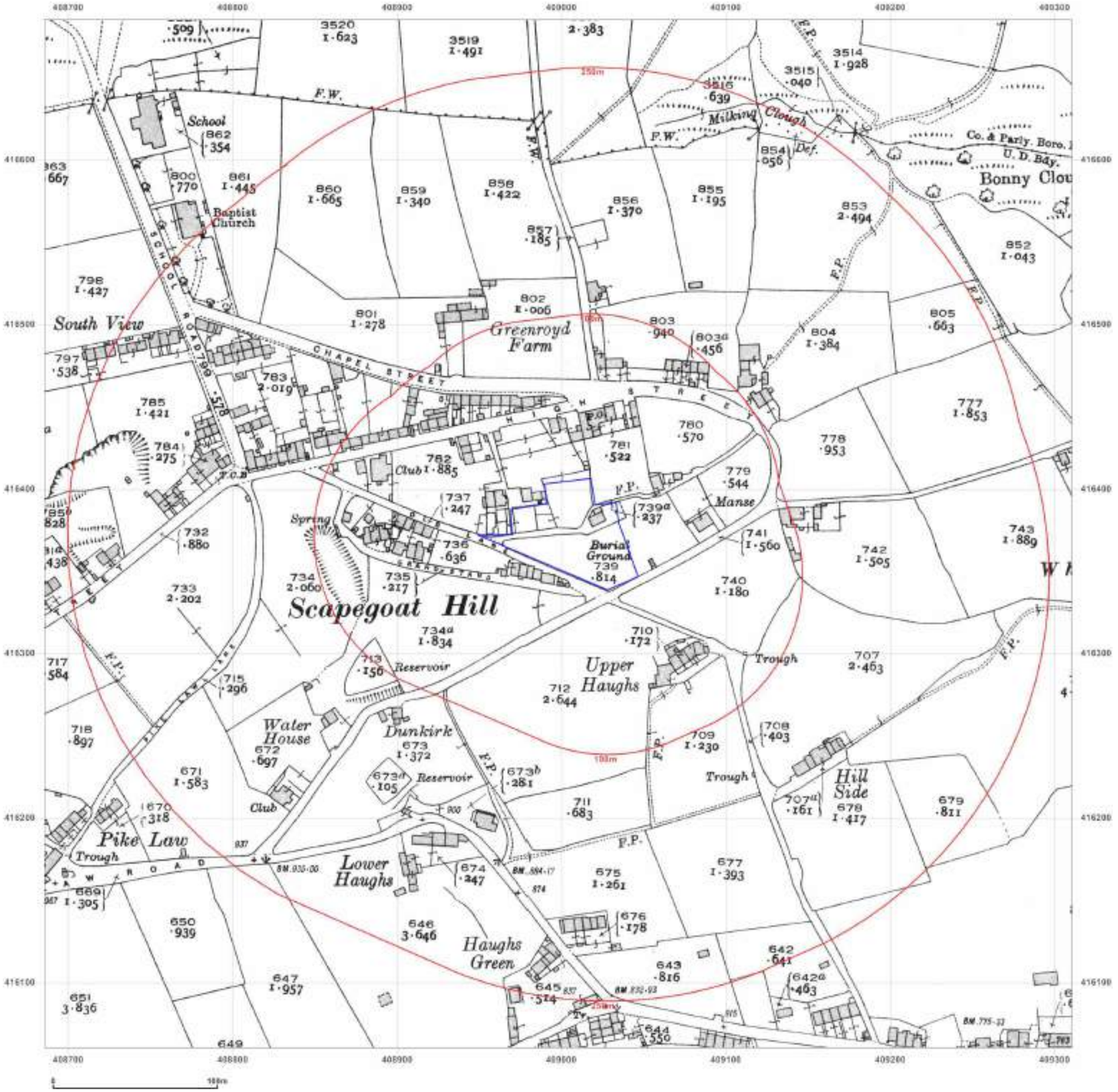

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Grid Ref: 408998, 416373

Map Name: County Series

Map date: **1932**

Scale: 1:2,500

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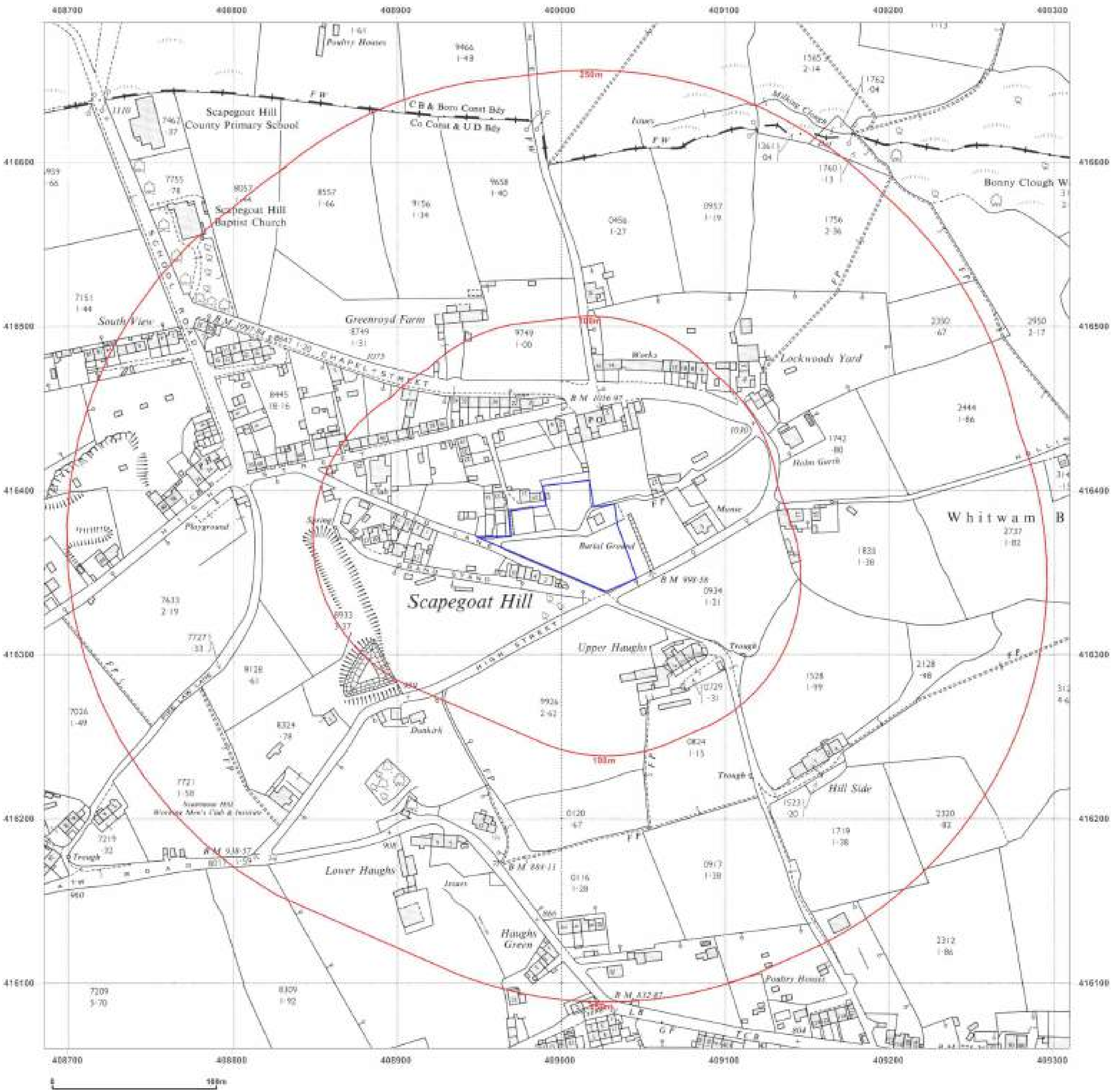

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Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: National Grid

Map date: **1961**

Scale: 1:2,500

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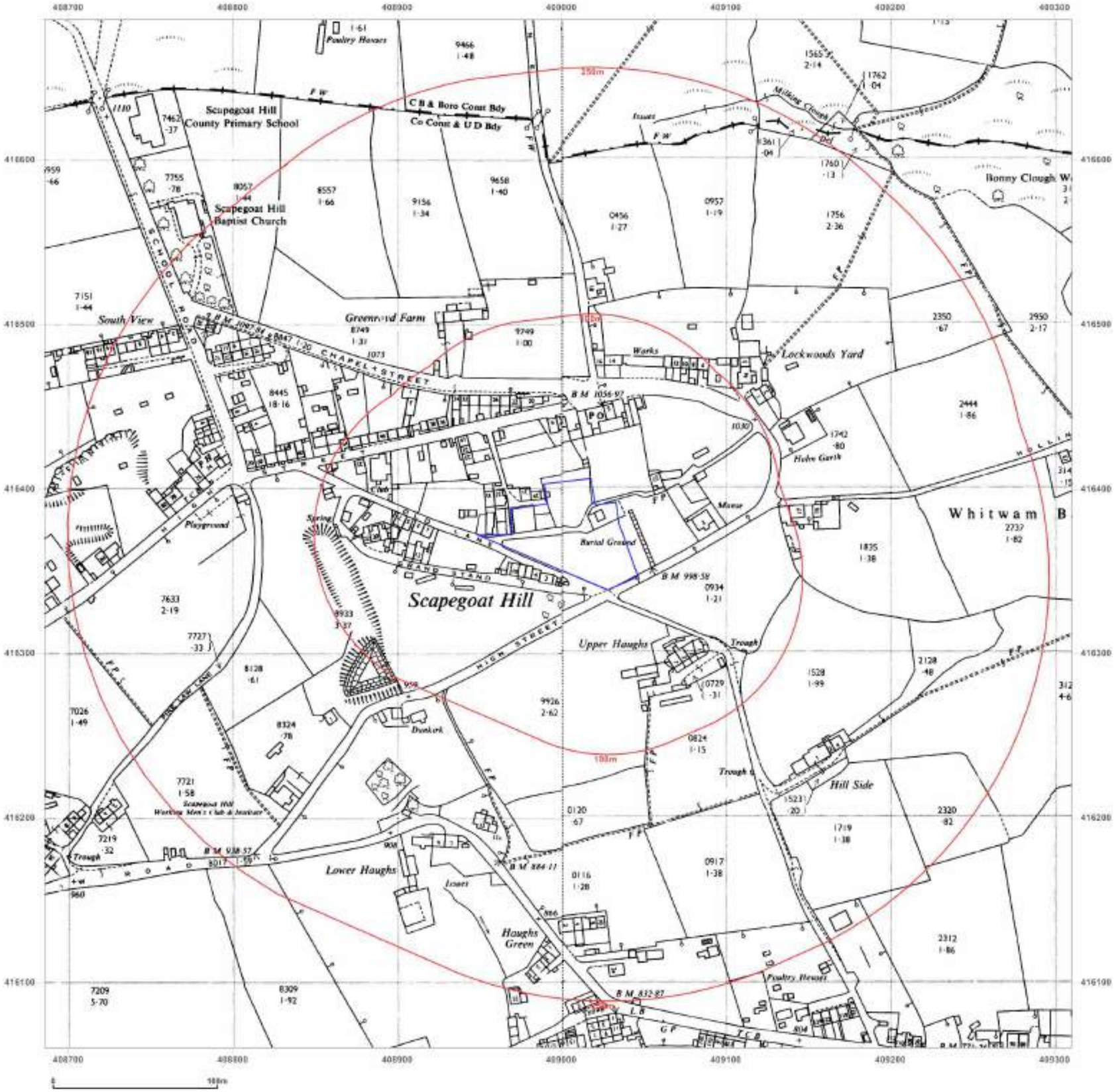

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Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: National Grid

Map date: **1963**

Scale: 1:2,500

Printed at: 1:2,500

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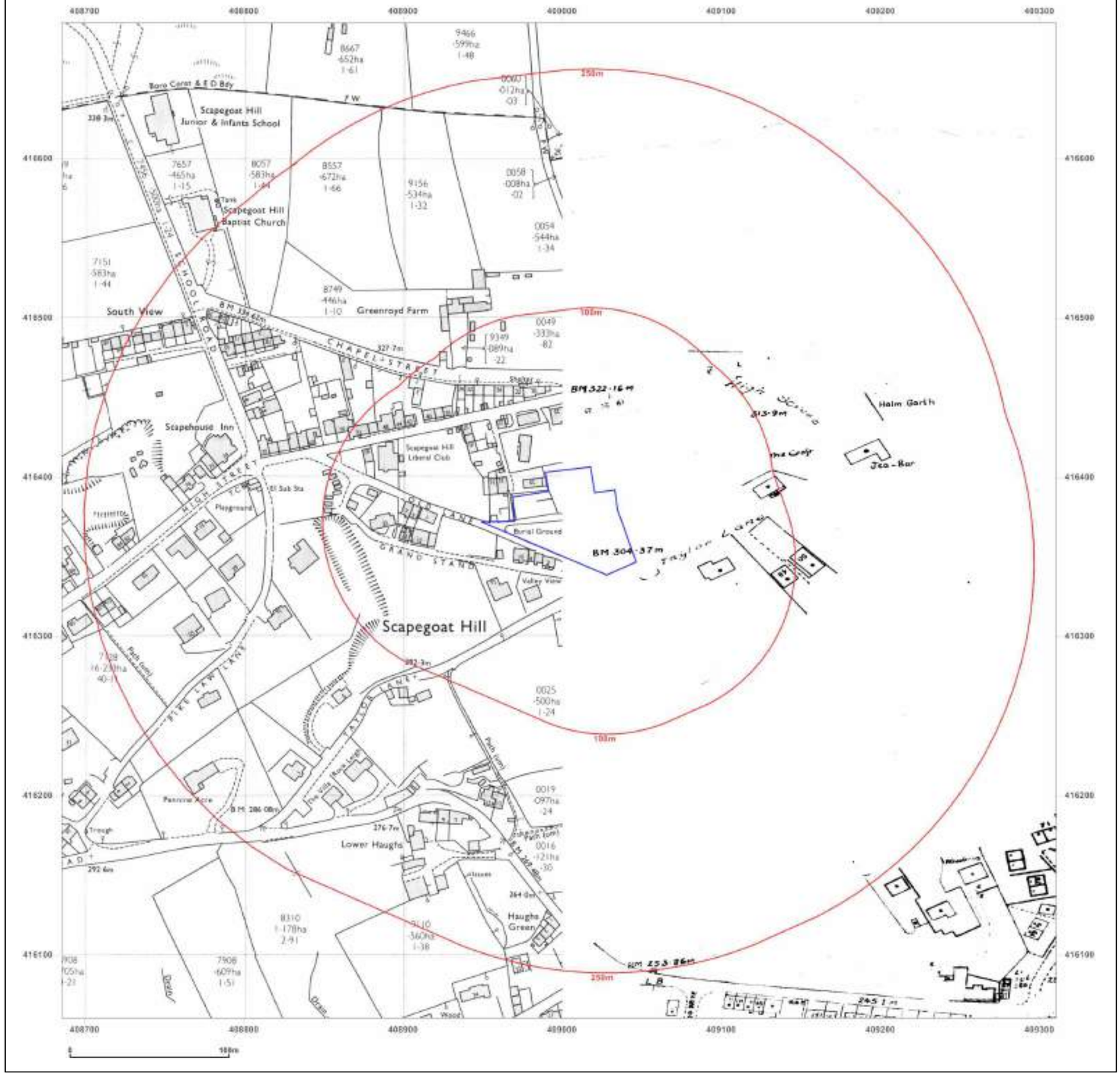

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Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: National Grid

Map date: **1978-1980**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1980	Surveyed N/A
Revised 1980	Revised N/A
Edition N/A	Edition N/A
Copyright 1982	Copyright N/A
Levelled 1959	Levelled N/A

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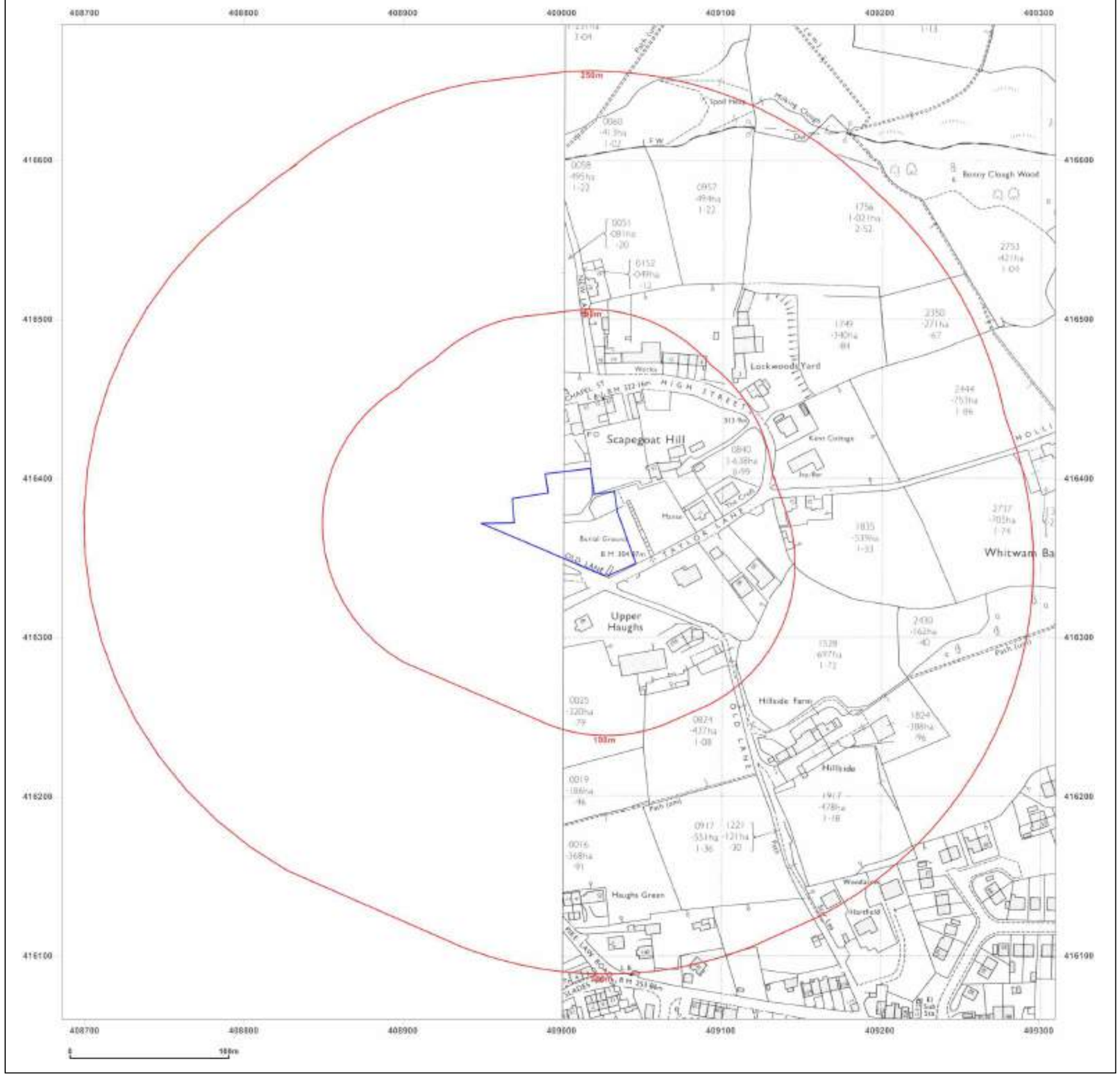

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Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: National Grid
Map date: **1980**
Scale: 1:2,500
Printed at: 1:2,500

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Surveyed 1961
Revised 1980
Edition N/A
Copyright 1982
Levelled 1959

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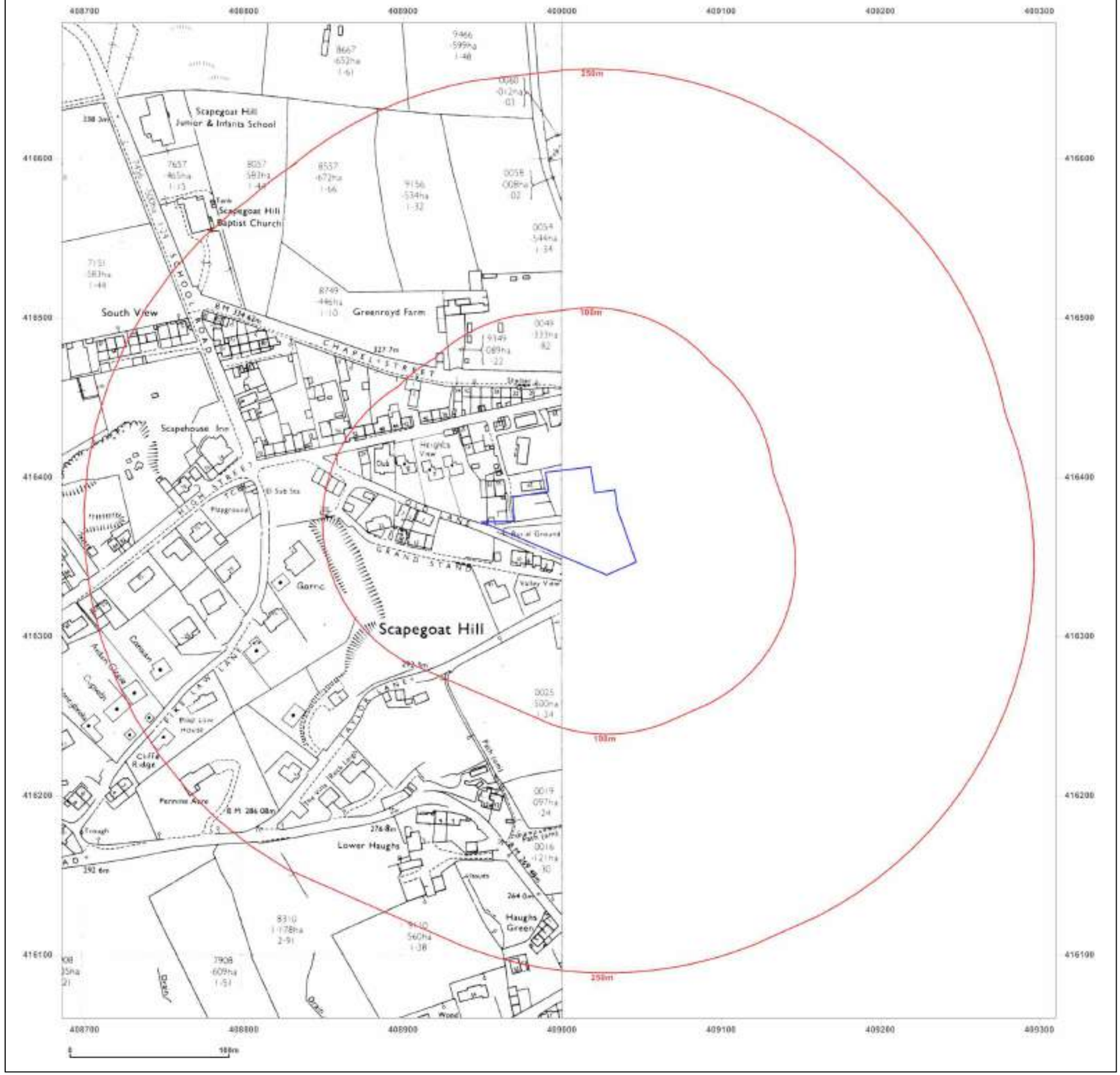

emapsite™

Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: National Grid

Map date: **1991**

Scale: 1:2,500

Printed at: 1:2,500

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Revised 1991
Edition N/A
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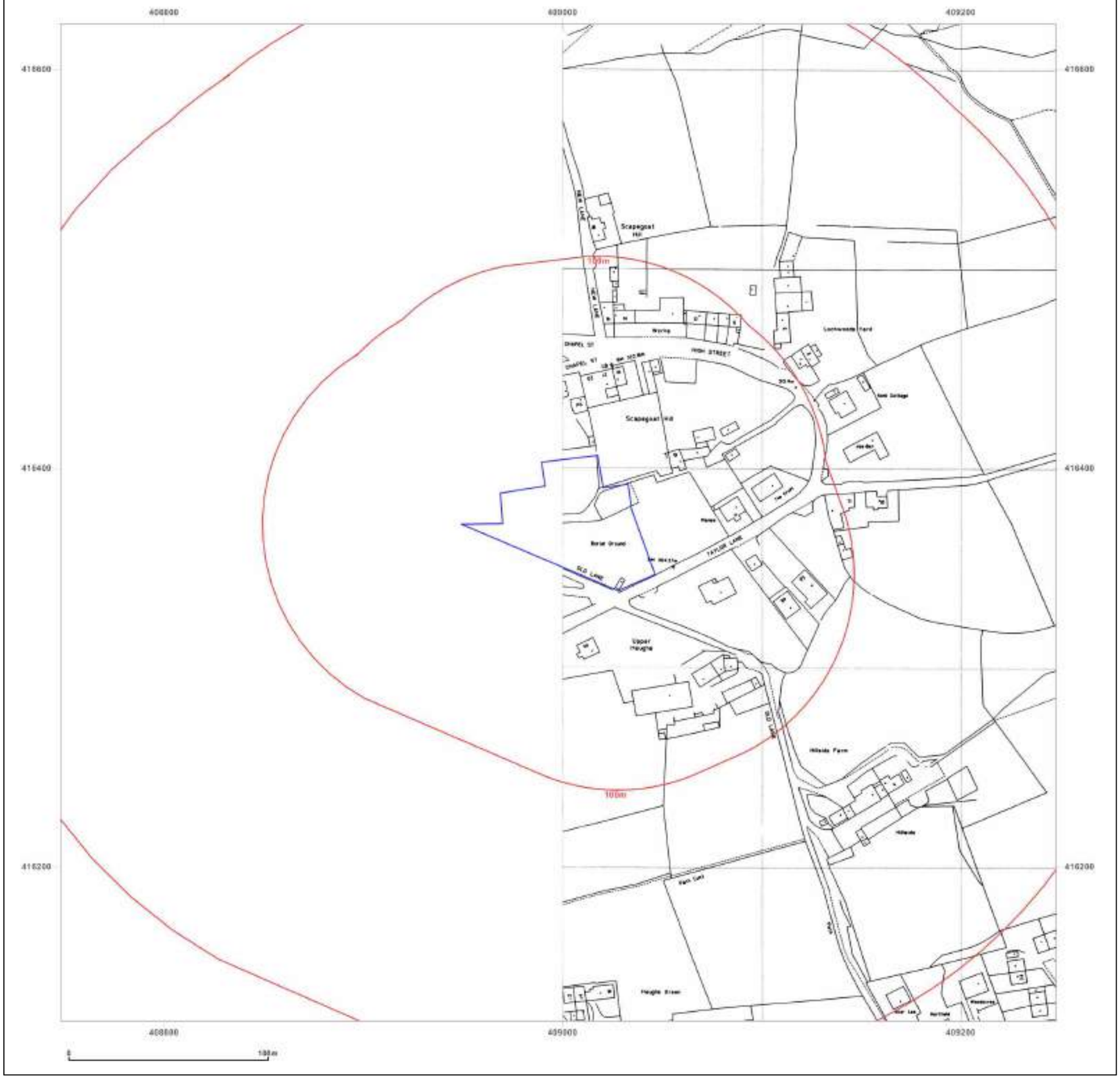

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Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: National Grid
Map date: **1993**
Scale: 1:1,250
Printed at: 1:2,000

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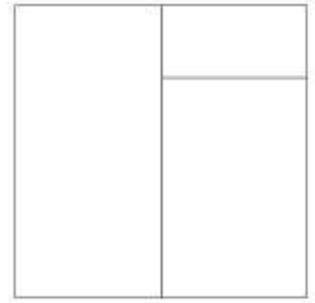
Surveyed N/A
Revised N/A
Edition N/A
Copyright 1993
Levelled N/A



Surveyed N/A
Revised N/A
Edition N/A
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Map legend available at:
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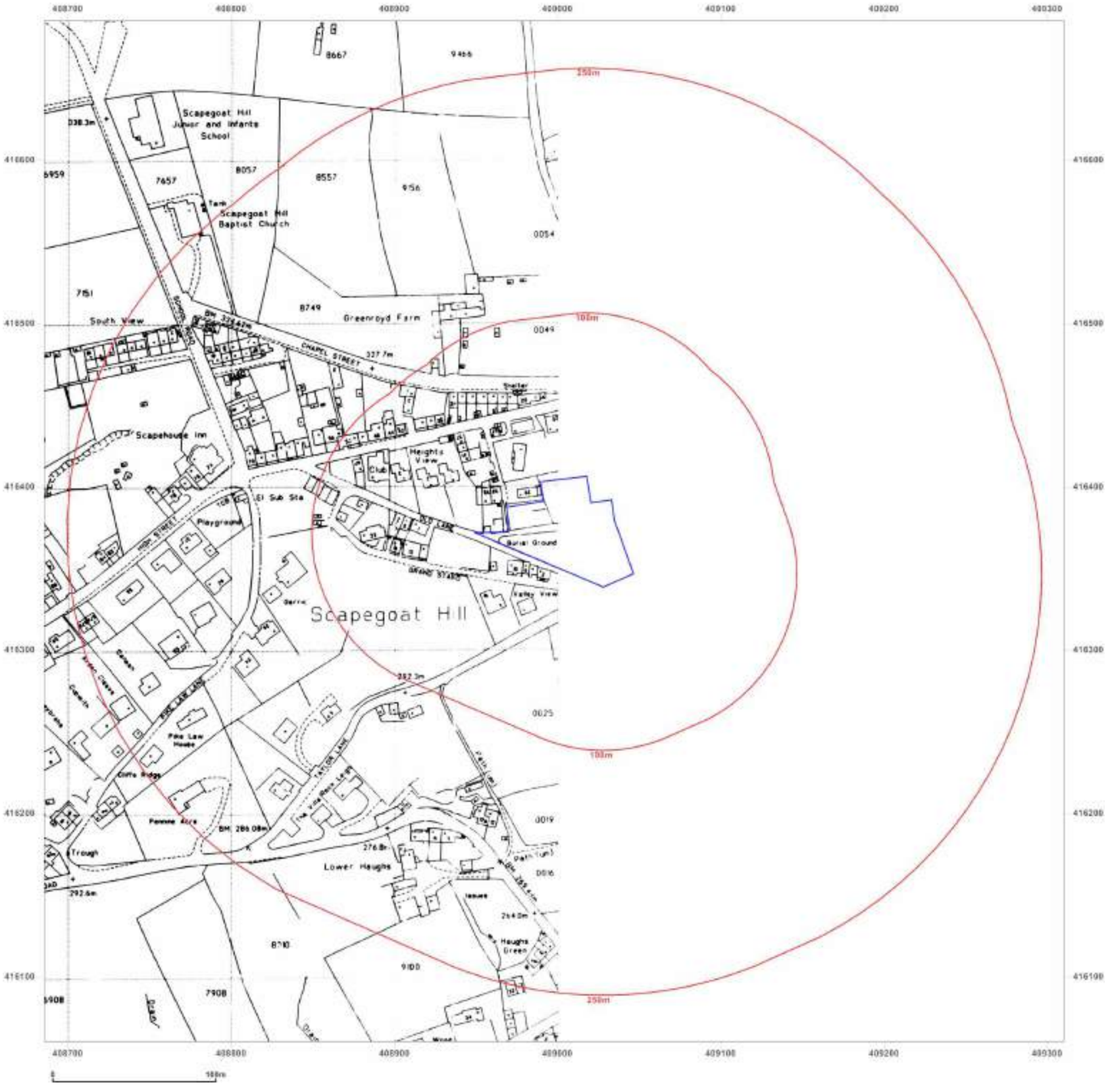

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Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: National Grid

Map date: **1993**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
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Surveyed N/A
Revised N/A
Edition N/A
Copyright 1993
Levelled N/A

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Production date: 12 March 2018

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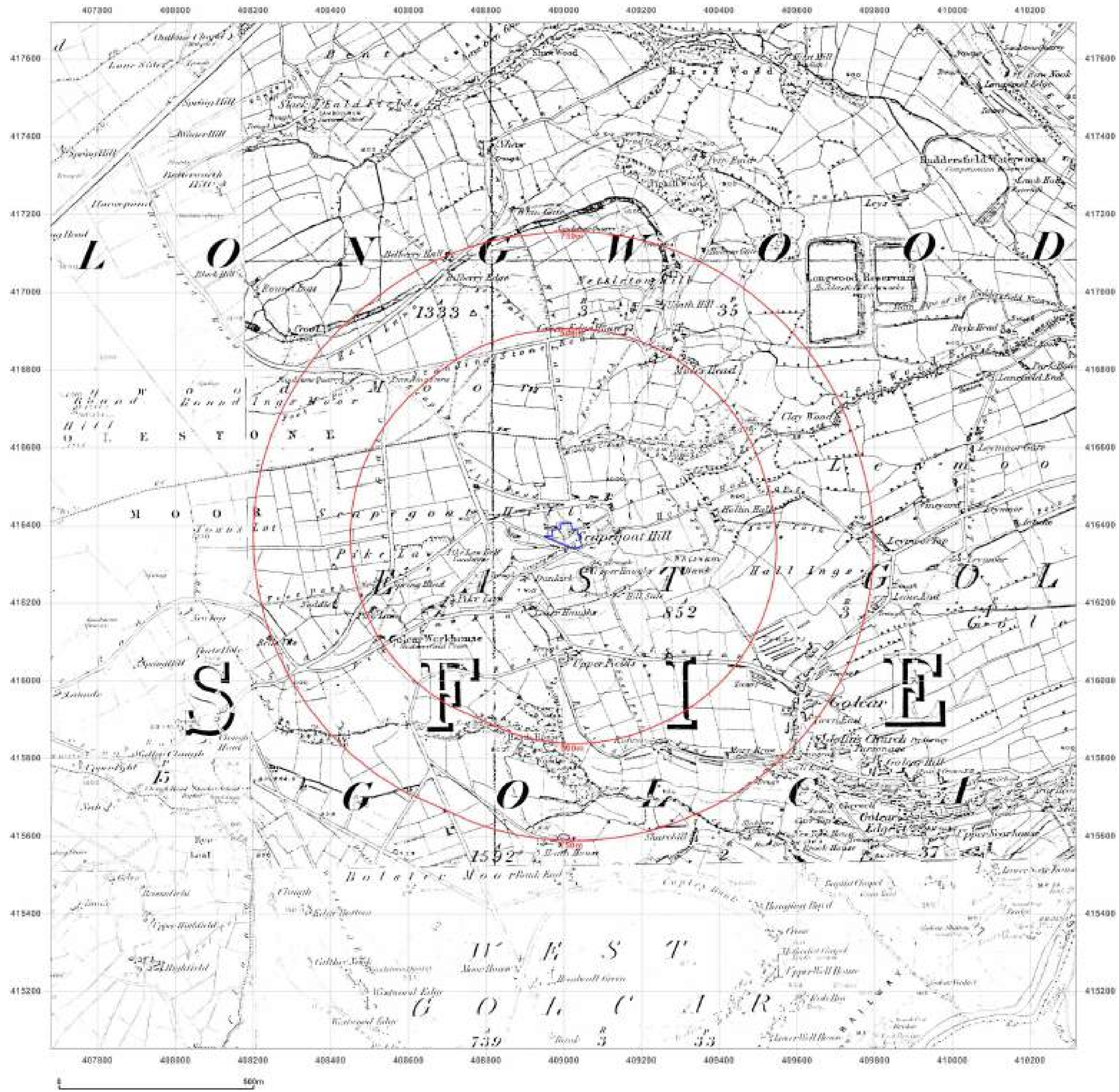

emapsite™

Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: County Series

Map date: **1854**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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Surveyed 1849
Revised N/A
Edition 1854
Copyright N/A
Levelled N/A

Surveyed 1850
Revised N/A
Edition 1854
Copyright N/A
Levelled 1853

Surveyed 1850
Revised N/A
Edition 1854
Copyright N/A
Levelled 1853

Surveyed 1851
Revised N/A
Edition 1854
Copyright N/A
Levelled N/A

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Map legend available at:
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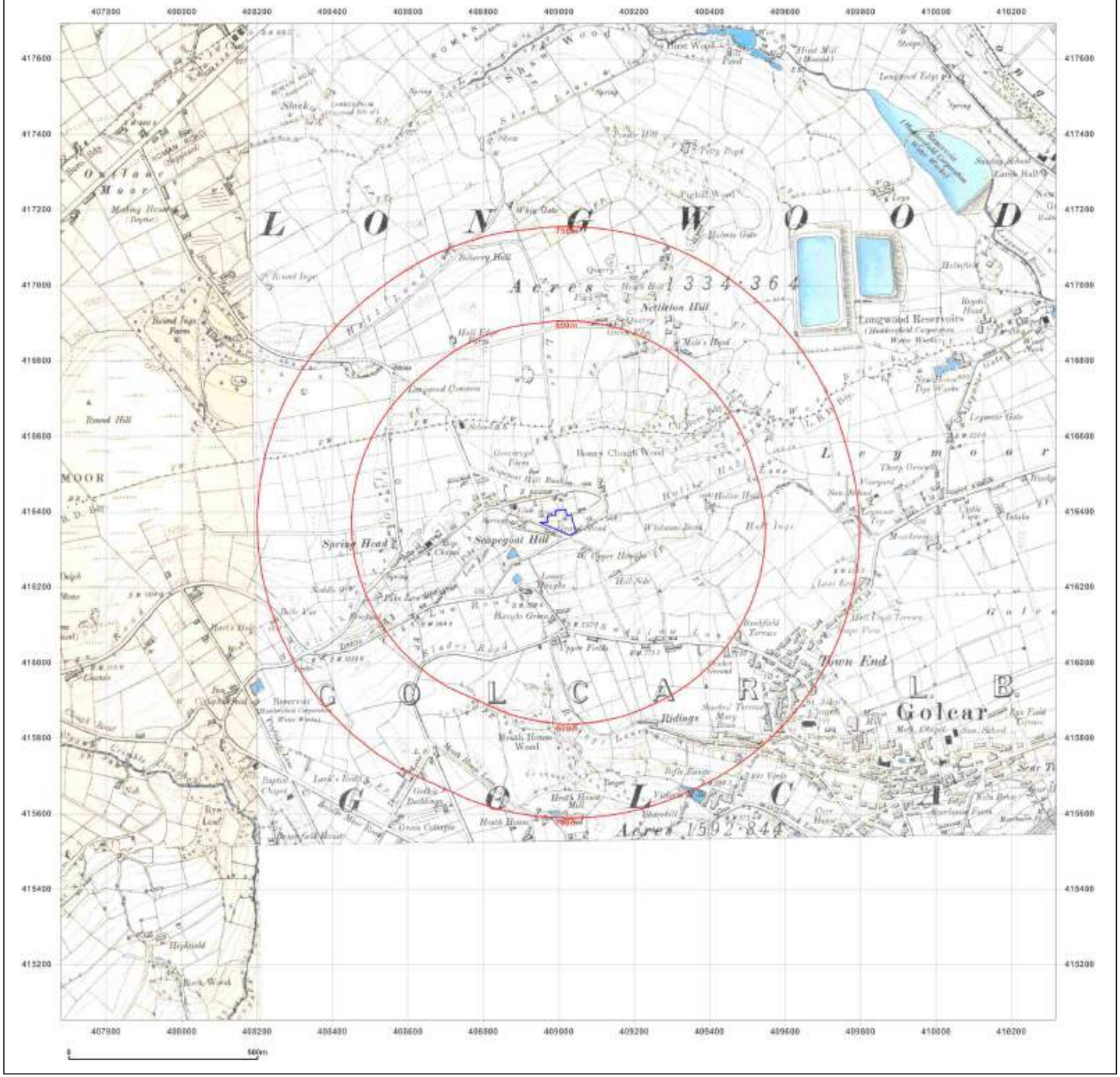

emapsite™

Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: County Series
Map date: **1890-1892**
Scale: 1:10,560
Printed at: 1:10,560

N
W E
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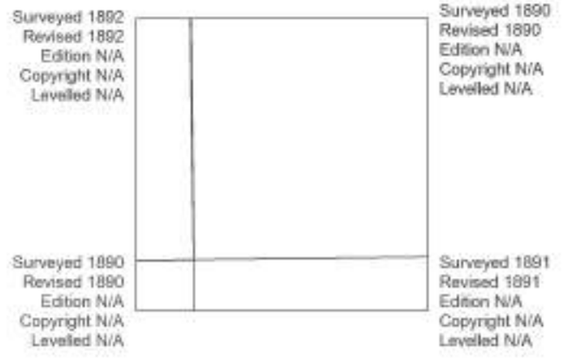

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Production date: 12 March 2018

Map legend available at:
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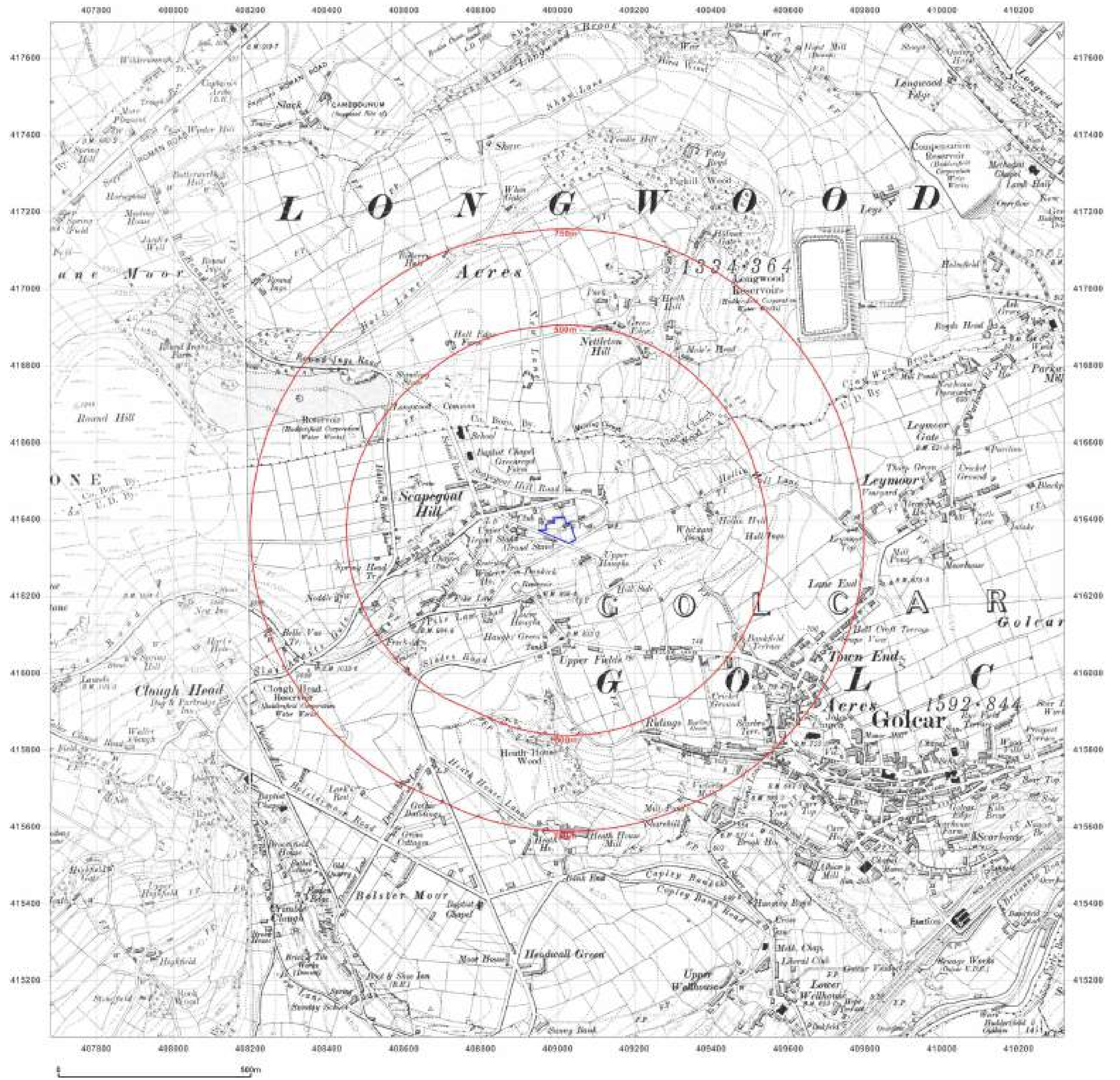

emapsite™

Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: County Series

Map date: **1904-1908**

Scale: 1:10,560

Printed at: 1:10,560

N
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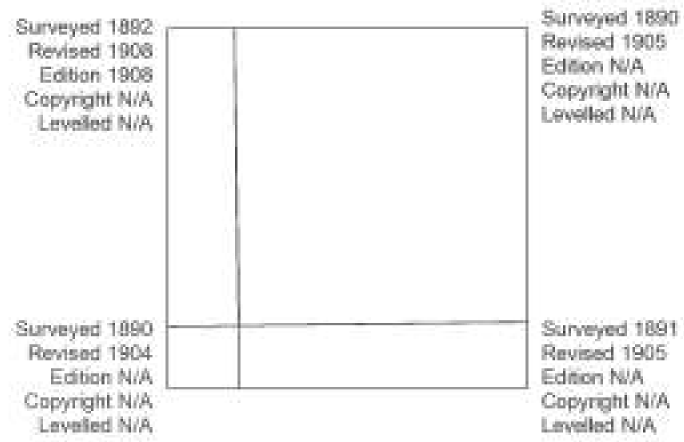

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Production date: 12 March 2018

Map legend available at:
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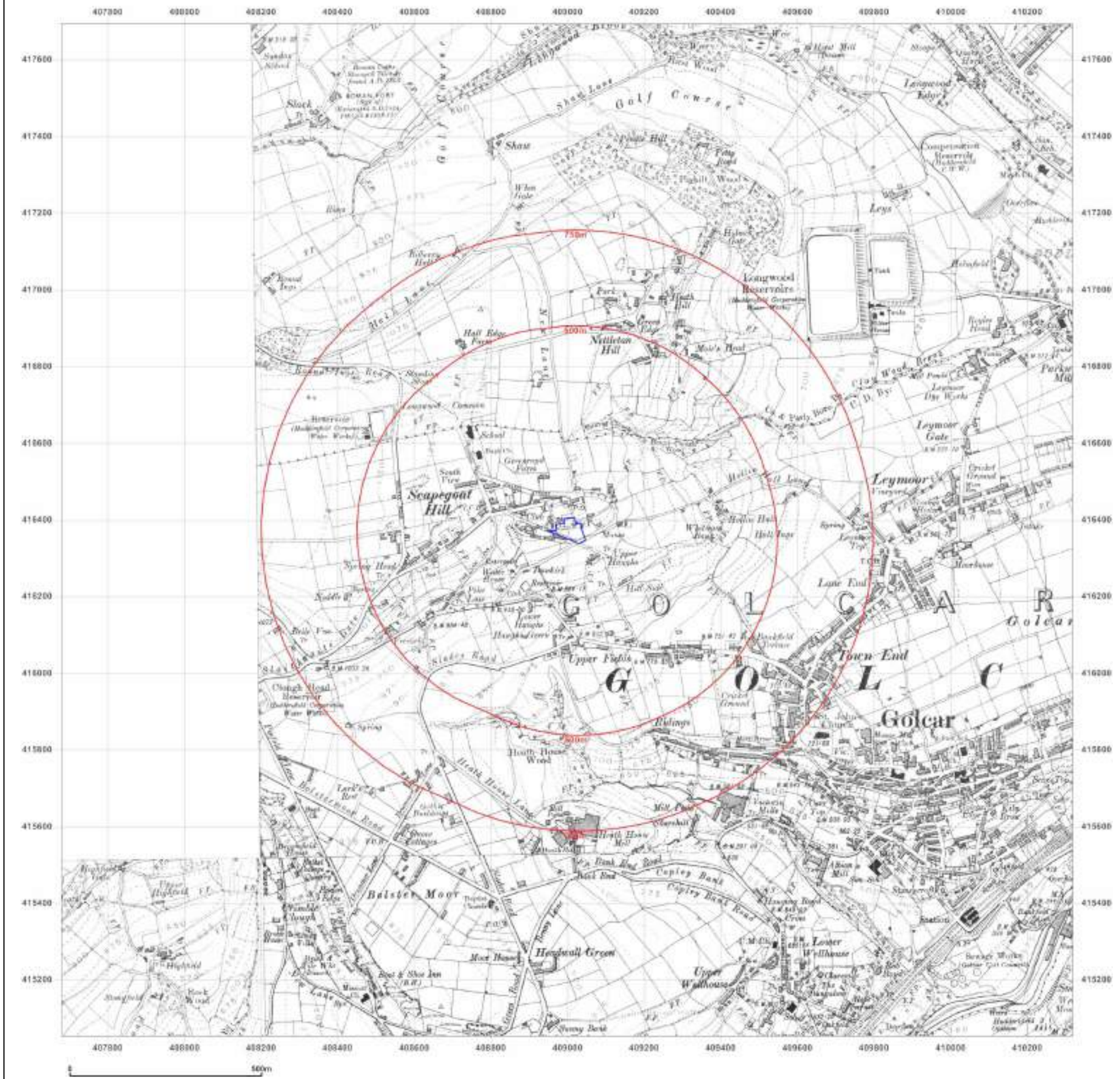

emapsite™

Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: County Series

Map date: **1930**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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Surveyed 1849
Revised 1930
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1849
Revised 1930
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1851
Revised 1930
Edition N/A
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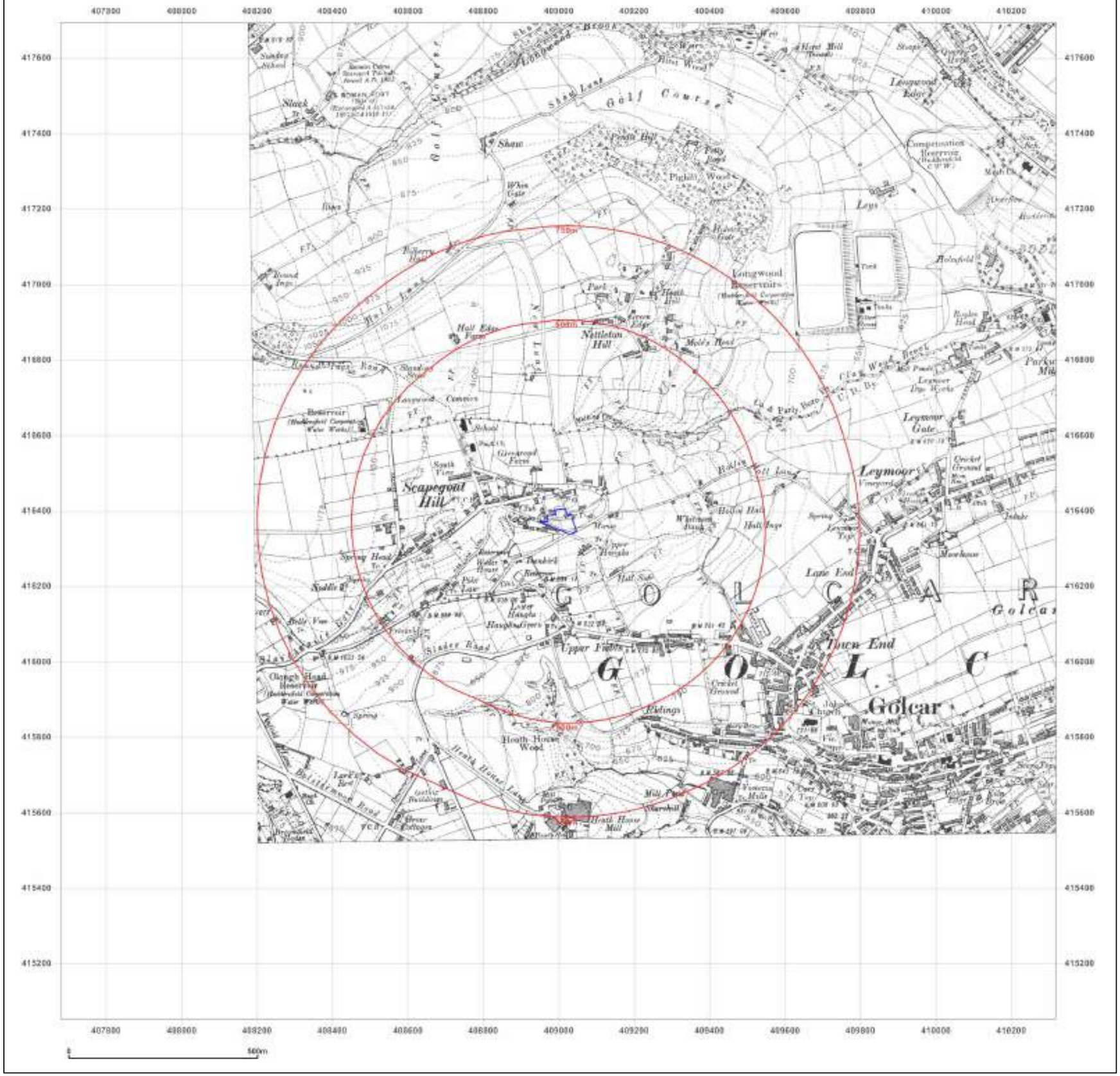

emapsite™

Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1849
Revised 1938
Edition 1938
Copyright N/A
Levelled N/A

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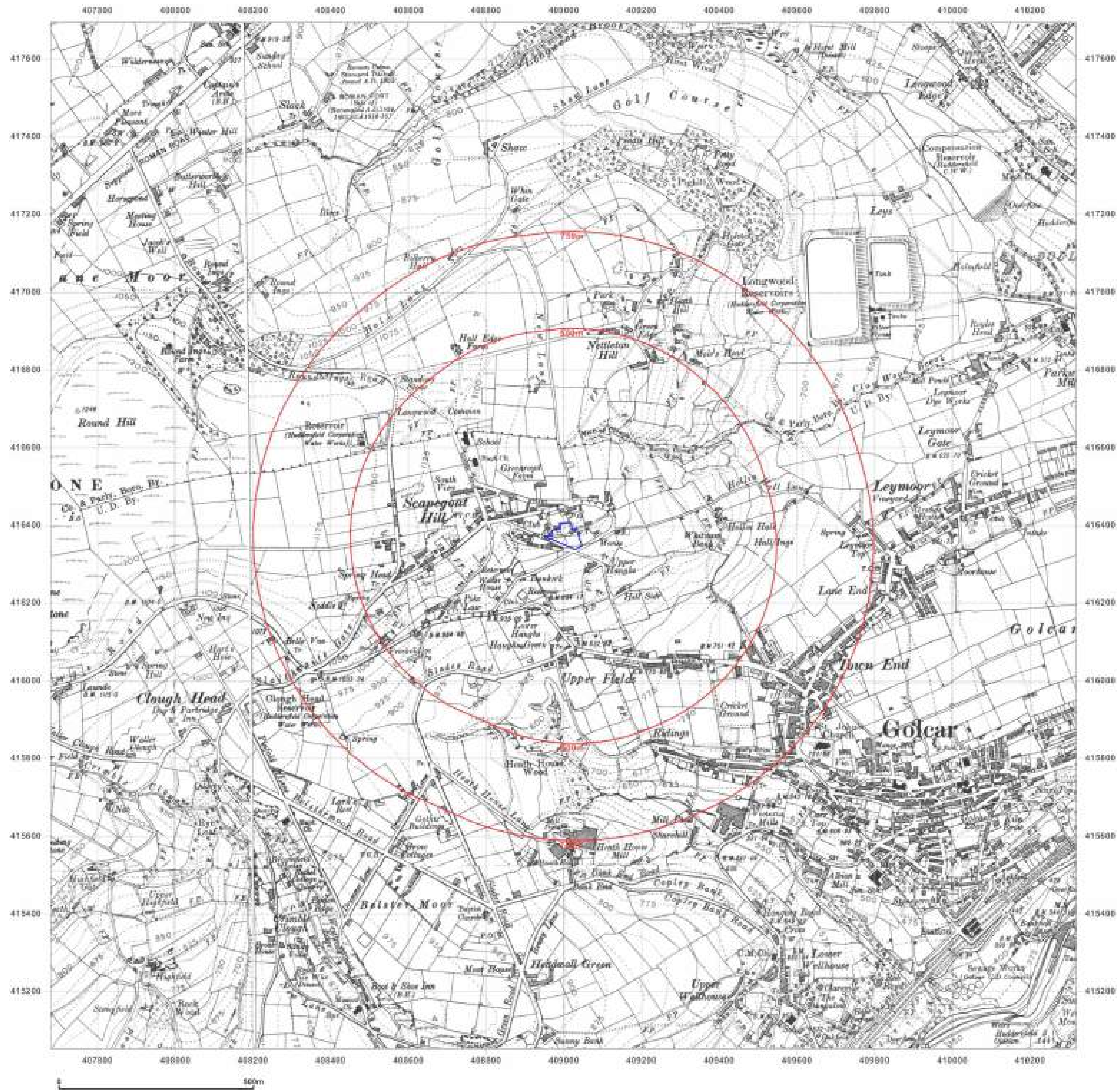

Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: County Series

Map date: **1948**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1849
Revised 1948
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1849
Revised 1948
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1849
Revised 1948
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1851
Revised 1948
Edition N/A
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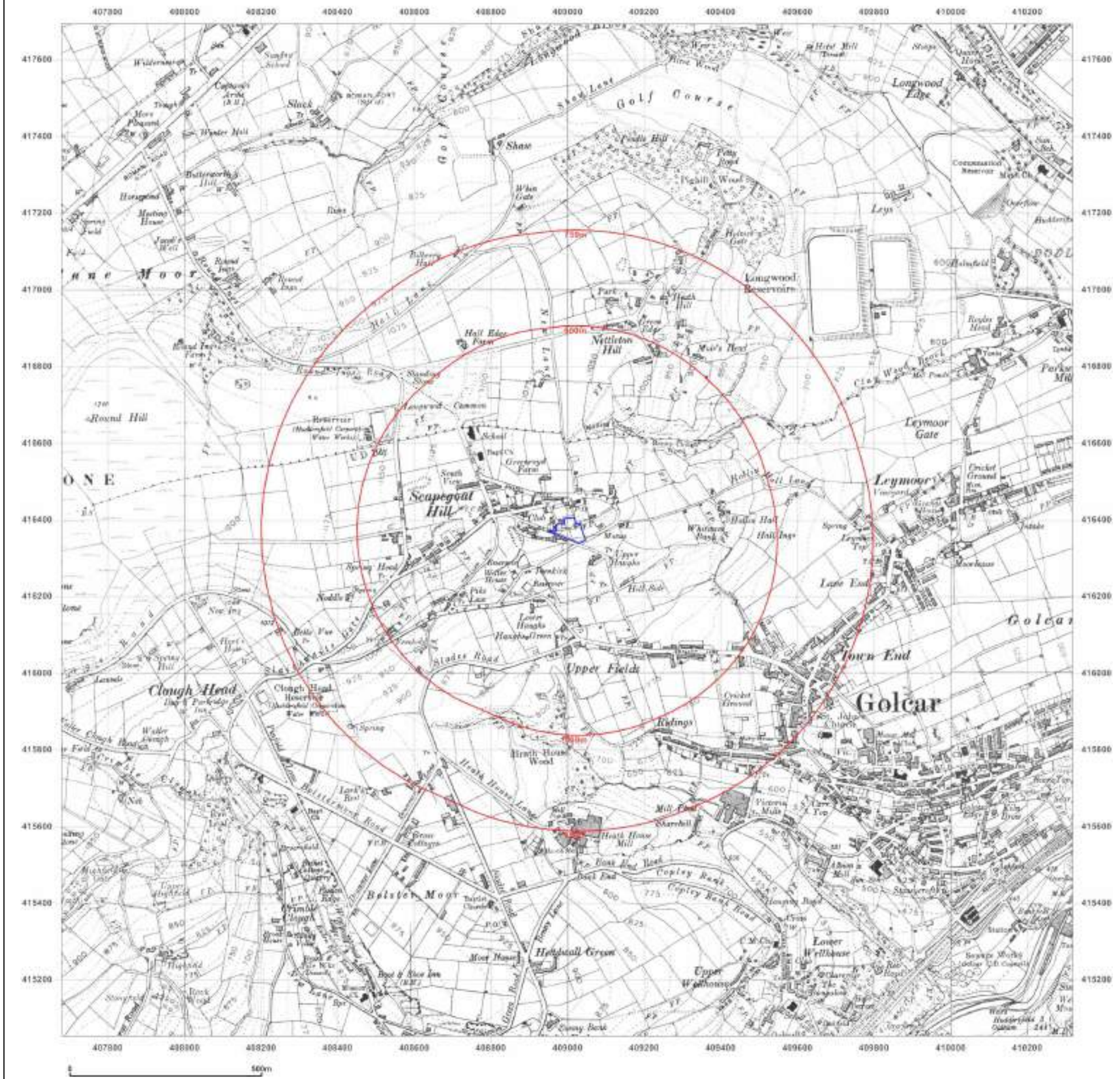

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Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: Provisional

Map date: **1955-1956**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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Surveyed 1951
Revised 1955
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1951
Revised 1951
Edition N/A
Copyright 1956
Levelled N/A

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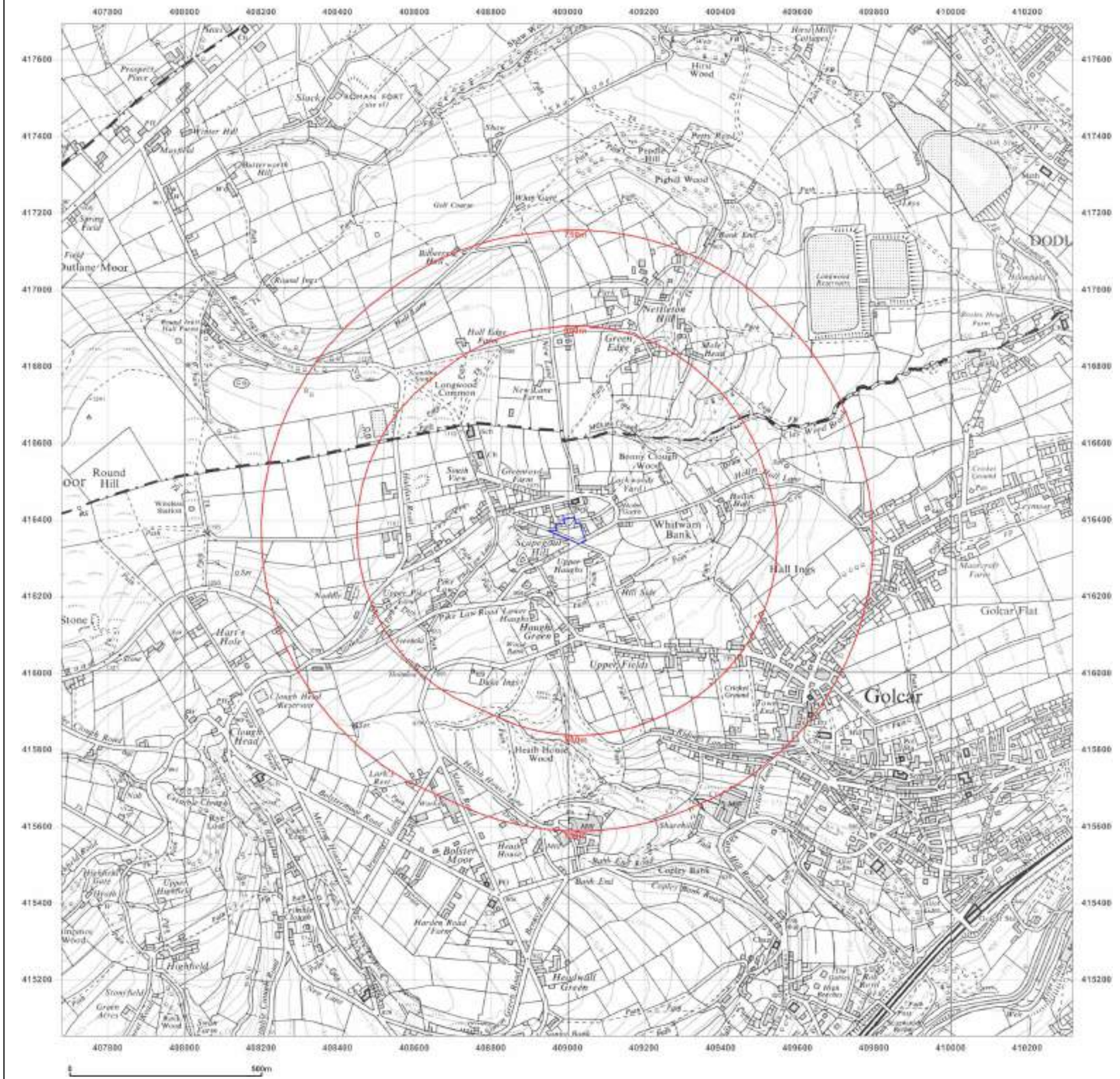

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Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: Provisional

Map date: **1966-1967**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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Surveyed 1967
Revised 1967
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1966
Revised 1966
Edition N/A
Copyright N/A
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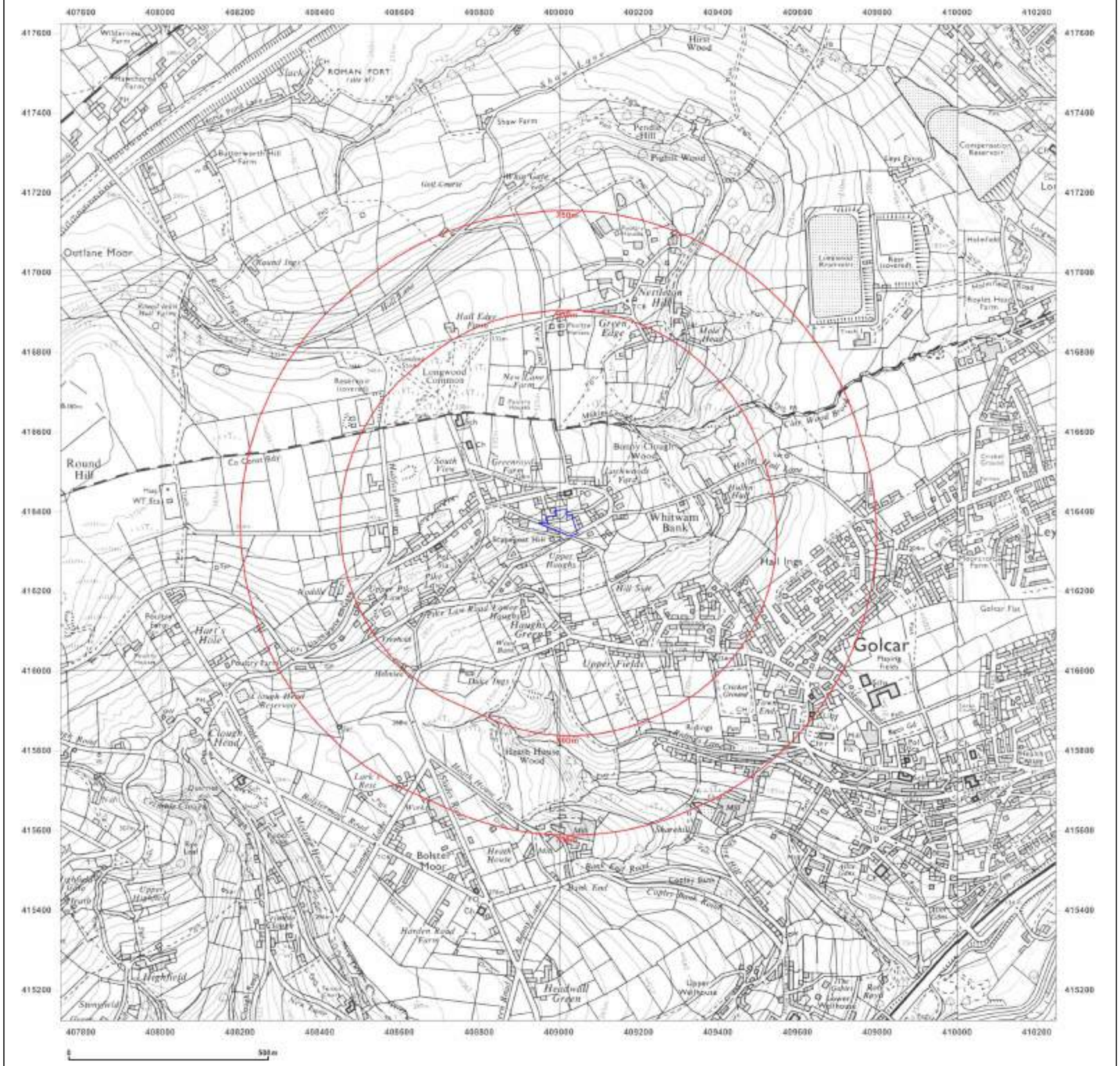

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Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: National Grid

Map date: **1975-1978**

Scale: 1:10,000

Printed at: 1:10,000

N
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Surveyed 1977
Revised 1978
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1974
Revised 1975
Edition N/A
Copyright N/A
Levelled N/A

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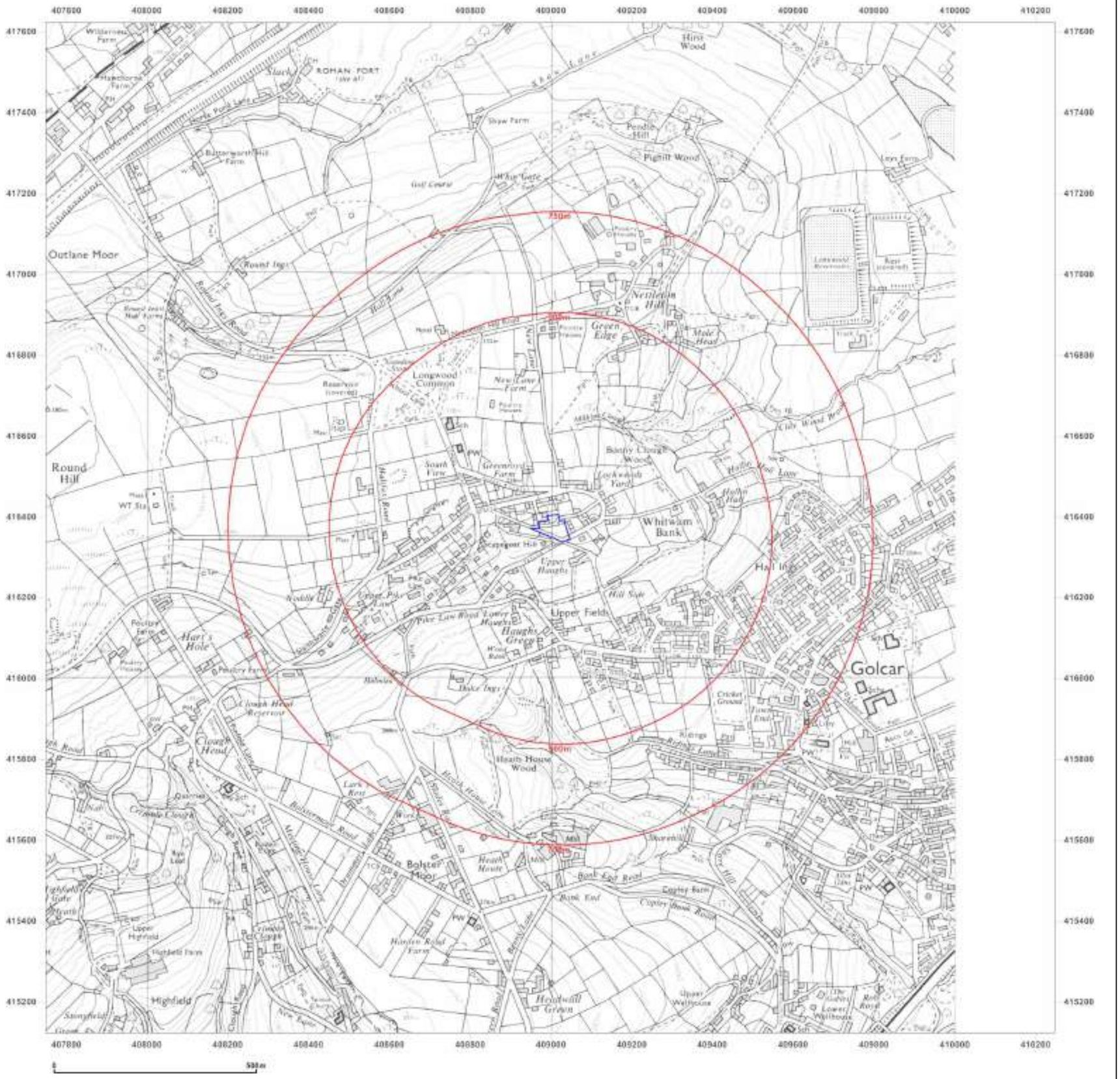

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Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: National Grid
Map date: **1993**
Scale: 1:10,000
Printed at: 1:10,000

N
W E
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Surveyed 1977
Revised 1993
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 12 March 2018

Map legend available at:
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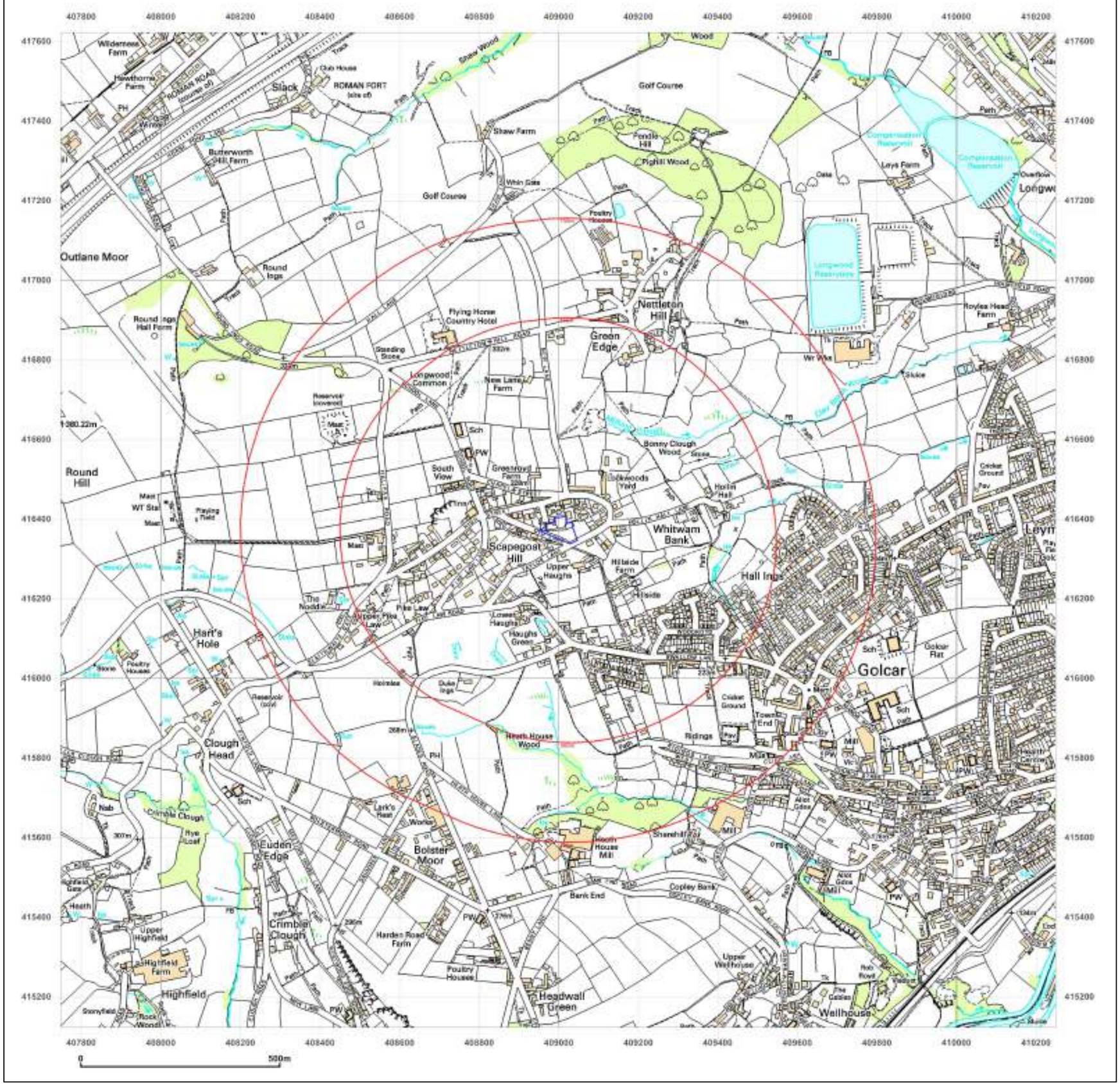

emapsite™

Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: 1:10,000 Raster

Map date: **2002**

Scale: 1:10,000

Printed at: 1:10,000

N
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2002

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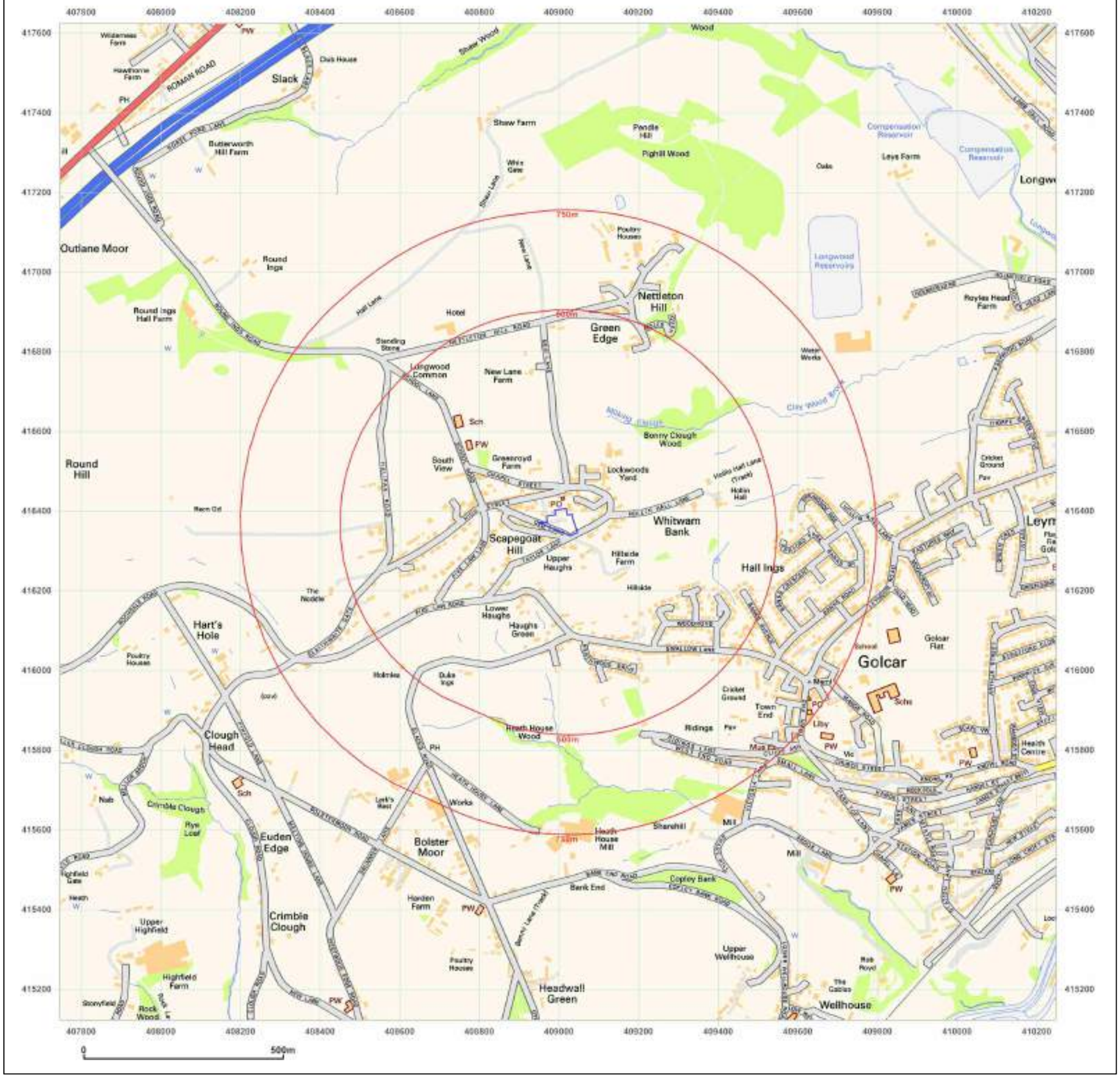

emapsite™

Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

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

N
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2010

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Production date: 12 March 2018

Map legend available at:
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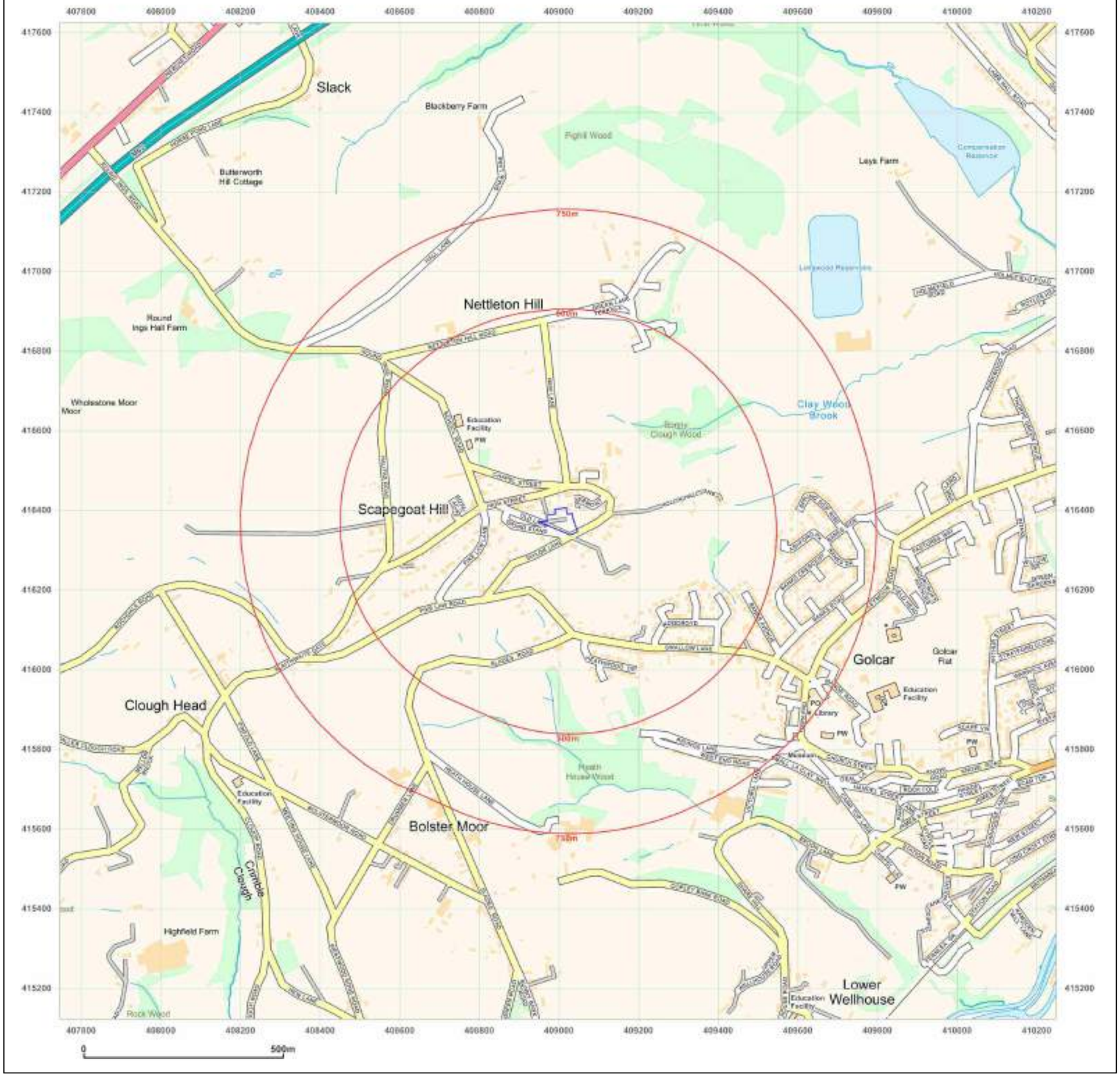

emapsite™

Site Details:

Client Ref: EMS_466873_626778
Report Ref: EMS-466873_626778
Grid Ref: 408998, 416373

Map Name: National Grid

Map date: **2014**

Scale: 1:10,000

Printed at: 1:10,000

N
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2014

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Production date: 12 March 2018

Map legend available at:
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APPENDIX D

GROUND INVESTIGATION LOGS

Alan Wood & Partners

Rotary Core Log

Borehole No. **BH1**

Sheet 1 of 4

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 98.60	Scale 1:25
Client: Brierstone Ltd		Dates: 20/03/2018 - 20/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.40	98.20		TOPSOIL
										Yellow / brown, sandy, gravelly CLAY. Gravel is sandstone (Drillers Description).
							1.80	96.80		Extremely weak to medium strong, thinly laminated, grey, inter bedded MUDSTONE & SILTSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, stepped, with no infilling, and slight orange staining [MILLSTONE GRIT GROUP].
		2.00 - 3.00 (2.45)	C (17)	100	93	30				
		(2.95)	C							
		3.00 - 3.50	7	70	64	0				
		3.50 - 4.00		40	0	0				
		4.00 - 5.00 (4.45)	C	92	13	0				

Continued on next sheet

1 2 3 4 5

Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No. **BH1**

Sheet 2 of 4

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 98.60	Scale 1:25
Client: Brierstone Ltd		Dates: 20/03/2018 - 20/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		5.30 5.00 - 6.00	C 9	95	64	39				
		6.30 6.00 - 7.00	C 30	85	39	44				
		7.00 - 7.20	4	100	100	100				
		7.40 7.50 - 7.65 7.20 - 7.90 7.80 - 7.90	C C 30 C	100	64	34	7.20	91.40		Weak to strong, laminated to thinly bedded SANDSTONE. Fractures are smooth, stepped, sub-horizontal and with no infill [MILLSTONE GRIT GROUP].
		7.90 - 8.00	2	100	100	100	7.90	90.70		Extremely weak, thinly laminated, grey, MUDSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, stepped, with no infilling, and slight orange staining [MILLSTONE GRIT GROUP].
		8.00 - 8.80	15	74	11	0	8.00	90.60		Weak medium strong, thinly laminated to thinly bedded, brown SILTSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, with no infilling, and slight orange staining [MILLSTONE GRIT GROUP].
		8.80 - 9.00	2	100	0	0	8.80	89.80		Very weak to weak, thinly laminated, grey, MUDSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, smooth, with no infilling, and slight orange staining [MILLSTONE GRIT GROUP].
		9.00 - 10.00	C	91	64	27				
		10.00	C							

Continued on next sheet

Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No.
BH1
Sheet 3 of 4

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 98.60	Scale 1:25
Client: Brierstone Ltd		Dates: 20/03/2018 - 20/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		10.15	C							
		10.00 - 11.00		87	56	10				
		11.20	C				11.00	87.60		Weak to strong, laminated to thinly bedded, brown SILTSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, with no infilling, and slight orange staining [MILLSTONE GRIT GROUP].
		11.00 - 12.00		95	84	49				
		11.60	C							
		12.00 - 13.00		86	45	0				
		13.35	C							
		13.00 - 14.00		98	79	65				
		14.30	C							
		14.00 - 15.00		93	83	58				

11
12
13
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Continued on next sheet

Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No. **BH1**

Sheet 4 of 4

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 98.60	Scale 1:25
Client: Brierstone Ltd		Dates: 20/03/2018 - 20/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		15.30 15.00 - 16.00	C	60	54	23				
		16.00 - 17.00		94	65	0				
		17.00 - 17.45		97	68	24				
		17.47 17.45 - 18.00	C	100	81	0	17.45	81.14		Medium strong, very thinly bedded to thinly bedded, brown SANDSTONE. Fractures are smooth, sub-horizontal with no infill [MILLSTONE GRIT GROUP].
		18.00 - 18.22		100	63	0				
		18.22 - 19.00		100	85	14	18.22	80.38		Weak to medium strong, very thinly bedded to thinly bedded, inter bedded SILTSTONE & SANDSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, smooth, with no infilling, no groundwater, and slight orange staining [MILLSTONE GRIT GROUP].
		19.30 19.00 - 20.00	C							
							20.00	78.60		End of borehole at 20.00 m

16 17 18 19 20

Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No. **BH2**

Sheet 1 of 4

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 106.23	Scale 1:25
Client: Brierstone Ltd		Dates: 20/03/2018 - 21/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.40	105.83		TOPSOIL
										Weak, yellow, brown, weathered sandstone (drillers description)
							2.00	104.23		
		2.00 - 3.00		57	57	48				Very strong, thinly bedded to medium bedded, brown SANDSTONE. Fractures are smooth, sub-horizontal with no infill [MILLSTONE GRIT GROUP].
		3.00 - 3.50		68	68	68				
							3.50	102.73		
		3.50 - 4.00		88	88	88				Extremely weak, thinly laminated, grey, MUDSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, with no infilling, and slight orange staining [MILLSTONE GRIT GROUP].
		4.00 - 4.40		100	100	0				
							4.40	101.83		
		4.40 - 4.80		95	95	52				Weak to strong, laminated to thinly bedded SANDSTONE. Fractures are smooth, sub-horizontal with no infill [MILLSTONE GRIT GROUP].
							4.80	101.43		
		4.80 - 5.00		89	0	0				Extremely weak, thinly laminated, grey, MUDSTONE. Fractures are extremely closely
							5.00	101.23		

Continued on next sheet

1 2 3 4 5

Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No. **BH2**

Sheet 2 of 4

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 106.23	Scale 1:25
Client: Brierstone Ltd		Dates: 20/03/2018 - 21/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										spaced to closely spaced, sub-horizontal, with no infilling, no groundwater, and slight orange staining [MILLSTONE GRIT GROUP].
		5.00 - 6.00		100	90	12				Extremely weak to very weak, laminated to thinly bedded, brown SILTSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, with no infilling, no groundwater, and slight orange staining [MILLSTONE GRIT GROUP].
		6.00 - 7.00		86	51	11				
		7.00 - 8.00		79	71	30				
		8.00 - 9.00		89	78	27	8.00	98.23		Extremely weak, thinly laminated, grey, MUDSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, with no infilling, no groundwater, and slight orange staining [MILLSTONE GRIT GROUP].
		9.00 - 10.00		95	54	14				

Continued on next sheet

6 7 8 9 10

Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No. **BH2**

Sheet 3 of 4

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 106.23	Scale 1:25
Client: Brierstone Ltd		Dates: 20/03/2018 - 21/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		10.00 - 11.00		83	83	34				
		11.00 - 11.60		100	100	58				
		11.60 - 12.00		100	100	50	11.60	94.63		Strong, very thinly bedded to thinly bedded SANDSTONE. Fractures are smooth, sub-horizontal with no infill and no groundwater [MILLSTONE GRIT GROUP].
		12.00 - 13.00		79	9	22				
		13.00 - 13.47		100	78	57				
		13.47 - 14.00		81	35	0	13.47	92.76		Extremely weak, thinly laminated to thinly bedded, brown SILTSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, with no infilling, no groundwater, and slight orange staining [MILLSTONE GRIT GROUP].
		14.00 - 15.50		73	50	41				

Continued on next sheet

Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No.
BH2
Sheet 4 of 4

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 106.23	Scale 1:25
Client: Brierstone Ltd		Dates: 20/03/2018 - 21/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							15.25	90.98		Extremely weak, thinly laminated, grey, MUDSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, with no infilling, no groundwater, and slight orange staining [MILLSTONE GRIT GROUP].
		15.50 - 17.00		86	56	20	15.50	90.73		Weak to strong, very thinly bedded to thinly bedded, brown SILTSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, with no infilling, no groundwater, and slight orange staining [MILLSTONE GRIT GROUP].
		17.00 - 18.50		93	93	76	17.10	89.13		Very strong, thinly bedded SANDSTONE. Fractures are smooth, stepped, sub-horizontal with no infill and dry [MILLSTONE GRIT GROUP].
							18.40	87.83		Extremely weak, thinly laminated, grey, MUDSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, stepped, with no infilling, no groundwater, and slight orange staining [MILLSTONE GRIT GROUP].
		18.50 - 20.00		91	70	17	18.50	87.73		Weak to strong, laminated to thinly bedded SANDSTONE. Fractures are smooth, stepped, sub-horizontal with no infill and dry [MILLSTONE GRIT GROUP].
							20.00	86.23		End of borehole at 20.00 m

16 17 18 19 20

Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No.
BH3
Sheet 1 of 5

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 99.43	Scale 1:25
Client: Brierstone Ltd		Dates: 21/03/2018 - 22/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.40	99.03		TOPSOIL
							1.00	98.43		Yellow/brown, weathered sandstone (drillers description)
							1.35	98.08		Medium strength, thinly bedded, brown Sandstone COBBLES
							1.66	97.77		Soft, brown, very sandy CLAY
		1.66 - 1.76		100	10	0	1.76	97.67		Weak to medium strong, laminated SANDSTONE. Fractures are smooth, stepped, sub-horizontal with no infill [MILLSTONE GRIT GROUP].
		1.76 - 2.50		32	10	0	2.50	96.93		Extremely weak, thinly laminated, grey, MUDSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, with no infilling, and slight orange staining [MILLSTONE GRIT GROUP].
		2.50 - 4.00		92	52	20				Extremely weak, thinly laminated to very thinly bedded, brown, MUDSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, with no infilling, and slight orange staining [MILLSTONE GRIT GROUP].
		4.00 - 5.50		74	50	25				

1 2 3 4 5

Continued on next sheet

Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No.
BH3
Sheet 2 of 5

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 99.43	Scale 1:25
Client: Brierstone Ltd		Dates: 21/03/2018 - 22/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		5.50 - 7.00		81		17				
		7.00 - 8.50		96	59	24				
							8.50	90.93		Weak to strong, very thinly bedded to thinly bedded SANDSTONE. Fractures are smooth, sub-horizontal with no infill [MILLSTONE GRIT GROUP].
		8.50 - 10.00		99	82	36				

6 7 8 9 10

Continued on next sheet

Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No.
BH3
Sheet 3 of 5

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 99.43	Scale 1:25
Client: Brierstone Ltd		Dates: 21/03/2018 - 22/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		10.00 - 11.50		98	70	30				
		11.50 - 13.00		95	91	40	11.45	87.98		Very weak, very thinly bedded to thinly bedded, grey SILTSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, with no infilling, and slight orange staining [MILLSTONE GRIT GROUP].
		13.00 - 14.50		94	94	47				
							14.50	84.93		Weak to strong, very thinly bedded to thinly bedded SANDSTONE. Fractures are smooth, sub-horizontal with no infill [MILLSTONE GRIT GROUP].

Continued on next sheet

11
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Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No.
BH3
Sheet 4 of 5

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 99.43	Scale 1:25
Client: Brierstone Ltd		Dates: 21/03/2018 - 22/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		14.50 - 16.00		90	86	50				
		16.00 - 17.50		91	66	46				
		17.50 - 19.00		71	71	30				
		19.00 - 20.50		86	62	6				
							20.00	79.43		Continued on next sheet

16
17
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19
20

Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No.
BH3
Sheet 5 of 5

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 99.43	Scale 1:25
Client: Brierstone Ltd		Dates: 21/03/2018 - 22/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										End of borehole at 20.50 m

21
22
23
24
25

Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No.
BH4
Sheet 1 of 4

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 96.68	Scale 1:25
Client: Brierstone Ltd		Dates: 25/03/2018 - 25/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										MADE GROUND: Fill
							1.60	95.08		Yellow/brown, weathered SANDSTONE [ROUGH ROCK]
		2.00 - 3.50		93	66	35	2.10	94.58		Very weak to weak, thinly bedded to medium bedded, brown SILTSTONE. Fractures are extremely closely spaced to closely spaced, sub-horizontal, with no infilling, no groundwater, and slight orange staining [MILLSTONE GRIT GROUP].
		3.50 - 5.00		85	80	20				
										Continued on next sheet

1 2 3 4 5

Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No.
BH4
Sheet 2 of 4

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 96.68	Scale 1:25
Client: Brierstone Ltd		Dates: 25/03/2018 - 25/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		5.00 - 6.50		95	70	22				
		6.50 - 8.00		96	57	33				
		8.00 - 9.50		60	27	8				

6
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8
9
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Continued on next sheet

Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No.
BH4
Sheet 3 of 4

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 96.68	Scale 1:25
Client: Brierstone Ltd		Dates: 25/03/2018 - 25/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		9.50 - 11.00		88	62	26				
		11.00 - 12.50		94	69	22				
		12.50 - 14.00		95	78	26				
		14.00 - 15.50		84	75	17	13.00	83.68		Medium strong to very strong, thinly bedded to medium bedded SANDSTONE. Fractures are smooth, sub-horizontal with no infill and no groundwater [MILLSTONE GRIT GROUP].

11
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14
15

Continued on next sheet

Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Rotary Core Log

Borehole No.
BH4
Sheet 4 of 4

Project Name: Scapegoat Hill	Project No. Scapegoat Hill	Co-ords: -	Hole Type RC
Location: Scapegoat Hill		Level: 96.68	Scale 1:25
Client: Brierstone Ltd		Dates: 25/03/2018 - 25/03/2018	Logged By

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		15.50 - 17.00		86	79	28				
		17.00 - 18.50			18	0				
		18.50 - 20.00								
							20.00	76.68		End of borehole at 20.00 m

16
17
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Remarks
No groundwater encountered.

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No **TP1**

Sheet 1 of 1

Project Name: Scapegoat Hill	Project No. 40706	Co-ords: - Level:	Date 14/03/2018
Location: Scapegoat Hill, Golcar, Near Huddersfield		Dimensions (m): Depth 1.70	Scale 1:25
Client: Brierstone Ltd			Logged CL

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.15	ES		0.10			Very soft, black, sandy, organic rich, TOPSOIL, with numerous plant roots.
							Very soft, black, organic rich, sandy, peaty, slightly gravelly, TOPSOIL. Gravel is fine to coarse, sub-angular and sub-rounded, sandstone.
				0.45			Medium dense, light brown, very gravelly, slightly clayey, SAND. Gravel is fine to coarse, angular to sub-rounded, sandstone.
	0.60	ES					
	0.70	D					
	1.30	ES					
	1.35	D					
				1.70			Sandstone bedrock.
				1.71			*Smooth hardrock, likely sandstone bedrock.* End of pit at 1.70 m

Remarks: No Groundwater Encountered. Partial collapse of sides at all depths during excavation.

Stability: Partial collapse of sides at all depths during excavations.

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP2
Sheet 1 of 1

Project Name: Scapegoat Hill	Project No. 40706	Co-ords: - Level:	Date 14/03/2018
Location: Scapegoat Hill, Golcar, Near Huddersfield		Dimensions (m): Depth 1.65	Scale 1:25
Client: Brierstone Ltd			Logged CL

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.30	ES		0.40			Soft, black/dark brown, organic rich, sandy, slightly gravelly, containing numerous plant roots, TOPSOIL. Gravel is medium and coarse, sub-rounded, sandstone.
	1.00 1.00	D ES		1.65 1.65			Medium dense, orange/light brown, very gravelly, slightly clayey, SAND. Gravel is fine to coarse, including cobbles, angular to sub-rounded, sandstone. SANDSTONE bedrock. End of pit at 1.65 m

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Remarks: No Groundwater Encountered. Partial collapse of sides of pit below 0.40m bgl.

Stability: Partial collapse of sides of pit below 0.40m bgl.

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No **TP3**

Sheet 1 of 1

Project Name: Scapegoat Hill	Project No. 40706	Co-ords: - Level:	Date 14/03/2018
Location: Scapegoat Hill, Golcar, Near Huddersfield		Dimensions (m): Depth 1.80	Scale 1:25
Client: Brierstone Ltd			Logged CL

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Soft, black/dark brown, sandy, slightly gravelly, organic rich, TOPSOIL, with numerous plant roots. Gravel is fine to coarse, angular and sub-angular, brick and sandstone.
				0.75			MADE GROUND: Medium dense, dark brown, clayey, slightly silty, gravelly, SAND. Gravel is fine to course, including cobbles, angular to sub-rounded, sandstone, brick and glass.
				1.60			Medium dense, orange, slightly clayey, very gravelly, SAND. Gravel is fine to coarse, including cobbles, angular to sub-rounded, sandstone.
				1.80			Weathered mudstone bedrock. Recovered as stiff, grey, fissured, CLAY.
							End of pit at 1.80 m

1 2 3 4 5

Remarks: No Groundwater Encountered. Partial collapse on one side of the pit between 0.75m and 1.00m bgl.

Stability:

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No **TP4**

Sheet 1 of 1

Project Name: Scapegoat Hill	Project No. 40706	Co-ords: - Level:	Date 14/03/2018
Location: Scapegoat Hill, Golcar, Near Huddersfield		Dimensions (m): Depth 1.55	Scale 1:25
Client: Brierstone Ltd			Logged CL

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.35	ES					Soft, black/dark brown, organic rich, with numerous plant roots, slightly sandy, rarely gravelly, TOPSOIL. Gravel is medium and coarse, sub-angular, sandstone. Also, containing sandstone cobbles and boulders to 0.40m. Plastic noted at 0.35m bgl.
	0.85 0.90	D ES		0.80			Medium dense, orange/light brown, slightly clayey, very gravelly, SAND. Gravel is fine to coarse, angular to sub-rounded, sandstone.
	1.40 1.40	D ES		1.35 1.55			Weathered mudstone bedrock. Recovered as dense, grey, clayey, compact fissured, slightly gravelly, SAND. Gravel is medium, sub-angular and sub-rounded, sandstone. End of pit at 1.55 m

1 2 3 4 5

Remarks: No Groundwater Encountered. Stable.

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No **HP1**

Sheet 1 of 1

Project Name: Scapegoat Hill	Project No. 40706	Co-ords: - Level:	Date 14/03/2018
Location: Scapegoat Hill, Golcar, Near Huddersfield		Dimensions (m): Depth 0.75	Scale 1:25
Client: Brierstone Ltd			Logged CL

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.30	ES					Very soft, black, organic rich, sandy, slightly gravelly, TOPSOIL. Gravel is medium and coarse, sub-rounded, sandstone.
				0.50			
	0.60	ES					Medium dense, light brown, slightly clayey, gravelly, SAND. Gravel is fine to coarse, including cobbles, sub-angular and sub-rounded, sandstone.
	0.70	D		0.75			End of pit at 0.75 m

Remarks: No Groundwater Encountered.

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
HP2
Sheet 1 of 1

Project Name: Scapegoat Hill	Project No. 40706	Co-ords: - Level:	Date 14/03/2018
Location: Scapegoat Hill, Golcar, Near Huddersfield		Dimensions (m): Depth 1.00	Scale 1:25
Client: Brierstone Ltd			Logged CL

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.40	ES		0.45			Very soft, black/dark brown, organic rich with numerous plant roots, sandy, slightly gravelly TOPSOIL. Gravel is medium and coarse, sub-angular and sub-rounded, sandstone.
	0.70 0.70	D ES		1.00			Medium dense, light brown/orange, clayey, gravelly, SAND. Gravel is fine to coarse, angular and sub-angular, mudstone.
							End of pit at 1.00 m

1
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Remarks: No Groundwater Encountered.

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
HP3
Sheet 1 of 1

Project Name: Scapegoat Hill	Project No. 40706	Co-ords: - Level:	Date 14/03/2018
Location: Scapegoat Hill, Golcar, Near Huddersfield		Dimensions (m): Depth 0.60	Scale 1:25
Client: Brierstone Ltd			Logged CL

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.35			Very soft, black/dark brown, slightly organic rich, rarely gravelly TOPSOIL. Gravel is coarse, sub-angular, sandstone
	0.50 0.50	D ES		0.60			Medium dense, orange/light brown, clayey, very gravelly, SAND. Gravel is fine to coarse, including cobbles, angular to sub-rounded, sandstone.
							End of pit at 0.60 m

Remarks: No Groundwater Encountered.

Stability: Stable

AGS

APPENDIX E

LABORATORY TEST RESULTS: GEOTECHNICAL

LABORATORY REPORT

4043

Contract Number: PSL18/1521

Report Date: 19 April 2018

Client's Reference: 40706

Client Name: Alan Wood & Partners
Hallamshire House
Hayland Street
Sheffield
S9 1BY

For the attention of: Sam Thomas

Contract Title: Scape Goat Hill

Date Received: 4/4/2018
Date Commenced: 4/4/2018
Date Completed: 19/4/2018

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)
	Redacted	
L Knight (Senior Technician)	S Eyre (Senior Technician)	A Fry (Senior Technician)

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tel: Redacted
fax:
e-m

DETERMINATION OF UNCONFINED COMPRESSIVE STRENGTH

ISRM Suggested Methods, pp 111 –116, 1981.

Hole Number	Sample Number	Sample Type	Top Depth (m)	Base Depth (m)	Sample Diameter (mm)	Sample Length (mm)	Height Ratio	Initial Mass (g)	Bulk Density (Mg/m)	Moisture Content (%)	Dry Density (Mg/m)	Load Failure (kN)	UCS (MPa)	Failure Mode	Date Tested	Remarks
BH1		C	7.50	7.65	72	122	1.7	1206	2.43	6.2	2.29	17.2	4.2	Brittle	18/04/18	
BH2		C	3.50	3.85	72	194	2.7	1807	2.29	9.4	2.09	41.4	10.2	Brittle	18/04/18	
BH4		C	15.80		72	168	2.3	1744	2.55	4.2	2.45	109.2	26.8	Brittle	18/04/18	

Professional Soils Laboratory

Scape Goat Hill

Contract No:
PSL18/1521
Client Ref:
40706/S2331

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH1	9.50		A	Perp	72	44	3168	4033.62	63.51	-	0.35	0.09	1.114	0.10	Valid	
BH1	13.35		A	Perp	72	37	2664	3391.91	58.24	-	0.47	0.14	1.071	0.15	Valid	
BH1	17.47		I	Par	72	46	3312	4216.97	64.94	-	2.19	0.52	1.125	0.58	Valid	
BH1	17.47		A	Perp	72	36	2592	3300.24	57.45	-	2.78	0.84	1.064	0.90	Valid	
BH2	8.80		A	Perp	72	30	2160	2750.20	52.44	-	0.40	0.15	1.022	0.15	Valid	
BH2	14.40		A	Perp	72	44	3168	4033.62	63.51	-	0.20	0.05	1.114	0.06	Valid	
BH2	18.80		A	Perp	72	43	3096	3941.95	62.78	-	0.58	0.15	1.108	0.16	Valid	
BH3	5.10		A	Perp	72	26	1872	2383.50	48.82	-	0.26	0.11	0.989	0.11	Valid	
BH3	12.70		A	Perp	72	28	2016	2566.85	50.66	-	0.56	0.22	1.006	0.22	Valid	
BH3	16.80		A	Perp	72	39	2808	3575.26	59.79	-	2.51	0.70	1.084	0.76	Valid	
BH4	4.90		A	Perp	72	26	1872	2383.50	48.82	-	0.10	0.04	0.989	0.04	Valid	
BH4	11.30		A	Perp	72	30	2160	2750.20	52.44	-	0.39	0.14	1.022	0.14	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL Professional Soils Laboratory

Scape Goat Hill

Contract No:

PSL18/1521

Client Ref:

40706/S2331

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH1	9.50		D	Par	-	72	5184	72.00	-	0.23	0.044	1.178	0.05	Valid	
BH1	13.35		D	Par	-	72	5184	72.00	-	0.65	0.125	1.178	0.15	Valid	
BH2	8.80		D	Par	-	72	5184	72.00	-	0.50	0.096	1.178	0.11	Valid	
BH2	14.40		D	Par	-	72	5184	72.00	-	0.29	0.056	1.178	0.07	Valid	
BH2	18.80		D	Par	-	72	5184	72.00	-	0.35	0.068	1.178	0.08	Valid	
BH3	12.70		D	Par	-	72	5184	72.00	-	0.70	0.135	1.178	0.16	Valid	
BH3	16.80		D	Par	-	72	5184	72.00	-	0.84	0.162	1.178	0.19	Valid	
BH4	4.90		D	Par	-	72	5184	72.00	-	0.05	0.010	1.178	0.01	Valid	
BH4	11.30		D	Par	-	72	5184	72.00	-	0.15	0.029	1.178	0.03	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

UKAS TESTING 4043

PSL Professional Soils Laboratory

Scape Goat Hill

Contract No:

PSL18/1521

Client Ref:

40706/S2331

LABORATORY REPORT

4043

Contract Number: PSL18/1272

Report Date: 06 April 2018

Client's Reference:

Client Name: Alanwood & Partners
Hallamshire House
Hayland Street
Sheffield
S9 1BY

For the attention of: Andy Borthwick

Contract Title: Scapegoat Hill

Date Received: 19/3/2018
Date Commenced: 19/3/2018
Date Completed: 6/4/2018

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)
	Redacted	
L Knight (Senior Technician)	C Marshall (Laboratory Manager)	A Fry (Senior Technician)

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.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
HP1		D	0.70		Brown very gravelly SAND.

UKAS TESTING 4043	PSL Professional Soils Laboratory	Scapegoat Hill	Contract No: PSL18/1272 Client Ref:

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
HP1		D	0.70		17				NP			

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

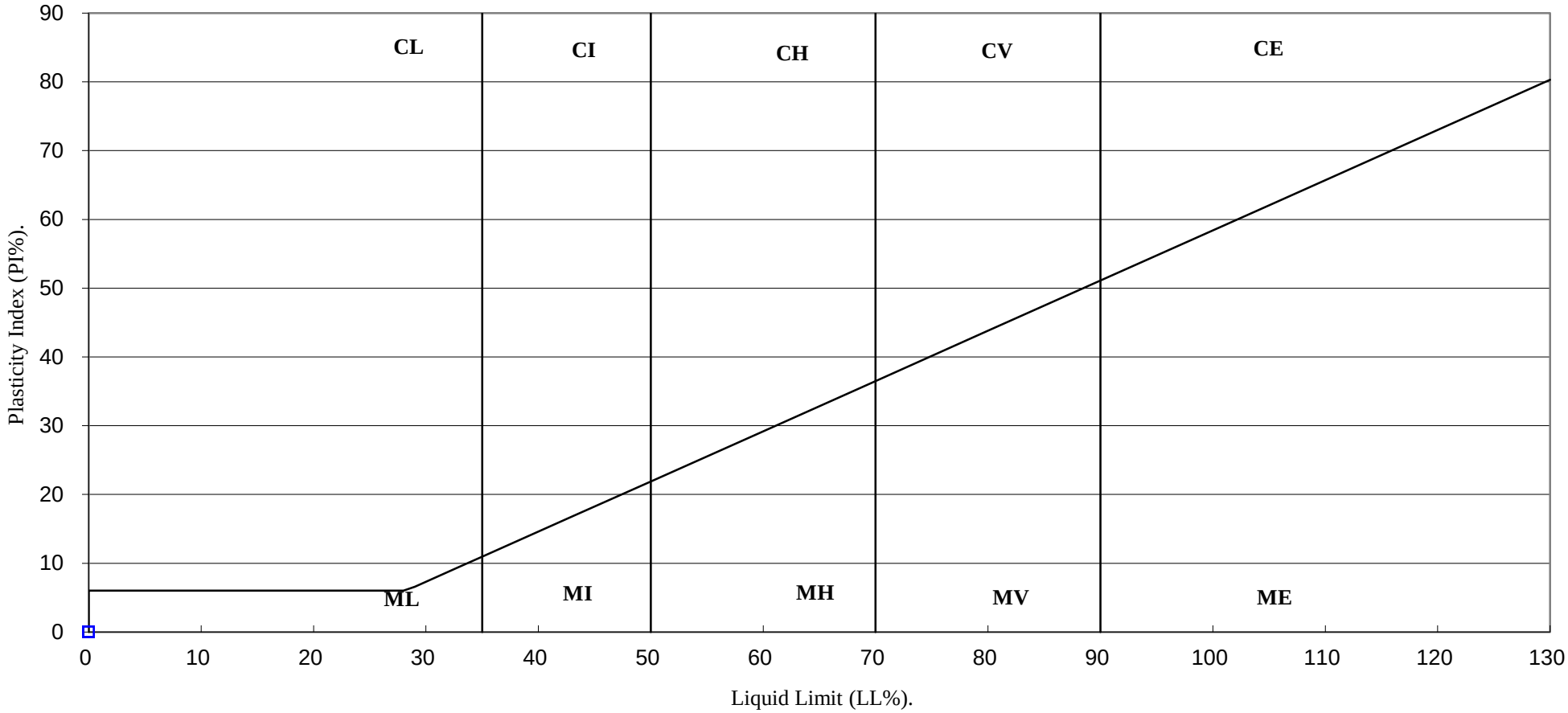
Scapegoat Hill

Contract No:

PSL18/1272

Client Ref:

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	**Scapegoat Hill**	**Contract No:**
			PSL18/1272
			Client Ref:
			0

APPENDIX F

LABORATORY TEST RESULTS: CHEMICAL

2531

ANALYTICAL TEST REPORT

Contract no:	70709
Contract name:	Scapegoat Hill
Client reference:	-
Clients name:	Alan Wood & Partners
Clients address:	Hallamshire House Hayland Street Sheffield S9 1BY
Samples received:	16 March 2018
Analysis started:	22 March 2018
Analysis completed	04 April 2018
Report issued:	04 April 2018

Notes:

Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, without prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key:

U UKAS accredited test
M MCERTS & UKAS accredited test
$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAD No Asbestos Detected

Redacted

Approved by:

James Spittle
Customer Services Team Leader

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
70709-1	HP1 E1	0.30	Clayey Sand with Roots	-	-	31.7
70709-2	HP2 E1	0.40	Clayey Sand with Roots	-	-	22.3
70709-3	HP3 E1	0.20	Clayey Sand with Roots & Gravel	-	-	37.7
70709-4	TP1 E1	0.15	Clayey Sand with Roots	-	-	23.0
70709-5	TP1 E3	1.30	Sand with Gravel	-	-	13.2
70709-6	TP2 E1	0.30	Clayey Sand with Roots	-	-	26.9
70709-7	TP2 E2	1.00	Sand with Gravel	-	-	13.4
70709-8	TP3 E1	0.15	Calayey Sand with Gravel & Slag	-	-	24.1
70709-9	TP3 E3	0.60	Calayey Sand with Gravel & Slag	-	-	24.4
70709-10	TP4 E1	0.35	Sand with Gravel	-	-	24.1
70709-11	TP4 E3	1.40	Sandy Clay with Gravel	-	-	13.0

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SOILS

Lab number			70709-1	70709-2	70709-3	70709-4	70709-5	70709-6
Sample id			HP1 E1	HP2 E1	HP3 E1	TP1 E1	TP1 E3	TP2 E1
Depth (m)			0.30	0.40	0.20	0.15	1.30	0.30
Date sampled			14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018
Test	Method	Units						
Arsenic (total)	CE127 M	mg/kg As	16	20	20	24	2.7	19
Boron (water soluble)	CE063 M	mg/kg B	0.7	<0.5	5.3	0.6	<0.5	<0.5
Cadmium (total)	CE127 M	mg/kg Cd	<0.2	0.2	0.4	0.3	<0.2	0.3
Chromium (total)	CE127 M	mg/kg Cr	61	123	81	118	123	114
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	24	31	41	28	5.9	41
Lead (total)	CE127 M	mg/kg Pb	77	99	147	99	17	281
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE127 M	mg/kg Ni	8.2	13	15	15	13	15
Selenium (total)	CE127 M	mg/kg Se	0.7	0.8	3.2	1.1	0.6	1.0
Zinc (total)	CE127 M	mg/kg Zn	17	38	62	31	27	70
pH	CE004 M	units	4.6	4.9	4.0	4.4	4.7	4.8
Sulphate (2:1 water soluble)	CE061 M	mg/l SO_4	17	16	770	42	19	18
Sulphate (total)	CE062 M	mg/kg SO_4	1481	928	3128	1061	276	1265
Sulphide	CE079	mg/kg S^{2-}	<10	<10	<10	<10	<10	<10
Cyanide (free)	CE077	mg/kg CN	<1	<1	<1	<1	<1	<1
Cyanide (total)	CE077	mg/kg CN	<1	<1	<1	<1	<1	<1
Thiocyanate	CE145 M	mg/kg SCN	<1	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Organic Carbon (TOC)	CE072 M	% w/w C	3.75	3.41	4.03	3.56	0.25	3.63
Estimate of OMC (calculated from TOC)	CE072 M	% w/w	6.47	5.88	6.95	6.14	0.43	6.26
PAH								
Naphthalene	CE087 M	mg/kg	0.12	0.04	0.18	<0.01	<0.01	0.15
Acenaphthylene	CE087 M	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	0.19
Acenaphthene	CE087 M	mg/kg	0.03	<0.01	0.15	<0.01	<0.01	0.13
Fluorene	CE087 U	mg/kg	<0.01	<0.01	0.10	<0.01	<0.01	0.23
Phenanthrene	CE087 M	mg/kg	0.45	0.17	1.95	0.11	<0.02	4.42
Anthracene	CE087 U	mg/kg	0.12	0.05	0.48	0.03	<0.02	0.92
Fluoranthene	CE087 M	mg/kg	0.61	0.35	4.56	0.13	<0.02	6.83
Pyrene	CE087 M	mg/kg	0.56	0.33	3.89	0.12	<0.02	5.49
Benzo(a)anthracene	CE087 U	mg/kg	0.32	0.24	1.81	0.10	0.03	2.64
Chrysene	CE087 M	mg/kg	0.31	0.22	1.86	0.08	<0.01	2.68
Benzo(b)fluoranthene	CE087 M	mg/kg	0.33	0.28	2.16	0.08	<0.02	3.41
Benzo(k)fluoranthene	CE087 M	mg/kg	0.20	0.11	1.06	0.03	<0.02	1.51
Benzo(a)pyrene	CE087 U	mg/kg	0.28	0.22	1.83	0.07	<0.02	2.78
Indeno(123cd)pyrene	CE087 M	mg/kg	0.14	0.11	0.98	<0.02	<0.02	1.54
Dibenz(ah)anthracene	CE087 M	mg/kg	0.03	<0.02	0.25	<0.02	<0.02	0.39
Benzo(ghi)perylene	CE087 M	mg/kg	0.20	0.16	1.08	0.06	<0.02	1.67
PAH (total of USEPA 16)	CE087	mg/kg	3.72	2.28	22.32	0.80	<0.27	34.99
Pesticides								
Organochlorine pesticides	CE065	mg/kg	<0.01	-	<0.01	-	-	<0.01

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SOILS

Lab number			70709-1	70709-2	70709-3	70709-4	70709-5	70709-6
Sample id			HP1 E1	HP2 E1	HP3 E1	TP1 E1	TP1 E3	TP2 E1
Depth (m)			0.30	0.40	0.20	0.15	1.30	0.30
Date sampled			14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018
Test	Method	Units						
Organophosphate pesticides	CE065	mg/kg	<0.01	-	<0.01	-	-	<0.01
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

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SOILS

Lab number			70709-7	70709-8	70709-9	70709-10	70709-11
Sample id			TP2 E2	TP3 E1	TP3 E3	TP4 E1	TP4 E3
Depth (m)			1.00	0.15	0.60	0.35	1.40
Date sampled			14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018
Test	Method	Units					
Arsenic (total)	CE127 M	mg/kg As	1.4	14	39	22	4.6
Boron (water soluble)	CE063 M	mg/kg B	<0.5	0.6	0.9	<0.5	<0.5
Cadmium (total)	CE127 M	mg/kg Cd	<0.2	0.3	0.5	0.2	<0.2
Chromium (total)	CE127 M	mg/kg Cr	75	60	99	86	66
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	3.4	19	39	39	27
Lead (total)	CE127 M	mg/kg Pb	12	132	464	112	47
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE127 M	mg/kg Ni	12	15	30	13	35
Selenium (total)	CE127 M	mg/kg Se	0.6	0.6	1.4	0.8	1.1
Zinc (total)	CE127 M	mg/kg Zn	37	53	146	29	84
pH	CE004 M	units	4.8	6.6	7.6	4.7	5.2
Sulphate (2:1 water soluble)	CE061 M	mg/l SO_4	22	32	44	35	17
Sulphate (total)	CE062 M	mg/kg SO_4	266	1236	1875	1175	243
Sulphide	CE079	mg/kg S^{2-}	<10	<10	<10	<10	<10
Cyanide (free)	CE077	mg/kg CN	<1	<1	<1	<1	<1
Cyanide (total)	CE077	mg/kg CN	<1	<1	<1	<1	<1
Thiocyanate	CE145 M	mg/kg SCN	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5
Total Organic Carbon (TOC)	CE072 M	% w/w C	0.17	3.46	3.84	3.93	1.00
Estimate of OMC (calculated from TOC)	CE072 M	% w/w	0.29	5.97	6.62	6.78	1.72
PAH							
Naphthalene	CE087 M	mg/kg	<0.01	0.06	0.09	0.07	<0.01
Acenaphthylene	CE087 M	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	CE087 M	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	CE087 U	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	CE087 M	mg/kg	<0.02	0.18	0.27	0.19	0.04
Anthracene	CE087 U	mg/kg	<0.02	0.06	0.07	0.05	<0.02
Fluoranthene	CE087 M	mg/kg	<0.02	0.45	0.56	0.27	0.09
Pyrene	CE087 M	mg/kg	<0.02	0.43	0.54	0.26	0.09
Benzo(a)anthracene	CE087 U	mg/kg	0.03	0.35	0.47	0.19	0.08
Chrysene	CE087 M	mg/kg	<0.01	0.28	0.42	0.16	0.05
Benzo(b)fluoranthene	CE087 M	mg/kg	<0.02	0.43	0.90	0.19	0.08
Benzo(k)fluoranthene	CE087 M	mg/kg	<0.02	0.14	0.27	0.09	0.04
Benzo(a)pyrene	CE087 U	mg/kg	<0.02	0.28	0.41	0.15	0.06
Indeno(123cd)pyrene	CE087 M	mg/kg	<0.02	0.14	0.24	0.05	<0.02
Dibenz(ah)anthracene	CE087 M	mg/kg	<0.02	0.03	0.06	<0.02	<0.02
Benzo(ghi)perylene	CE087 M	mg/kg	0.04	0.21	0.33	0.10	0.04
PAH (total of USEPA 16)	CE087	mg/kg	<0.27	3.05	4.63	1.78	0.56
Pesticides							
Organochlorine pesticides	CE065	mg/kg	-	-	-	-	-

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SOILS

Lab number			70709-7	70709-8	70709-9	70709-10	70709-11
Sample id			TP2 E2	TP3 E1	TP3 E3	TP4 E1	TP4 E3
Depth (m)			1.00	0.15	0.60	0.35	1.40
Date sampled			14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018
Test	Method	Units					
Organophosphate pesticides	CE065	mg/kg	-	-	-	-	-
Subcontracted analysis							
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD

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PREPARED LEACHATES

Lab number			70709-1L	70709-2L	70709-3L	70709-4L	70709-6L	70709-10L
Sample id			HP1 E1	HP2 E1	HP3 E1	TP1 E1	TP2 E1	TP4 E1
Depth (m)			0.30	0.40	0.20	0.15	0.30	0.35
Test	Method	Units						
Arsenic (dissolved)	CE128 U	µg/l As	10.89	5.24	8.89	5.64	4.77	2.67
Boron (dissolved)	CE128 U	µg/l B	<6	<6	<6	<6	<6	<6
Cadmium (dissolved)	CE128 U	µg/l Cd	0.09	<0.07	0.13	0.08	0.07	0.09
Chromium (dissolved)	CE128 U	µg/l Cr	1.0	1.0	2.1	1.2	0.7	0.6
Chromium VI (dissolved)	CE050 U	µg/l CrVI	<10	<10	<10	<10	<10	<10
Copper (dissolved)	CE128 U	µg/l Cu	20.7	10.3	20.8	17.3	13.7	18.0
Lead (dissolved)	CE128 U	µg/l Pb	9.6	3.8	28.7	7.5	10.9	3.9
Mercury (dissolved)	CE128 U	µg/l Hg	0.063	0.058	0.046	0.046	0.017	0.023
Nickel (dissolved)	CE128 U	µg/l Ni	1.5	1.2	2.3	1.5	1.4	0.9
Selenium (dissolved)	CE128 U	µg/l Se	0.60	0.54	0.67	0.68	0.34	0.32
Zinc (dissolved)	CE128 U	µg/l Zn	8	12	22	12	18	9
pH	CE004 U	units	6.8	6.3	4.8	5.3	6.2	5.6
Sulphate	CE049 U	mg/l SO_4	<10	<10	<10	<10	<10	<10
Sulphide	CE079	µg/l S^{2-}	<100	<100	<100	<100	<100	<100
Cyanide (total)	CE147	µg/l CN	<20	<20	<20	<20	<20	<20
Thiocyanate	CE014	µg/l SCN	<200	<200	432	<200	<200	<200
Phenols (total)	CE148	µg/l PhOH	<10	12	<10	<10	<10	<10
PAH								
Naphthalene	CE051	µg/l	0.2	<0.1	<0.1	0.3	<0.1	<0.1
Acenaphthylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	CE051	µg/l	0.1	<0.1	<0.1	0.2	<0.1	<0.1
Anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	CE051	µg/l	0.2	0.2	0.2	<0.1	<0.1	0.2
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE063	Boron (water soluble)	Hot water extract, ICP-OES	Dry	M	0.5	mg/kg B
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
-	Chromium (III)	Calculation: Cr (total) - Cr (VI)	Dry		1	mg/kg CrIII
CE146	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO_4
CE062	Sulphate (total)	Acid extraction, ICP-OES	Dry	M	100	mg/kg SO_4
CE079	Sulphide	Extraction, Continuous Flow Colorimetry	Wet		10	mg/kg S^{2-}
CE077	Cyanide (free)	Extraction, Continuous Flow Colorimetry	Wet		1	mg/kg CN
CE077	Cyanide (total)	Extraction, Continuous Flow Colorimetry	Wet	M	1	mg/kg CN
CE145	Thiocyanate	Weak acid extraction, Colorimetry	Dry	M	1	mg/kg SCN
CE078	Phenols (total)	Extraction, Continuous Flow Colorimetry	Wet		0.5	mg/kg PhOH
CE072	Total Organic Carbon (TOC)	Removal of IC by acidification, Carbon Analyser	Dry	M	0.1	% w/w C
CE072	Estimate of OMC (calculated from TOC)	Calculation from Total Organic Carbon	Dry	M	0.1	% w/w
CE087	Naphthalene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	Wet	U	0.01	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	Wet		0.27	mg/kg
CE065	Organochlorine pesticides	Solvent extraction, GC-MS	Wet		0.01	mg/kg
CE065	Organophosphate pesticides	Solvent extraction, GC-MS	Wet		0.01	mg/kg
$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

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METHOD DETAILS

METHOD	PREPARED LEACHATES	METHOD SUMMARY	STATUS	LOD	UNITS
CE001	Leachate preparation (EA)	L:S 10:1		-	-
CE128	Arsenic (dissolved)	ICP-MS	U	0.06	µg/l As
CE128	Boron (dissolved)	ICP-MS	U	6	µg/l B
CE128	Cadmium (dissolved)	ICP-MS	U	0.07	µg/l Cd
CE128	Chromium (dissolved)	ICP-MS	U	0.2	µg/l Cr
CE050	Chromium VI (dissolved)	Colorimetry	U	10	µg/l CrVI
CE128	Copper (dissolved)	ICP-MS	U	0.4	µg/l Cu
CE128	Lead (dissolved)	ICP-MS	U	0.2	µg/l Pb
CE128	Mercury (dissolved)	ICP-MS	U	0.008	µg/l Hg
CE128	Nickel (dissolved)	ICP-MS	U	0.5	µg/l Ni
CE128	Selenium (dissolved)	ICP-MS	U	0.07	µg/l Se
CE128	Zinc (dissolved)	ICP-MS	U	1	µg/l Zn
CE004	pH	Based on BS 1377, pH Meter	U	-	units
CE049	Sulphate	Ion Chromatography	U	10	mg/l SO_4
CE079	Sulphide	Continuous Flow Colorimetry		100	µg/l S2-
CE147	Cyanide (total)	Continuous Flow Colorimetry		20	µg/l CN
CE014	Thiocyanate	Colorimetry		200	µg/l SCN
CE148	Phenols (total)	Continuous Flow Colorimetry		10	µg/l PhOH
CE051	PAH (speciated)	Solvent extraction, GC-MS		0.1	µg/l
CE051	PAH (total of USEPA 16)	Solvent extraction, GC-MS		1.6	µg/l

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DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
IT	Sample not cooled
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
70709-1	HP1 E1	0.30	N	
70709-2	HP2 E1	0.40	N	
70709-3	HP3 E1	0.20	N	
70709-4	TP1 E1	0.15	N	
70709-5	TP1 E3	1.30	N	
70709-6	TP2 E1	0.30	N	
70709-7	TP2 E2	1.00	N	
70709-8	TP3 E1	0.15	N	
70709-9	TP3 E3	0.60	N	
70709-10	TP4 E1	0.35	N	
70709-11	TP4 E3	1.40	N	

APPENDIX G

AWP Generic Assessment Criteria

Alan Wood & Partners
Generic Assessment Criteria for Soils

Revision Version: V.7 - September 2015

Parameter	Residential		Commercial	Allotment	Public Open Space near Residential land (POS_{res})	Public Park Land (POS_{park})	Source
	With Plant Uptake	Without Plant Uptake					
	1-6% SOM	1-6% SOM	1-6% SOM	1-6% SOM	1-6% SOM	1-6% SOM	
Metals/Metalloids [a]							
Arsenic (inorganic)	37	40	640	49	79	170	DEFRA C4SL [m]
Beryllium	1.7	1.7	12	35	2.2	63	LQM/CIEH [c]
Boron	290	11,000	240,000	45	21,000	46,000	LQM/CIEH [c]
Cadmium [d]	22	150	410	3.9	220	880	DEFRA C4SL [m]
Chromium (III)	910	910	8,600	18,000	1,500	33,000	LQM/CIEH [c]
Chromium (VI) [e]	21	21	49	170	21	250	DEFRA C4SL [m]
Copper	2,400	7,100	68,000	520	12,000	44,000	LQM/CIEH [c]
Lead [f]	200	310	2,300	80	630	1,300	DEFRA C4SL [m]
Mercury (inorganic)	40	58	1,100	19	120	240	LQM/CIEH [c]
Nickel	130	180	980	53	230	800	LQM/CIEH [c]
Selenium	250	430	12,000	88	1,100	1,800	LQM/CIEH [c]
Vanadium	410	1,200	9,000	91	2,000	5,000	LQM/CIEH [c]
Zinc	3,700	40,000	730,000	620	81,000	170,000	LQM/CIEH [c]
Other Inorganics							
pH	<5	<5	<5	<5	<5	<5	-
Total Sulphate	2400	2400	2400	2400	2400	2400	BRE (2005) [g]
Water-Soluble Sulphate	0.5g/l	0.5g/l	0.5g/l	0.5g/l	0.5g/l	0.5g/l	BRE (2005)

Parameter	Residential						Commercial [i]			Allotment			Public Open Space near Residential land (POS_{res})			Public Park Land (POS_{park})			
	With Plant Uptake			Without Plant Uptake															
	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	
Organics [h]																			
Acenaphthene	200	490	1,080	2,000	3,600	5,200	75,000	92,000	100,000	34	85	202	Subject to site specific assessment where required			Subject to site specific assessment where required			CLEA/LQM/CIEH
Acenaphthylene	170	400	900	2,000	3,600	5,200	76,000	92,000	100,000	28	68	163							CLEA/LQM/CIEH
Anthracene	2,300	5,400	10,700	30,000	34,000	36,000	520,000	530,000	540,000	380	947	2,239							CLEA/LQM/CIEH
Benzo(a)anthracene	7.5	11	13	12	14	15	170	170	180	2.9	6.5	13							CLEA/LQM/CIEH
Benzo(a)pyrene	2.2	2.7	3	3.2	3.2	3.2	35	35	36	3.6	3.7	3.7							CLEA/LQM/CIEH
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	44	45	45	1	2.2	3.9							CLEA/LQM/CIEH
Benzo(g,h,i)perylene	315	340	350	360	360	360	3,900	4,000	4,000	290	480	646							CLEA/LQM/CIEH
Benzo(k)fluoranthene	77	93	100	110	110	110	1,200	1,200	1,200	37	78	120							CLEA/LQM/CIEH
Chrysene	15	22	27	30	31	32	350	350	350	4.1	9.5	19							CLEA/LQM/CIEH
Dibenz(a,h)anthracene	0.24	0.28	0.30	0.31	0.32	0.32	3.5	3.6	3.6	0.14	0.37	0.44							CLEA/LQM/CIEH
Fluoranthene	280	560	850	1,500	1,600	1,600	23,000	23,000	23,000	52	127	288							CLEA/LQM/CIEH
Fluorene	165	390	850	2,200	3,400	4,200	60,000	67,000	70,000	27	67	158							CLEA/LQM/CIEH
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	500	510	510	9.5	21	40							CLEA/LQM/CIEH
Naphthalene	1	2.3	5.5	1	2.4	6	100	260	600	4	9.8	23							CLEA/LQM/CIEH
Phenanthrene	95.0	220	440	1,300	1,400	1,500	22,000	22,000	23,000	15	38	90							CLEA/LQM/CIEH
Pyrene	620	1,200	2,000	3,700	3,800	3,800	54,000	54,000	56,000	111	271	620							CLEA/LQM/CIEH
Aliphatic EC 5-6 (benzene)	24	40	80	24	40	80	2,400	4,000	8,000	752	1,730	3,900	Subject to site specific assessment where required			Subject to site specific assessment where required			CLEA/LQM/CIEH
Aliphatic EC >6-8 (toluene)	52	110	250	52	110	250	5,200	11,000	25,000	2,304	5,580	13,000							CLEA/LQM/CIEH
Aliphatic EC >8-10	13	30	70	13	30	70	1,300	3,000	7,000	321	770	1,700							CLEA/LQM/CIEH
Aliphatic EC >10-12	60	150	360	60	150	360	6,000	15,000	32,000	2,153	4,300	7,150							CLEA/LQM/CIEH
Aliphatic EC >12-16	500	1,200	2,600	500	1,200	2,600	42,000	72,000	90,000	10,800	12,400	13,200							CLEA/LQM/CIEH
Aliphatic EC >16-35	41,000	69,000	94,000	41,000	69,000	94,000	140,000	160,000	180,000	240,000	260,000	260,000							CLEA/LQM/CIEH
Aliphatic EC >35-44	41,000	69,000	94,000	41,000	69,000	94,000	140,000	160,000	180,000	240,000	260,000	260,000							CLEA/LQM/CIEH

Alan Wood & Partners
Generic Assessment Criteria for Soils

Revision Version: V.6 - April 2015

Alan Wood & Partners

Parameter	Residential						Commercial [i]			Allotment			Public Open Space near Residential land (POS_{res})			Public Park Land (POS_{park})			
	With Plant Uptake			Without Plant Uptake															
	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	
Organics contd.) [h]																			
Aromatic EC >5-7	50	110	240	155	300	630	16,000	28,000	56,000	12	25	57	Subject to site specific assessment where required			Subject to site specific assessment where required			CLEA/LQM/CIEH
Aromatic EC >7-8	100	240	560	370	800	1,800	33,000	68,000	130,000	21	50	117							CLEA/LQM/CIEH
Aromatic EC >8-10	20	50	110	20	53	125	2,000	5,000	120,000	8.6	21	50							CLEA/LQM/CIEH
Aromatic EC >10-12	63	150	340	120	280	650	11,000	22,000	31,000	12.5	31	74							CLEA/LQM/CIEH
Aromatic EC >12-16	140	320	680	1,100	1,900	2,300	35,000	37,000	38,000	23	57	134							CLEA/LQM/CIEH
Aromatic EC >16-21	260	540	930	1,800	1,900	1,900	28,000	28,000	28,000	47	112	260							CLEA/LQM/CIEH
Aromatic EC >21-35	1,100	1,400	1,700	1,900	1,900	1,900	28,000	28,000	28,000	370	820	1,500							CLEA/LQM/CIEH
Aromatic EC >35-44	1,100	1,400	1,700	1,900	1,900	1,900	28,000	28,000	28,000	370	820	1,500							CLEA/LQM/CIEH
Benzene	0.06	0.13	0.30	0.16	0.30	0.64	15	28	57	0.016	0.033	0.073	Subject to site specific assessment where required			Subject to site specific assessment where required			CLEA/LQM/CIEH
Toluene	104	240	550	370	830	1800	33,000	68,000	130,000	22	50	117							CLEA/LQM/CIEH
Ethylbenzene	30	62	150	34	81	190	3,200	7,000	16,000	16	38	91							CLEA/LQM/CIEH
o-xylene	30	70	170	40	90	200	3,700	8,000	19,000	28	67	160							CLEA/LQM/CIEH
m-xylene	30	70	160	34	80	190	3,400	8,000	18,000	30	74	170							CLEA/LQM/CIEH
p-xylene	30	70	160	33	80	190	3,200	8,000	17,000	28	69	160							CLEA/LQM/CIEH

NOTES

- All values are rounded to 1 or 2 significant figures. All values mg/kg unless otherwise stated.

(a) Generic Assessment Criteria presented by DEFRA (2014) and LQM/CIEH (2015) for metals are not sensitive to Soil Organic Matter content and may be applied directly across the SOM range 1-6% for the land uses given.

(b) Final Category 4 Screening Levels given in DEFRA SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination - Policy Companion Document, December 2014. Calculated for sandy loam soils with 6% SOM.

(c) Nathanial, C.P., McCaffrey, C., Gillett, A.C., Ogden, R.C. And Nathanial, J.F. (2015). The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham. Publication Number **S4UL3286**.

(d) GAC for cadmium are calculated for soils with pH values between 6 and 8. Care should be applied when using the GAC values outside this range and particularly below 5.

(e) Additional site specific risk assessment may be required where elevated concentrations of Chromium (VI) are measured on site.

(f) DEFRA (2014) indicate that the BGS have derived 'normal' background lead concentrations for England & Wales. In England normal background concentrations are 180mg/kg for the principal domain, 2400mg/kg for the mineralisation domain and 820mg/kg for the urban domain (DEFRA, 2012). Calculated C4SL values to be adopted for residential, allotment and POS_{res} are lower therefore than the 'normal' background concentration of lead in urban areas.

(g) BRE (2005) Special Digest 1, 3rd Edition 'Concrete in Aggressive Ground'. GAC is the upper limit for DS-1 sulphate class concrete.

(h) Organic contaminant GAC values calculated using CLEA v1.06 for sandy soil with SOM of 1%, 2.5% and 6%. Sandy soil type is considered to be conservative for the majority of soils, including brownfield soils on (potentially contaminated) sites. Changes made to default CLEA exposure parameters as per updated information given in DEFRA (2014) (C4SL Tables 3.2 and 3.5) and LQM/CIEH (2015).

(i) GAC derived for pre-1970 office buildings using default commercial CLEA model with adjustment to CLEA exposure parameters as per DEFRA (2014) (C4SL Tables 3.2 and 3.5).

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