

soiltechnics

environmental and geotechnical consultants

Proposed residential development
Land east of Chipping Lane
Longridge, Preston

Ground Investigation Report
(Phase 3)

Ivy Mill Business Centre, Crown Street, Failsworth, Manchester M35 9BG

t: 0161 9470270

e: mail@soiltechnics.net

w: www.soiltechnics.net

**Proposed residential development
Phase 3
Land East of Chipping Lane
Longridge
Preston
PR3 2NA**

GROUND INVESTIGATION REPORT

Soiltechnics Ltd. Ivy Mill Business Centre, Crown Street, Failsworth, Manchester, M35 9BG
Tel: (0161) 9470270 E-mail: mail@soiltechnics.net

Report originators

Prepared
by

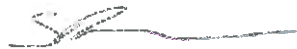


Tomasz Opara B.Sc., M.Sc.

tomasz.opara@soiltechnics.net

Assistant geo-environmental Engineer, Soiltechnics
Limited

Supervised/
Reviewed
by



Sam Dean B.Sc. (Hons.), FGS., MIEEnvSc.

sam.dean@soiltechnics.net

Director, Soiltechnics Limited



Aerial photograph of site



Approximate Phase 3 site boundaries edged in pink

Report status and format

Report section	Principal coverage	Report status	
		Revision	Comments
1	Executive summary		
2	Introduction		
3	Desk study information		
4	Chemical contamination		
5	Gaseous contamination		
6	Future investigations		
7	Drawings		

List of drawings

Drawing	Principal coverage	Status	
		Revision	Comments
01	Site location plan		
02	Plan showing existing site features and location and extent of development phases		

List of appendices

Appendix	Content
A	Definitions of geo-environmental terms used in this report
B	Copies of Statutory Undertakers replies
C	Copy of Phase 1 Desk Study report undertaken by Curtins Consulting Ltd
D	Illustrative masterplan showing indicative development layout
E	Copy of correspondence received from Environmental Health
F	Conceptual site model

1 Executive summary

We recommend the following executive summary is not read in isolation to the main report which follows.

Topic	Summary	Abnormals		
Site conditions	The site comprised three open grassed fields separated by mature hedgerows and sporadic trees, positioned on the north-western outskirts of Longridge, Preston. It is understood that the land is currently used by livestock for grazing. Higgin Brook is also recorded along part of the south-western boundary of the site.			
Proposals	We understand the scheme in its entirety will consist of redevelopment as areas of Public Open Space and recreational grounds.			
Investigations	Limited at this stage to collection, presentation and review of desk study information.			
History of the site	Historically the site has remained undeveloped farm land.			
Ground conditions	Soils (geological sequence)			
	Strata.	Typical Soil type	Approximate thickness	
	Alluvium (NW of site only)	Clays and silts	<3m	
	Devensian Till	Clay	>5m	
	Pendleside Sandstone Member	Sandstone with mudstone and siltstones	Up to 50m	
	Bowland Shale Formation	Mudstone, siltstone with sandstones	Up to 200m	
Groundwater and Geohydrology	Strata.	Aquifer designation	Likely permeability	Groundwater
	Alluvium	Secondary A	Low-moderate	Possibly in basal deposits
	Devensian Till	Unproductive strata (r)	Low	Unlikely
	Pendleside Sandstone Member	Secondary A aquifer (r)	Low to moderate	Possibly at depth
	Bowland Shale Formation	Secondary A and secondary undifferentiated aquifers (r)	Low to moderate	Possibly at depth
Land stability	Site not recorded in a source protection zone (SPZ) Site levels gently fall to the north-west and thus not considered to be at risk of instability. Site not affected by opencast workings or past mine workings			
Soil classification	N/A			
Possible foundation solution	N/A			
Soakaway feasibility	N/A			
Contamination	Chemical Gas			
	Risks considered low on site and based on adjacent land uses. Alluvium present in the north-western part of the site may contain organic matter which would provide a source of gasses. Given the nature of the development, site considered at low risk.			
Future investigations	Site considered to pose a low risk of causing harm to identified receptors. Intrusive investigations not considered necessary. As a precaution hardness of water in Higgin Brook should be determined, to enable a more detailed risk assessment to be completed in relation to water receptors			
Statement with respect to NPPF paragraphs 120 and 121	Site not considered to present unacceptable risks from pollution and land instability. Remediation to render the site fit for purpose with respect to chemical/gaseous contamination considered unlikely.			

2 Introduction

- 2.1 Objectives
 - 2.2 Client instructions and confidentiality
 - 2.3 Site location and scheme proposals
 - 2.4 Report format and investigation standards
 - 2.5 Status of this report
 - 2.6 Report distribution
-

2.1 Objectives

- 2.1.1 This report describes a ground investigation carried out for the Phase 3 area of a proposed residential development located on land east of Chipping Lane, Longridge, Preston PR3 2NA.
- 2.1.2 The Phase 3 development of the Chipping Lane site incorporates areas of Public Open Space (POS) and recreational grounds. This report addresses issues relating to the health of identified human receptors and risks to controlled waters from ground conditions at the site.
- 2.1.3 A Phase 1 Desk Study Assessment has been previously undertaken for the site by Curtins Consulting Ltd (ref EB1355/GL/3692 Revision A dated April 2014). A copy of their report is presented in Appendix L. We understand that we have the benefit of using such information and have provided a summary of the data in Section 3 of this report. This will also form a basis for our interpretative chemical and gaseous contamination assessments presented in Sections 4 and 5 respectively.
- 2.1.4 The investigation has also been produced to support a planning application for the site (ref 3/2014/0764) by satisfying National Planning Policies Framework sections 120 and 121.

2.2 Client instructions and confidentiality

- 2.2.1 This report was prepared in June 2016 acting on instructions received from our client Barratt Homes (Manchester).
- 2.2.2 This report has been prepared for the sole benefit of our above named instructing client, but this report, and its contents, remains the property of Soiltechnics Limited until payment in full of our invoices in connection with production of this report.
- 2.2.3 Our original investigation proposals were outlined in our correspondence to Barratt Homes of 20th January 2016. The investigation generally followed our original investigation proposals. The investigation process was also determined to maintain as far as possible the original investigation budget costs.

2.3 Site location and scheme proposals

2.3.1 The National Grid reference for the site is 360447, 437970. A plan showing the location of the site is presented on Drawing 01, with the extent of the development phases presented on Drawing 02.

2.3.2 We understand the scheme in its entirety will comprise the construction of up to 363 dwellings within what is termed Phases 1 and 2 (refer to Drawing 02 for details), with associated landscaping, gardens, hardstanding and access roads. This report refers to the Phase 3 area in which areas of POS and recreational grounds are proposed in the northern and eastern areas of the development site.

2.3.3 We have received layout drawings of the proposed scheme with the indicative layout presented in Appendix D.

2.4 Report format and investigation standards

2.4.1 Sections 2 to 3 of this report describe the factual aspects of the investigation with Section 4 providing a risk assessment of likely chemical contamination with section 5 describing a similar risk assessment in relation to gaseous contamination. Section 6 outlines a strategy for any future investigations required to progress the scheme to detailed design and construction.

2.4.2 This report describes both contamination and geotechnical aspects of the site. The desk study process followed the principles of BS10175: 2011 '*Investigation of potentially Contaminated Sites – Code of Practice*' and limited to a preliminary investigation as described in this document.

2.4.3 The extent and result of the preliminary investigation (desk study) undertaken by Curtins Consulting Ltd, in addition to site reconnaissance undertaken by Soiltechnics Ltd, is reported in Section 3.

2.5 Status of this report

2.5.1 This report is final based on our current instructions.

2.5.2 This investigation has been carried out and reported based on our understanding of best practice. Improved practices, technology, new information and changes in legislation may necessitate an alteration to the report in whole or part after publication. Hence, should the development commence after expiry of one year from the publication date of this report then we would recommend the report be referred back to Soiltechnics for reassessment. Equally, if the nature of the development changes, Soiltechnics should be advised and a reassessment carried out if considered appropriate.

2.6 Report distribution

- 2.6.1 This report has been prepared to assist in the design and planning process of the development and normally will require distribution to the following parties, although this list may not be exhaustive:

Table summarising parties likely to require information contained in this report

Party	Reason
Client	For information/reference and cost planning.
Developer/Contractor/project manager	To ensure procedures are implemented, programmed and costed.
Planning department	Potentially to discharge planning conditions.
Environment Agency	If ground controlled waters are affected and obtain approvals to any remediation strategies.
Independent inspectors such as Building Control	To ensure procedures are implemented and compliance with building regulations.
Project design team	To progress the design.
Principal Designer (PD)	To advise in construction risk identification and management under the Construction (Design and Management) Regulations.

Table 2.6

3 Desk study information and site observations

3.1	General
3.2	Description of the site
3.3	Injurious and invasive weeds and asbestos
3.4	History of the site
3.5	Geology and geohydrology of the area
3.6	Landfill and infilled ground
3.7	Radon
3.8	Flood risk
3.9	Enquiries with Statutory Undertakers
3.10	Enquiries with Local Authority Building Control and Environmental Health Officers

3.1 General

3.1.1 A Phase 1 Detailed Desk Top Study has been previously undertaken for the site by Curtins Consulting Ltd (reference EB1355/GL/3692, revision A, issue 01, dated 14th April 2014). A copy of their report is presented in Appendix C. We understand that we have the benefit of using such information and have provided a summary of the data in following paragraphs, together with our own site observations. It should be noted that we have tailored the information to suite the current site boundary for the Phase 3 development area, which is shown in a slightly different position in the Curtins report.

3.2 Description of the site

3.2.1 The site is positioned on the north-western outskirts of Longridge, Preston, at an elevation of between approximately 101m and 122m AOD and with the topography of the site falling in a north-westerly direction. The site comprised of three open grassed fields separated by hedgerows and trees between approximately 2m and 15m in height. Localised ponding of surface water was evident, with two small ponds present along the eastern boundary of the most north-westerly located parcel of land. Higgin Brook is also recorded along part of the south-western boundary of this parcel of land, flowing in a north-westerly direction and culverted beyond the location of the adjacent cricket pavilion.

3.2.2 The site was bound to the north and east by further open grassed fields. Chipping Lane, further fields and a cricket pitch were located to the west. The grassed fields which form the Phase 1 and Phase 2 development areas are present to the south, with residential housing and Willows Farm present to the south-east.

3.2.3 A plan showing existing site features and location of exploratory points is presented as Drawing 02.

3.3 Injurious and invasive weeds and asbestos

3.3.1 Injurious and invasive weeds

3.3.1.1 The following weeds are controlled under the Weeds Act 1959:

- Common ragwort
- Spear thistle
- Creeping (or field) thistle
- Broad-leaved dock
- Curled dock

3.3.1.2 Whilst it is not an offence to have the above weeds growing on your land, you must:

- Stop them spreading to agricultural land, particularly grazing areas or land used for forage, like silage and hay
- Choose the most appropriate control method for the your site
- Not plant them in the wild

3.3.1.3 Should you allow the spread of these weeds to another parties land, Natural England could serve you with an Enforcement Notice. You can also be prosecuted if you allow animals to suffer by eating these weeds.

3.3.1.4 In addition to the above, you must not plant in the wild or cause certain invasive and non-native plants to grow in the wild as outlined in the Wildlife and Countryside Act 1981. It is an offence under section 14(2) of the act to '*plant or otherwise cause to grow in the wild*' any plants listed in schedule 9, part II. This can include moving contaminated soil or plant cuttings. The offence carries a fine or custodial sentence of up to two years. The most commonly found invasive, non-native plants include:

- Japanese knotweed
- Giant hogweed
- Himalayan balsam
- Rhododendron ponticum
- New Zealand pigmyweed

3.3.1.5 You are not legally obliged to remove these plants or to control them. However, if you allow Japanese knotweed to spread to another party's land, you could be prosecuted for causing a private nuisance.

3.3.1.6 The presence of such weeds on site may have considerable effects on the cost/timescale in developing the site. Japanese knotweed can cause significant damage to buildings, roads and pavements following development, if untreated prior to development.

3.3.1.7 Our investigations exclude surveys to identify the presence of injurious and invasive weeds. We did not observe any obvious evidence the above species; however, we recommend specialists in the identification and procedures to deal with injurious and invasive weeds are appointed prior to commencement of any works on site.

3.3.2 Asbestos

3.3.2.1 Our investigations exclude surveys to identify the presence or absence of asbestos on site. It should be noted, however, that where intrusive investigations were undertaken we did not observe any obvious evidence of potential asbestos containing materials. This information does not constitute a site-specific risk assessment and we recommend specialists in the identification and control/disposal of asbestos are appointed prior to commencement of any works on site.

3.3.2.2 The presence of asbestos on site may have considerable effects on the cost/timescale in developing the site. There is good guidance in relation to asbestos available on the Health and Safety Executive (HSE) website.

3.4 History of the site

3.4.1 The recent pertinent history of the site, updated from the Curtins summary to reflect the current site boundary, is presented in the following table:

Summary description of site history		
Date	On site	Off site
1847	Open fields including a number of small ponds and marshy areas.	Surrounding land predominantly agricultural. Quarrying works recorded between 500m and 1000m east of the site.
1893 to 1914	No significant change	Pitt Street Mills (Corn & Bone) and a smithy are some 300m to the south. An iron and brass foundry present 350m to the south-west of the site. Victoria Mill and gasometer present 100m to south-eastern boundary. Tan Yard 500m to the south-east.
1932 to 1956	No significant change	The Pitt Street Mills (Corn & Bone) and smithy buildings recorded as a Bobbin works. Tank recorded at Willow Farm to the south-east of the site.
1961 to 1967	No significant change	The Bobbin works is no longer recorded and the site has been redeveloped as Ashley Dairy. Some residential development has also occurred to the south and west.
1968 to 1975	No significant change	The iron and brass foundry was labelled as a works. Significant development is occurring to the south of the site (Longridge).
1975 to 1996	No significant change	No significant changes
2001 to 2013	No significant change	Ashley Dairy has been redeveloped as a superstore.

Table 3.4.1

3.5 Geology and geohydrology of the area

3.5.1 Geology of the area

3.5.1.1 The geology of the area, updated from the Curtins summary to reflect the current site boundary, is presented in the following table:

Summary of geology and likely aquifer-containing strata					
Stratum	Bedrock or superficial	Approximate thickness	Typical soil type	Likely permeability	Aquifer designation
Alluvium (north-western part of site)	Superficial	<3m	Clay, silt, sand	Low to moderate	Secondary A aquifer (r)
Devensian Till	Superficial	>5m	Clay with silt and sand	Low	Unproductive strata (r)
Pendleside Sandstone Member	Bedrock	Up to 50m	Sandstone with mudstone and siltstones	Low to moderate	Secondary A aquifer (r)
Bowland Shale Formation	Bedrock	Up to 200m	Mudstone, siltstone with sandstones	Low to moderate	Secondary A and secondary undifferentiated aquifers (r)

Table 3.5.1

(r) recorded aquifer designation
(a) assumed aquifer designation

3.5.1.2 Unproductive strata are defined as deposits exhibiting low permeability with negligible significance for water supply or river base flow. Unproductive strata are generally regarded as not containing groundwater in exploitable quantities.

3.5.1.3 Secondary A aquifers are predominantly permeable layers capable of supporting water supplies at a local, rather than strategic, scale. In some cases, Secondary A aquifers can form an important source of base flow to rivers.

3.5.1.4 Secondary undifferentiated aquifer is a designation used when it is not possible to attribute fully one of either Secondary A or Secondary B, due to the variable nature of the soils. The unit will therefore be a mix of both, which are defined as follows:

- Secondary A can be defined as: 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.
- Secondary B can be defined as: layers which may store limited amounts of ground water. These groundwater stores are generally the water bearing parts of former aquifers.

3.5.2 Water abstractions

3.5.2.1 There are no potable groundwater abstraction licences within 2km of the site. The only surface water abstraction within a 2km radius of the site is associated with field drains located approximately 450m to the south of the site. Details of the water's use are not supplied.

3.5.2.2 There are two groundwater abstractions within a 2km radius of the site. They are both associated with Singletons Dairy (Mill Farm, Preston) and are located approximately 900m and 1km to the south of the site. The abstracted water is used for general purposes.

3.5.2.3 The site is not located within a zone protecting a potable water supply abstracting from a principal aquifer (i.e. a source protection zone).

3.5.3 Coal mining and brine extraction

3.5.3.1 The site is not recorded to be within an area affected by past or present coal mining, minerals worked in association with coal, or brine extraction (within the Cheshire Brine Compensation District). The site does not lie within a coal mining referral area and, as such, a Coal Authority report is not required.

3.5.4 Shallow mining and natural subsidence hazards

3.5.4.1 The British Geological Survey presents hazard ratings for shallow mining and natural subsidence hazards. The site has the following ratings:

Hazard	Rating
Mining hazard in non-coal mining areas	Highly unlikely
Potential for collapsible ground stability hazard	Very low / no hazard
Potential for compressible ground stability hazard	Moderate / no hazard
Potential for ground dissolution stability hazard	Low / very low
Potential for landslide ground stability hazard	Very low
Potential for running sand ground stability hazard	Low / very low
Potential for shrinking or swelling clay ground stability hazard	Very low

Table 3.5.4

3.5.4.2 The moderate potential for compressible ground stability hazards is likely to be associated with the deposits of Alluvium recorded in northern-western most parcel of land at the site.

3.5.5 Borehole records

3.5.5.1 The British Geological Survey (BGS) retains records of boreholes formed from ground investigations carried out on a nationwide basis. However, there are no BGS borehole records in the vicinity of the site.

3.6 Landfill and infilled ground

- 3.6.1 Within a 2km radius of the site, there are no BGS recorded or historical landfill sites; however, there are two registered landfill sites. Lords Delph (Forty Acre Lane, Longridge) is located approximately 500m to the east of the site and has been accepting non-biodegradable waste since at least 1982. Chapel Hill Quarry is located approximately 900m to the south of the site and accepted non-biodegradable waste; in 1992, the site was recorded as dormant.
- 3.6.2 In addition, we have reviewed old Ordnance Survey maps and there is no obvious evidence of significant quarrying in the area, other than a small number of BGS mineral sites, recorded between 250m and 700m of the subject site which exploited the underlying clays and grits. The geological map of the area indicates areas of infilled ground which approximately coincide with such areas.

3.7 Radon

- 3.7.1 Envirocheck uses the British Geological Survey database to review reported radon levels in the area in which the site is located, to establish recommended radon protection levels for new dwellings. The database presented in the Curtins report indicates that the site is located in an area where no protection is considered necessary.
- 3.7.2 Building Research Establishment (BRE) publication BR211 '*Radon: guidance on protective measures for new buildings*' (2007) applies to all new buildings, conversions and refurbishments, whether they be for domestic or non-domestic use.
- 3.7.3 It is noteworthy that the BRE information is based on statistical analysis of measurements made in dwellings, in combination with geological units which are known to emit radon. Therefore there is a risk that actual radon levels at the site will exceed the levels assessed by the BRE. Currently, the only true method of checking actual radon levels is by measurement within a building on the site over a period of several months. It should be noted that it is not currently a requirement of the Building Regulations to test new buildings for radon; however, the BRE recommends testing on completion or occupation of all new buildings (domestic and non-domestic), extensions and conversions. Should you wish to undertake radon monitoring following completion of the development, we can provide proposals.

3.8 Flood risk

- 3.8.1 Based on the information provided within the Curtins report, the site is not located within a fluvial or tidal flood plain. It should be noted that this information does not constitute a site-specific Flood Risk Assessment (FRA) and that a full FRA may be required for the development to support a planning application or to satisfy planning conditions.

3.9 Enquiries with Statutory Undertakers

3.9.1 We have been provided with the following Statutory Undertaker (SU) records in order to avoid damaging their apparatus during our fieldwork activities:

- a) BT Openreach
- b) Electricity North West
- c) ESP Utilities Group
- d) National Grid Gas
- e) United Utilities

3.9.2 Copies of these records are presented in Appendix B. These records have been obtained solely for the purposes described above.

3.9.3 Normally Statutory Undertakers' drawings record the approximate location of their services. We recommend further on-site investigations be undertaken to confirm the position of the apparatus and thus establish the effect on the proposed development and the necessity or otherwise for the permanent or temporary diversion of the service to allow the construction of the development to safely and successfully proceed.

3.9.4 It should be noted that Statutory Undertakers' records normally exclude private services.

3.10 Enquiries with Environmental Health Officers

3.10.1 We have contacted the Local Authority Environmental Health Officer, who has confirmed that no gas monitoring is required on this site, due to the limited number of sources and pathways in the area (refer to Section 5 for further details). A copy of their correspondence is presented in Appendix E.

4 Chemical contamination

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- 4.1 Contaminated land, regulations and liabilities
 - 4.2 Objectives and procedures
 - 4.3 Development characterisation and identified receptors
 - 4.4 Identification of pathways
 - 4.5 Assessment of sources of contamination
 - 4.6 Initial conceptual model
 - 4.7 Actions
 - 4.8 Risk assessment summary and recommendations
 - 4.9 Statement with respect to National Planning Policy Framework
-

4.1 Contaminated land, regulation and liabilities

4.1.1 Statute

- 4.1.1.1 Part IIA of the Environment Protection Act 1990 became statute in April 2000. The principal feature of this legislation is that the hazards associated with contaminated land should be evaluated in the context of a site-specific risk based framework. More specifically contaminated land is defined as:

“any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reasons of substances in, on or under the land, that:

- a) *Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- b) *Pollution of controlled waters is being or is likely to be caused”.*

- 4.1.1.2 Central to the investigation of contaminated land and the assessment of risks posed by this land is that:

- i) There must be contaminant(s) at concentrations capable of causing health effects (*Sources*).
- ii) There must be a human or environmental receptor present, or one which makes use of the site periodically (*Receptor*); and
- iii) There must be an exposure pathway by which the receptor comes into contact with the environmental contaminant (*Pathway*).

4.1.1.3 In most cases the Act is regulated by Borough or District Councils and their role is as follows:

- i) Inspect their area to identify contaminated land
- ii) Establish responsibilities for remediation of the land
- iii) See that appropriate remediation takes place through agreement with those responsible, or if not possible:
 - by serving a remediation notice, or
 - in certain cases carrying out the works themselves, or
 - in certain cases by other powers
- iv) keep a public register detailing the regulatory action which they have taken

4.1.1.4 For “special” sites the Environment Agency will take over from the Council as regulator. Special sites typically include:

- Contaminated land which affects controlled water and their quality
- Oil refineries
- Nuclear sites
- Waste management sites

4.1.2 Liabilities under the Act

4.1.2.1 Liability for remediation of contaminated land would be assigned to persons, organisations or businesses if they caused, or knowingly permitted contamination, or if they own or occupy contaminated land in a case where no polluter can be found.

4.1.3 Relevance to predevelopment conditions

4.1.3.1 For current use, Part IIA of the Environmental Protection Act 1990 provides the regulatory regime. The presence of harmful chemicals could provide a ‘source’ in a ‘pollutant linkage’ allowing the regulator (Local Authority or Environment Agency) to determine if there is a significant possibility of harm being caused to humans, buildings or the environment. Under such circumstances the regulator would determine the land as ‘contaminated’ under the provision of the Act requiring the remediation process to be implemented.

4.1.4 Relevance to planned development

4.1.4.1 The developer is responsible for determining whether land is suitable for a particular development or can be made so by remedial action. In particular, the developer should carry out an adequate investigation to inform a risk assessment to determine:

- a) Whether the land in question is already affected by contamination through source – pathway – receptor pollutant linkages and how those linkages are represented in a conceptual model.
- b) Whether the development proposed will create new linkages e.g. new pathways by which existing contaminants might reach existing or proposed receptors and whether it will introduce new vulnerable receptors, and

- c) What action is needed to break those linkages and avoid new ones, deal with any unacceptable risks and enable safe development and future occupancy of the site and neighbouring land?

4.1.4.2 Building control bodies enforce compliance with the Building Regulations. Practical guidance is provided in Approved documents, one of which is Part C, 'Site preparation and resistance to contaminants and moisture' which seeks to protect the health, safety and welfare of people in and around buildings, and includes requirements for protection against harm from chemical contaminants.

4.1.5 Pollution of controlled waters

4.1.5.1 Part IIA of the Environment Protection Act 1990, defines pollution of controlled waters as

'The entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter'

4.1.5.2 Paragraphs A36 and A39 of statutory guidance (DETR 2000) further define the basis on which land may be determined to be contaminated land on the basis of pollution of controlled waters.

'Before determining that pollution of controlled waters is being, or likely to be, caused, the Local Authority should be satisfied that a substance is continuing to enter controlled waters, or is likely to enter controlled waters. For this purpose, the local authority should regard something as being likely when they judge it more likely than not to occur'

'Land should not be designated as contaminated land where:

- a) A substance is already present in controlled waters:
- b) Entry into controlled waters of that substance from the land has ceased, and
- c) It is not likely that further entry will take place.

Substances should be regarded as having entered controlled waters where:

- a) They are dissolved or suspended in those waters; or
- b) If they are immiscible with water, they have direct contact with those waters, or beneath the surface of the waters'

4.1.5.3 Controlled waters are defined in statute to be:

'territorial waters which extend seawards for 3 miles, coastal waters, inland freshwaters, that is to say, the waters in any relevant lake or pond or of so much of any relevant river or watercourse as is above the freshwater limit, and groundwaters, that is to say, any waters contained in underground strata.'

4.1.6 Further information

- 4.1.6.1 The above provides a brief outline as regards current statute and planning controls. Further information can be obtained from the Department for the Environment, Food and Rural Affairs (DEFRA) and their website www.defra.gov.uk.

4.2 Objectives and procedures

4.2.1 Objectives

- 4.2.1.1 This report section discusses investigations carried out with respect to chemical contamination issues relating to the site. The investigations were carried out to determine if there are any liabilities with respect to Part IIA of the Environmental Protection Act. As stated in Section 2.4.2, the investigation process followed the principles of BS10175: 2011 '*Investigation of potentially contaminated sites – Code of Practice*', but limited to a desk study (preliminary investigation)
- 4.2.1.2 This section of the report produces '*Conceptual models*' based on investigatory data obtained to date. The conceptual model is constructed by identification of *contaminants* and establishment of feasible *pathways* and *receptors*. The conceptual model allows a *risk assessment* to be derived. Depending upon the outcome of the risk assessment it may be necessary to carry out remediation and/or further investigations with a view to eliminating, reducing or refining the risk of harm being caused to identified receptors. If appropriate, our report will provide recommendations in this respect.
- 4.2.1.3 Clearly we must consider the current pre-development condition, establishing risks which may require action to render the site safe to all relevant (current) receptors meeting the requirements of current legislation (Part IIA of the Environmental Protection Act 1990).
- 4.2.1.4 Definition of terms used in the preceding paragraph and subsequent parts of this section of the report are presented in Appendix A.

4.2.2 Procedure to assess risks of chemical contamination

4.2.2.1 For the purposes of presenting this section of this report, we have adopted the following sequence in assessing risks associated with chemical contamination.

Table outlining sequence to assess risk associated with chemical contamination		
Conceptual model element	Contributory information	Outcome
Receptor	Development categorisation	Identification of receptors at risk of being harmed Method of analysing test data Criteria for risk assessment modelling
Pathways	Geology and ground conditions Development proposals	Identification of critical pathways from source to receptor
Source	Previous site history Desk study information Site reconnaissance Fieldwork observations	Testing regime Identification of a chemical source Analysis of test data and other evidence

Table 4.2.2

4.2.2.2 We have adopted, in general, the procedures described in CIRIA C552 '*Contaminated land risk assessment - a guide to good practice*' in deriving a risk assessment. Initially we have carried out a 'phase 1 assessment' based on desk study information and site reconnaissance, to produce an initial conceptual model and thus a preliminary risk assessment. This model / assessment is then used to target any future fieldwork activities and laboratory testing that is recommended, ultimately allowing the conceptual model to be updated and risk assessments to be refined.

4.3 Development characterisation and identified receptors

4.3.1 Site characterisation

4.3.1.1 The nature of the site has a significant influence the likely exposure pathways between potentially contaminated soils and potential receptors. The following table summarises elements which characterise the site based on site observations and desk study information.

Summary of site characteristics		
Element	Source/criteria	Characteristic
Current land use	Observations	Site currently in use as grazing land for livestock. Not accessible to the general public.
Future land use	Advice	Developed as POS and recreational grounds
Site history	Desk study	Recorded as fields from earliest maps.
Geology	Desk study	Alluvium overlying overlying >5m thickness of Devensian Till deposits with Bowland Shale Formation/Pendleside Sandstone Member at depth.
Ground water	Aquifer potential	Alluvium recorded as a Secondary A aquifer. Devensian Till deposits recorded as unproductive strata. Underlying Bowland Shale recorded as a Secondary A and secondary undifferentiated aquifers (r), with Pendleside Sandstone recorded as Secondary A.
	Abstractions	There are no potable water abstractions within 1000m of the site. There are two groundwater abstractions within 1000m of the site, the nearest associated with Mill Farm borehole located 900m south of the site.
	Source protection zone	Site not recorded in source protection zone (SPZ).
Surface waters	Location	The nearest surface water feature is a tertiary river (Higgin Brook) which flows in a north-westerly direction along the south-western boundary of the site.
	Abstractions	There is one surface water abstraction within 1000m of the site located 450m south-east associated with a field drain located in Lyndhurst, Longridge.

Table 4.3.1

4.3.2 Identified receptors

4.3.2.1 The principal receptors subject to harm caused by any contamination of the proposed development site are as follows.

Principle Receptor	Detail
Humans	Users of the current site
	End user of the developed site
	Construction operatives and other site investigators
Vegetation	Plants and trees, both before and after development
Controlled waters	Surface waters (Rivers, streams, ponds and above ground reservoirs)
	Ground waters (used for abstraction or feeding rivers/streams etc.)

Table 4.3.2

4.3.2.2 This section of the report assesses those receptors listed above.

4.3.3 Human receptors

4.3.3.1 The Contaminated Land Exposure Assessment (CLEA) model can be used to derive guideline values, against which land quality data can be compared to allow an assessment of the likely impacts of soil contamination on humans. The parameters used within the model can be chosen to allow guideline values to be derived for a variety of land uses and exposure pathways. For example, a construction worker is likely to be exposed in different ways and for different durations than an adult in a residential setting.

4.3.3.2 On the basis that the existing site is restricted to agricultural activities the adult is considered an appropriate current receptor. Following completion of the residential development the critical site user (receptor) is considered to be a child under the age of 6 years. These criteria have been used in the conceptual model for the current and future site use. Our assessment also considers construction operatives as adult receptors.

4.3.4 Vegetation receptors

4.3.4.1 Soil contaminants can have an adverse effect on plants if they are present at sufficient concentrations. The effects of phytotoxic contaminations include growth inhibition, interference with natural processes within the plant and nutrient deficiencies.

4.3.4.2 Vegetation is currently present at the site and will remain so following development, in addition to further vegetation proposed as part of the new development. We have therefore considered vegetation a viable receptor.

4.3.5 Water receptors

4.3.5.1 The near surface Alluvium deposits are recorded as a Secondary A aquifer. The underlying Devensian Till deposits are recorded as unproductive strata and are known to extend to depths beyond 3.2m within the Phase 1 and Phase 2 development areas. The underlying Bowland Shale Formation is recorded as a Secondary A aquifer. The site is not recorded in a source protection zone. Based on the above, given the relatively small and confined nature of the area of Alluvium recorded at the site and adjacent to the north, in addition to the thickness of Devensian Till, groundwater is not considered a viable receptor. The nearest watercourse to the site is Higgin Brook, which flows along the south-western site boundary. On this basis, surface water is considered to be a viable receptor.

4.3.6 Summary of identified receptors

4.3.6.1 Based on the above assessments, the following table summarises identified and critical receptors.

Table summarising identified (viable) receptors				
Principle Receptor	Detail	Viable and critical receptors		
		Viability and justification		Critical receptor
Humans	Users of the current site	Yes	Grazing land	Adult
	End user of the developed site	Yes	POS and recreational land	Child
	Construction operatives and other site investigators	Yes		Adult
Vegetation	Current site	Yes	Trees on site	Vegetation
	Developed site	Yes	Trees to remain	Vegetation
Controlled waters	Surface waters (Rivers, streams, ponds and above ground reservoirs)	Yes	Higgin Brook along site boundary	Surface waters
	Ground waters (used for abstraction or feeding rivers/ streams etc.)	No	Unlikely to be present (Impermeable)	Groundwater

Table 4.3.6

4.4 Identification of pathways

4.4.1 Pathways to human receptors

4.4.1.1 Guidance published by the Environment Agency in Science Report SC050021/SR3 'Updated technical background to the CLEA model' provides a detailed assessment of pathways and assessment and human exposure rates to source contaminants. In summary, there are three principal pathway groups for a human receptor:

Table summarising likely pathways	
Principal pathways	Detail
Ingestion through the mouth	Ingestion of air-borne dusts
	Ingestion of soil
	Ingestion of soil attached to vegetables
Inhalation through the nose and mouth.	Ingestion of home grown vegetables
	Inhalation of air-borne dusts
Absorption through the skin.	Inhalation of vapours
	Dermal contact with dust
	Dermal contact with soil

Table 4.4.1

4.4.1.2 The site currently comprises open fields surfaced in grass and used for grazing livestock. It is understood that this has been the principal site use for much of the sites history, if not all. Based on such we have considered all the above pathways would be present for current users with the exception of those associated with the consumption of vegetables.

4.4.1.3 Following redevelopment the site will comprise areas of POS and recreational grounds. Based on such, again all of the above pathways with the exception of those associated with the consumption of vegetables will be considered. A summary of our pathway assessment is presented in Section 4.4.4.

4.4.2 Pathways to vegetation

4.4.2.1 Guidance published by the Environment Agency in Science Report SC050021/SR (Evaluation of models for predicting plant uptake of chemicals from soil) provides a detailed assessment of plant uptake pathways. In summary, plants are exposed to contaminants in soils by the following pathways:

- Passive and active uptake by roots.
- Gaseous and particulate deposition to above ground shoots.
- Direct contact between soils and plant tissue.

4.4.2.2 All of the above routes of exposure are considered to be present for vegetation.

4.4.3 Pathways to controlled waters

4.4.3.1 A number of pathways exist for the transport of soil contamination to controlled waters. A summary of these pathways is presented below:

- Percolation of water through contaminated soils
- Near-surface water run-off through contaminated soils
- Saturation of contaminated soils by flood waters

4.4.3.2 Near surface soils in the Phase 1 and Phase 2 development areas comprised cohesive Devensian Till deposits which are considered impermeable and extend to depths beyond 3.2m at the sites. Whilst deposits of Alluvium are recorded in the north-western part of the site, which may exhibit a degree of permeability, they are not considered to be laterally extensive and unlikely to provide a source of groundwater worthy of abstraction. The clay soils of the Till will also severely restrict the percolation of surface water into the underlying aquifer of the Bowland Shale Formation, therefore, pathways associated with percolation of surface water will not be considered further.

4.4.3.3 Based on the permeability of near surface Devensian Till deposits, in our opinion such soils are considered amenable to promoting significant amounts of near surface water run off through contaminated soils.

4.4.3.4 The site is not recorded within a fluvial flood plain and as such saturation of contaminated soils by flood waters is unlikely to occur.

4.4.4 Summary of identified likely pathways

4.4.4.1 Based on the above assessments, the following table summarises likely pathways of potential chemical contaminants at the site to identified receptors.

Table of likely pathways		
Receptor group	Critical receptor	Pathway
Proposed site users	Child	Ingestion of air-borne dusts
		Ingestion of soil
		Inhalation air-borne dusts
		Inhalation of vapours
		Dermal contact with dust
		Dermal contact with soil
Current site users and construction operatives	Adult	Ingestion of air-borne dusts
		Ingestion of soil
		Inhalation of air-borne dusts
		Inhalation of vapours
		Dermal contact with dust
		Dermal contact with soil
Vegetation		Root uptake, deposition to shoots and foliage contact
Groundwater	Surface water	Near-surface water run-off through contaminated soils

Table 4.4.4

4.5 Assessment of sources of chemical contamination

4.5.1 Introduction

4.5.1.1 Initially, potential sources of contamination are assessed using the following elements of the investigation process.

- History of the site
- Desk study information
- Site reconnaissance
- Geology
- Fieldwork

4.5.1.2 These elements will dictate a relevant soil/water testing regime to quantify possible risks of any identified contaminative sources which may harm identified receptors.

4.5.2 Source assessment – History of the site

4.5.2.1 The history of the site and its immediate surroundings based on published Ordnance Survey maps is described in Section 3.

4.5.2.2 Based on published historical maps, there is no evidence to indicate the site has been subject to activities which could produce a source of chemical contamination. Records indicate that land uses in areas surrounding the site to the west, south and east consisted of mills, unclassified works, a garage, dairy and foundry. Due to the distance from the site and the relatively impermeable geology, in our opinion, there is unlikely to be a significant risk of contamination migrating from these potential sources to the subject site.

4.5.3 Source assessment – Desk study information

4.5.3.1 Envirocheck presents a detailed database of environmental information in relation to the site including;

- Pollution incidents
- Landfill sites
- Trading activities

4.5.3.2 *Pollution incidents*

4.5.3.2.1 Envirocheck report a number of pollution incidents to controlled waters within 2000m of the site, the closest of which are recorded some 200m to the north-west and 220m to the south-west. The incident to the north-west is dated 1994 and classified as a Category 3 minor incident, with silage liquor affecting Higgin Brook. The incident to the south-west is dated 1996 and associated with the release of inert materials and light oils and is classified as a Category 3 minor incident. Given the distances from the site and the type and severity of the incidents they are considered unlikely to have impacted the site.

4.5.3.3 *Landfill sites*

4.5.3.3.1 Envirocheck reports within 2km radius of the site, there are no BGS recorded or historical landfill sites; however, there are two registered landfill sites. Lords Delph (Forty Acre Lane, Longridge) is located approximately 500m to the east of the site and has been accepting non-biodegradable waste since at least 1982. Chapel Hill Quarry is located approximately 900m to the south of the site and accepted non-biodegradable waste; in 1992, the site was recorded as dormant.

4.5.3.3.2 In addition, we have reviewed old Ordnance Survey maps and there are a small number of quarries recorded between 250m and 700m from the subject site, predominantly to the east, exploiting the underlying clays and grits.

4.5.3.3.3 Based on the above, due to the distance, the risk of any chemical contamination associated with landfill sites and restored mineral sites in the area, migrating and impacting identified receptors at the site, is considered low.

4.5.4 Source assessment – Site reconnaissance

4.5.4.1 A full description of the site and observed adjacent land uses is provided in Section 3 of this report. A plan summarising observations made on site during our site reconnaissance visit is presented on Drawing 02.

4.5.4.2 We did not observe any obvious evidence of any current or recent activities on site which provide a potential source of chemical contamination.

4.5.5 Source assessment – Geology

4.5.5.1 The geological map of the area indicates the topography local to the site is formed in deposits of Alluvium, Devensian Till, Bowland Shale Formation and Pendleside Sandstone Formation. Typically, and in our experience, such deposits do not exhibit any abnormal concentrations of naturally occurring chemical contaminants.

4.5.7 Source assessment - summary

4.5.7.1 Based on the paragraphs above, we have identified the following potential sources of contamination:

Table summarising results of source assessment

Source	Origin of information	Possible contaminant	Probability of risk occurring	Likely extent of contamination
On site				
Historic land uses in local area	Desk study	Metals, PAHs, TPHs	Unlikely	N/A
Pollution incidents in local area	Desk study	Metals, PAHs, TPHs, organic pathogens/bacteria	Unlikely	N/A
Landfills/ restored quarries	Desk study	Metals, PAHs, TPHs	Unlikely	N/A
Table reference 4.5.2				

4.6 Initial Conceptual Model

4.6.1 Based on our assessment of potential contaminative sources, identified receptors and viable pathways to receptors described in preceding paragraphs, we have produced an initial conceptual model in the form of a table which is presented in Appendix F.

4.6.2 Based on the conceptual model the initial assessment of risk of chemical contamination causing harm to identified receptors does not exceed the low category, but this is solely based on desk study information. Clearly investigations are required to quantify and refine risks, but at this stage significant remediation is considered unlikely.

- 4.6.3 Based on laboratory testing of near surface soils within the areas of the Phase 1 and Phase 2 developments, concentrations of chemical contaminants tested were recorded below relevant guideline values for both current and proposed land uses. Typically Topsoil deposits were encountered, with very localised areas of Made Ground.
- 4.6.4 Near surface soils in the Phase 3 development area are highly likely to consist of Topsoil overlaying naturally deposited soils, and based on such, we consider it unlikely that such soils will be artificially contaminated in respect of human receptors.
- 4.6.5 Laboratory testing did, however, identify elevated concentrations of leachable copper in some samples of Topsoil tested, likely to be attributed to the use of copper based fertilisers in agriculture. The EQS values used in the assessment are largely dictated by the hardness of the receiving watercourse and fairly conservative values for hardness were adopted for the site based on readily available groundwater data. It is likely that if water was tested within Higgin Brook (receiving surface watercourse) that hardness values would be higher than those adopted (>200mg/l rather than <100mg/l) which would have the effect of increasing the EQS value of copper from 6µg/l to 28µg/l. If this were to be the case then the concentrations of leachable copper measured in Topsoil deposits in the development areas of Phase 1 and Phase 2 would fall below the guideline value for the site.
- 4.6.6 Based on the above, whilst there is the potential for leachable copper to also exist in Topsoil at the site, we are of the opinion that the concentrations are unlikely to have an adverse effect on surface waters in the area.
- 4.6.7 As a precaution, we recommended in the previous investigations that surface waters within Higgin Brook are tested to determine site specific values of hardness which will enable a more detailed risk assessment to be completed.

4.7 Actions

- 4.7.1 Based on the above our sole recommendations are as follows:-
- Hardness values within surface waters of Higgin Brook are determined, as recommended in our reports for the Phase 1 and Phase 2 redevelopment areas to the south, to enable a more detailed risk assessment to be completed in relation to water receptors
 - Construction operatives adopt adequate hygiene precautions
- 4.7.2 We also recommend that ground workers/construction operatives are vigilant during excavations onsite, and any noticeable change in ground conditions should be assessed and investigated if necessary.

4.8 Risk assessment summary and recommendations

4.8.1 Based on our assessments described above, we can provide the following summary and recommendations for each identified receptor.

4.8.2 Current and proposed site users

4.8.2.1 As no source of significant chemical contamination has been identified on site, we are of the opinion that the site represents a very low risk of causing harm to the health of identified current users of the site.

4.8.3 Construction operatives and other site investigators

4.8.3.1 The risk of damage to health of construction operatives and other site investigators is, in our opinion, low. As a precautionary approach, however, we recommend adequate hygiene precautions are adopted on site. Such precautions would be:-

- Wearing protective clothing particularly gloves to minimise ingestion from soil contaminated hands.
- Avoiding dust by dampening the soils during the works.
- Wearing masks if processing produce dust.

4.8.3.2 Guidance on safe working practices can be obtained from the following documents

- The Health and Safety Executive Publication "*Protection of Workers and the General Public during the Development of Contaminated Land*" (HMSO) and
- "*A Guide to Safer Working on Contaminated Sites*" (CIRIA Report 132).

4.8.3.3 In addition, reference should be made to the Health and Safety Executive. In all cases work shall be undertaken following the requirements of the Health and Safety at Work Act 1974 and regulations made under the Act including the COSHH regulations.

4.8.4 Controlled waters

4.8.4.1 Based on the above, and on laboratory results for Phases 1 and 2, we are of the opinion that the site potentially represents a low-moderate risk of causing harm to water receptors. As a precaution we recommend that values of hardness are determined in surface waters of Higgin Brook to enable a more detailed risk assessment to be undertaken in relation to concentrations of leachable copper.

4.8.5 Vegetation

4.8.5.1 As no source of significant chemical contamination has been identified on site, we are of the opinion that the site represents a low risk of causing harm to vegetation.

4.9 Statement with respect to National Planning Policy Framework

- 4.9.1** Based on investigations completed to date with respect to chemical contamination, providing the recommendations as outlined above are completed, we are of the opinion that the proposed development will be safe and suitable for use for the purpose for which it is intended, thus meeting the requirements of the National Planning Policy Framework section 121, and compliant with the Building Regulations Part C, '*Site preparation and resistance to contaminants and moisture*'.

5 Gaseous contamination

5.1	Legislative framework
5.2	General
5.3	Assessment of source of gases
5.4	Gas migration
5.5	Conclusion
5.6	Statement with respect to National Planning Policy Framework

5.1 Legislative framework

- 5.1.1 There is currently a complex mix of documentation relating to legislative and regulatory procedures on the issue of contamination and it is not considered a purpose of this report to discuss the detail of these regulations. Essentially, Government Policy is based on '*suitable for use approach*', which is relevant to both the current and proposed future use of land. For current use Part IIA of the Environmental Protection Act 1990 provides the regulatory regime (see Section 8.1). The presence of harmful soil gases could provide a 'source' in a 'pollutant linkage' allowing the regulator (Local Authority) to determine if there is a significant possibility of harm being caused to humans, buildings or the environment. Under such circumstances the regulator would determine the land as 'contaminated' under the provision of the Act requiring the remediation process to be implemented with the Environment Agency responsible for enforcement.
- 5.1.2 The Town and Country Planning (General Development Procedure) Order 1995, requires the planning authority to consult with the Environment Agency before granting planning permission for development on land within 250 metres of land which is being used for deposit of waste, (or has been at any time in the last 30 years) or has been notified to the planning authority for the purposes of that provision.
- 5.1.3 Building control bodies enforce compliance with the Building Regulations. Practical guidance is provided in Approved documents, one of which is Part C, '*Site preparation and resistance to contaminants and moisture*' which seeks to protect the health, safety and welfare of people in and around buildings and includes requirements for protection against harm from soil gas.

5.2 General

- 5.2.1 The following assessment relates to the potential for, and the effects of, gases generated by biodegradable matter. The potential for the development to be affected by radon gas is considered in Section 3. The principal ground gases are carbon dioxide (CO₂) and methane (CH₄). The following table provides a summary of the effects of these gases when mixed with air.

Significant gas concentrations in air		
Gas	Concentration by volume	Consequence
Methane	0.25%	Ventilation required in confined spaces
	5 - 15%	Potentially explosive when mixed with air
	30%	Asphyxiation
	75%	Death after 10 minutes
Carbon Dioxide	0.5%	8 hour long term exposure limit (LTEL) (HSE workplace limit)
	1.5%	15 min short term exposure limit (STEL) (HSE workplace limit)
	>3%	Breathing difficulties
	6 – 11%	Visual distortion, headaches, loss of consciousness, possible death
	>22%	Death likely to occur

Table 3.2.1

5.2.2 Following the current Building Regulations Approved Document C1, Section 2 'Resistance to Contaminants' (2004 incorporating 2010 and 2013 amendments) a risk assessment approach is required in relation to gaseous contamination based on the source-pathway-receptor conceptual model procedure. We have adopted procedures described in the following reference documents for investigation and assessments of risk of the development being affected by landfill type gases (permanent gases) and if appropriate the identification of mitigation measures.

- BS10175:2011 'Investigation of potentially contaminated sites- Code of Practice'
- BS8576:2013 'Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)'
- BS8485:2015 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'
- CIRIA Report C665 'Assessing risks posed by hazardous ground gases to buildings' (2007)
- NHBC report No 10627-R01(04) 'Guidance on development proposals on sites where methane and carbon dioxide are present' (January 2007)
- CL:AIRE Research Bulletin RB17 'A pragmatic approach to ground gas risk assessment' (November 2012)

5.2.3 Whilst we have followed the guidance and recommendations of BS8576, we have used BS8485:2015 to derive recommendations for protective works, and where considered necessary supplemented by NHBC report No 10627-R01(04).

5.2.4 An assessment of the risk of the site being affected by ground gases is based on the following aspects:

- a) Source of the gas
- b) Investigation information
- c) Migration feasibility
- d) Sensitivity of the development and its location relative to the source

5.3 Assessment of source of gases

5.3.1 General sources

5.3.1.1 The following table summarises the common sources of ground gases and parameters affecting the generation of ground gases:

Source and control of gases	
Type	Parameters affecting the rate of gassing
Landfills	Portion of biodegradable material, rate reduces with time
Mineworkings	Flooding reduces rate of gassing
Dock silt	Portion of organic matter
Carbonate deposits	Ground/rainwater (acidic) reacts with some carbonates to produce carbon dioxide.
Made Ground	Thickness of Made Ground and proportion of degradable organic matter.
Naturally deposited soils/rocks	Thickness of Made Ground and proportion of degradable organic matter.

Table 5.3.1

5.3.1.2 The rate of decomposition in gas production is also related to atmospheric conditions, pH, temperature, and water content/infiltration.

5.3.1.3 As the site is not within a dockland environment or an area affected by mineworkings, and near surface soils do not exhibit high carbonate content, then potential gas sources are limited to landfills and/or soils with a high proportion of organic matter.

5.3.2 Landfill and infilled ground sources

5.3.2.1 Waste Management Paper 27 (1991) produced by the Department of the Environment 'Control of Landfill Gases' contains the recommendation to avoid building within 50m of a landfill site actively producing large quantities of landfill type gases and to carry out site investigations within a zone 250m beyond the boundary of a landfill site. No distinction is made between sites of differing ground conditions, but the paper does not advocate the site is safe beyond the 250m zone, dependant, of course, upon the type of landfill and potential for migration of landfill gases.

5.3.2.2 Within a 2km radius of the site, there are no BGS recorded or historical landfill sites; however, there are two registered landfill sites. Lords Delph (Forty Acre Lane, Longridge) is located approximately 500m to the east of the site and has been accepting non-biodegradable waste since at least 1982. Chapel Hill Quarry is located approximately 900m to the south of the site and accepted non-biodegradable waste; in 1992, the site was recorded as dormant.

5.3.2.3 In addition, we have reviewed old Ordnance Survey maps there are a small number of quarries recorded between 500m and 1000m from the subject site, predominantly to the east. The geological map of the area indicates areas of infilled ground which approximately coincide with such areas.

5.3.2.4 Due to the distance of the sites from the subject site and the nature of the waste, in our opinion they are considered very unlikely to represent potential sources of ground gases which could affect the subject site. Furthermore, a series of small ponds are noted to have been recorded on adjacent sites and possibly filled in recent years. However, given the limited size of the water features it is considered unlikely that any gases associated with organic/putrescible material contained within would have the potential to affect identified receptors.

5.3.3 Soil conditions

5.3.3.1 None of the soils observed in exploratory excavations, in our opinion, exhibit significant concentrations of organic matter which are likely to produce elevated quantities of carbon dioxide and / or methane gas.

5.3.3.2 Based on an assessment of 'deep' geological conditions we are of the opinion that it is unlikely that the subject site would be affected by significant quantities of carbon dioxide and methane generated by soils/rocks at depth.

5.3.3.3 Based on the presence of extensive deposits of cohesive and impermeable Devensian Till in the local area, any potential migration of landfill type gases which may be generated at the sources outlined in Section 5.3.2 would also be severely restricted and unlikely to feasibly migrate to the subject site. We can confirm that we have consulted with Ribbles Valley Borough Council with regards to this matter and they have agreed with such assessments. A copy of their correspondence is presented in Appendix E.

5.3.3.4 Deposits of Alluvium are also recorded at surface in the north-western part of the site. Such soils may have the potential to contain organic material which may have the potential to generate landfill type gases. Given that development of the Phase 3 area of the site will consist of POS and recreational areas, with no enclosed spaces, any gases generated are unlikely to pose a risk to human receptors.

5.3.4 Source assessment summary

5.3.4.1 The following table summarises the possibility of a source of landfill type gases.

Source assessment summary		
Potential source origin	Viability of source	Evidence
Landfills	Unlikely	Desk study information
Mineworkings	Unlikely	Desk Study information Geological conditions not amenable
Dock silt	Unlikely	Site remote from dockland environment
Carbonate deposits	Unlikely	Recorded and observed soil conditions do not indicate high concentrations of carbonates
Made Ground	Unlikely	Based on Phase 1 and Phase 2 SI, unlikely to be present at thicknesses and compositions which would give cause for concern
Naturally deposited soils/rocks	Unlikely	Alluvium may generate some gasses if organic matter present, however, unlikely to harm human receptors in outdoor space.

Table 5.3.4

5.4 Conclusion

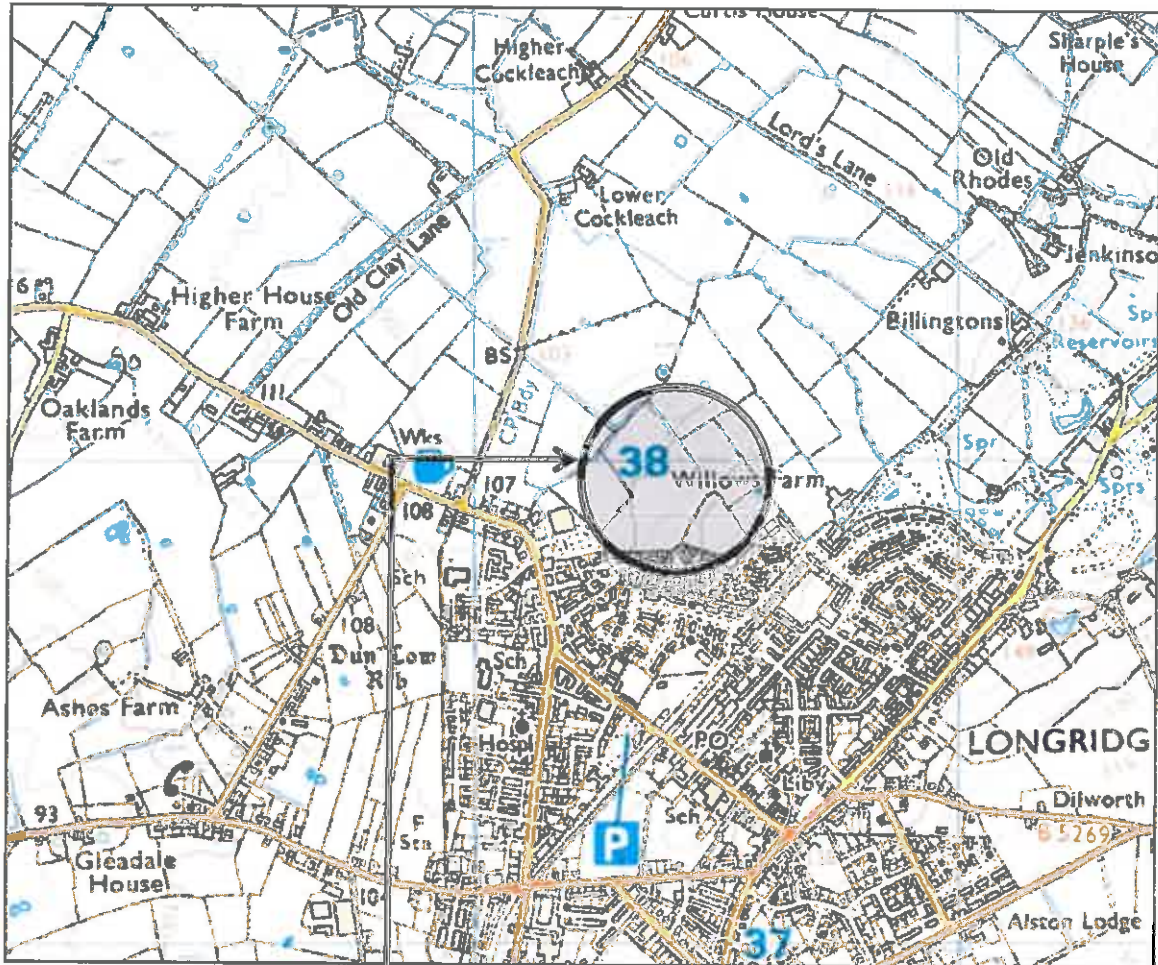
- 5.4.1** Based on the above there is no evidence to demonstrate that there is a potential source rendering the site at a significant risk of being affected by ground gases (carbon dioxide / methane) sufficient to cause significant harm to human end users of the site, construction operatives or indeed buildings. On this basis, it is not considered necessary to consider possible pathways for migration of ground gases, and indeed implementation of further investigations to measure concentrations of ground gases. Again on the basis of evidence provided above, mitigation measures against ingress of ground gases into the proposed development area are not considered necessary.

5.5 Statement with respect to National Planning Policy Framework

- 5.5.1** Based on investigations completed to date with respect to gaseous contamination, we are of the opinion the proposed development will be safe and suitable for use for the purpose for which it is intended (without the need for any remedial action) thus meeting the requirements of the National Planning Policy Framework section 121, and compliant with the Building Regulations Part C, '*Site preparation and resistance to contaminants and moisture*'.

6 Further investigations

- 6.1 Although we have endeavoured to provide a comprehensive investigation for the proposed development within budgetary constraints there are areas, which we recommend further investigations be carried out. These are as follows: -
- Hardness values within surface waters of Higgin Brook are determined, as recommended in our reports for the Phase 1 and Phase 2 redevelopment areas to the south, to enable a more detailed risk assessment to be completed in relation to water receptors
- 6.2 We would be pleased to carry out any of the supplementary investigations described above and provide proposals with costings on further instructions.

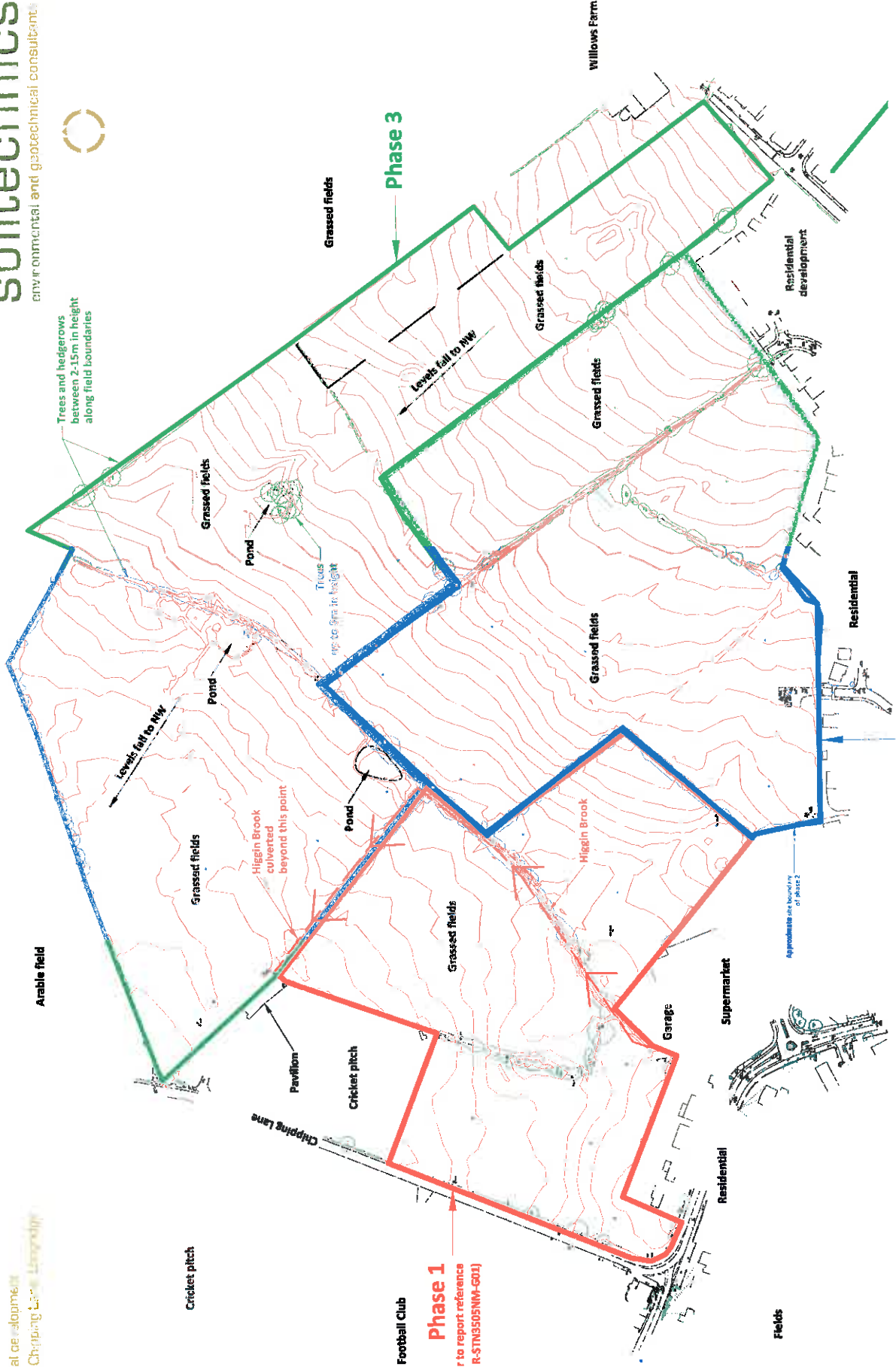


Approximate area of investigation

Title	Scale	Drawing number
Site location plan	Not to scale	01



Trees and hedgerows
between 2-15m in height
along field boundaries



Phase 1
(refer to report reference
R-STN3505NM-G01)

Phase 2
(refer to report reference STN3505NM-G02)

Scale
1:2500 at A3

Drawing number
02

Title
Plan showing existing site features and location and
extent of development phases

Definition of geo-environmental terms used in this report

Conceptual model

Textual and/or schematic hypothesis of the nature and sources of contamination, potential migration pathways (including description of the ground and groundwater) and potential receptors, developed on the basis of the information obtained from the investigatory process.

Contamination

Presence of a substance which is in, on or under land, and which has the potential to cause harm or to cause pollution of controlled water.

Controlled water

Inland freshwater (any lake, pond or watercourse above the freshwater limit), water contained in underground strata and any coastal water between the limit of highest tide or the freshwater line to the three mile limit of territorial waters.

Harm

Adverse effect on the health of living organisms, or other interference with ecological systems of which they form part, and, in the case of humans, including property.

Pathway

Mechanism or route by which a contaminant comes into contact with, or otherwise affects, a receptor.

Receptor

Persons, living organisms, ecological systems, controlled waters, atmosphere, structures and utilities that could be adversely affected by the contaminant(s).

Risk

Probability of the occurrence of, and magnitude of the consequences of, an unwanted adverse effect on a receptor.

Risk Assessment

Process of establishing, to the extent possible, the existence, nature and significance of risk.

Definition of environmental risk/hazard terms used in this report.

Based on CIRIA report C552 'Contaminated land risk assessment – A guide to good practice'.

Potential hazard severity definition

Category	Definition
Severe	Acute risks to human health, catastrophic damage to buildings/property, major pollution of controlled waters
Medium	Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species, significant damage to buildings or structures.
Mild	Pollution of non sensitive waters, minor damage to buildings or structures.
Minor	Requirement for protective equipment during site works to mitigate health effects, damage to non sensitive ecosystems or species.

Probability of risk definition

Category	Definition
High likelihood	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor.
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term
Low likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable.

Level of risk for potential hazard definition

Probability of risk	Potential severity			
	Severe	Medium	Mild	Minor
High Likelihood	Very high	High	Moderate	Low/Moderate
Likely	High	Moderate	Low/Moderate	Low
Low Likelihood	Moderate	Low/Moderate	Low	Very low
Unlikely	Low/Moderate	Low	Very low	Very low

Refer sheet 2 for definitions of 'very high' to 'low'

Definition of environmental risk/hazard terms used in this report.

Based on CIRIA report C552 '*Contaminated land risk assessment – A guide to good practice*'.

Risk classifications and likely action required:

Very high risk

High probability that severe harm could arise to a designated receptor from an identified hazard OR there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised is likely to result in substantial liability. Urgent investigation and remediation are likely to be required.

High risk

Harm is likely to arise to a designated receptor from an identified hazard. This risk, if realised, is likely to result in substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the long term.

Moderate risk

It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is likely that the harm would be relatively mild. Investigation is normally required to clarify risks and to determine potential liability. Some remedial works may be required in the long term.

Low risk

It is possible that harm could arise to a designated receptor from an identified hazard but it is likely that this harm, if realised, would at worst normally be mild.

Very low risk

It is a low possibility that harm could arise to a designated receptor. On the event of such harm being realised it is not likely to be severe.

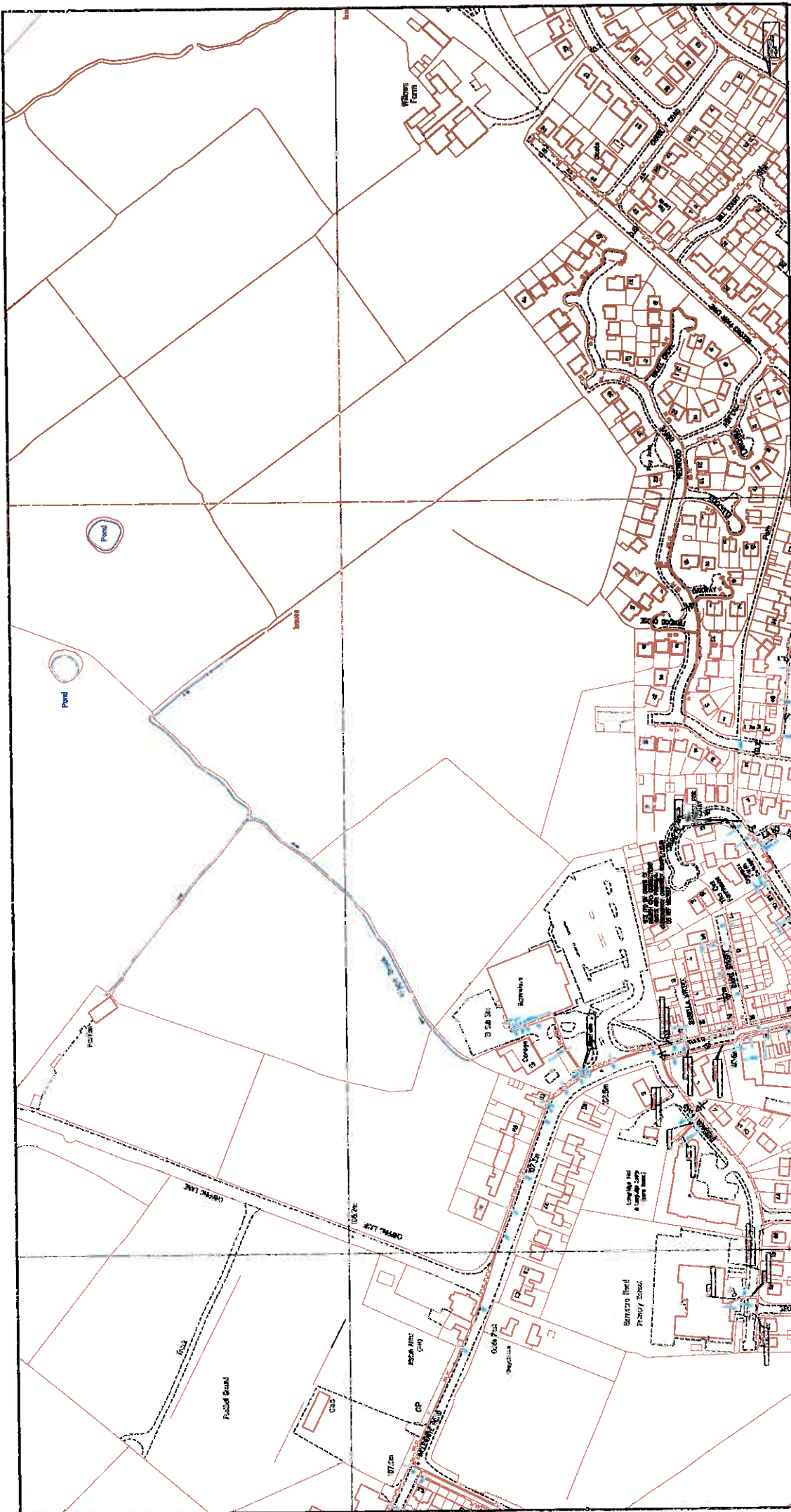
List of documents used in assessment of chemical contamination

No.	Title	Publication reference / publisher
1	Human health toxicological assessment of contaminants in soil	EA Science Report – SC050021/SR2
2	Updated technical background to the CLEA model	EA Science Report – SC050021/SR3
3	CLEA Software (Version 1.03 beta) Handbook	EA Science Report - SC050021/SR4
4	Guidance on comparing Soil Contamination Data with a Critical Concentration	CIEH
5	The LQM/CIEH S4ULs for Human Health Risk Assessment (2015)	LQM/CIEH
6	Assessment of Risks to Human Health from Land Contamination: An overview of the development of soil guideline values and related research	R&D Publication, Contaminated Land Report CLR 7
7	Contaminants of Soil: Collation of Toxicological Data and Intake Values for Humans	R&D Publication, Contaminated Land Report CLR 9
8	The Contaminated Land Exposure Assessment Model (CLEA): Technical Basis and Algorithms	R&D Publication, Contaminated Land Report CLR 10
9	Model Procedures for the Management of Land Contamination	R&D Publication, Contaminated Land Report CLR 11
10	Contaminants in Soil: Collection of Toxicological Data and Intake Values for Human Values	R&D Publications, Tox. 6
11	Soil Guideline Values for Contamination (2002)	R&D Publications, SGV 10
12	Soil Guideline Values (2009)	EA Science Reports – SC050021
13	Atkins ATRISK ^{SOIL} (2011)	http://www.atrisksoil.co.uk
14	Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination (September 2014)	CL:AIRE

CIEH	Chartered institute of Environmental Health
LQM	Land Quality Management
EA	Environment Agency
CL:AIRE	Contaminated Land: Applications in Real Environments

Testing suite summary

Table summarising testing suites		
Suite	Parameters	Medium
Suite 1	Arsenic, beryllium, boron, cadmium, chromium (total and VI), copper, lead, mercury, nickel, selenium, vanadium zinc, cyanide (free, total and complex), organic matter content, PAH (16 speciated), pH, phenol (total), TOC	Soil
Suite 2	Arsenic, boron (water soluble), beryllium, cadmium, chromium (total), copper, lead, mercury, nickel, selenium, vanadium, zinc, cyanide (free, total and complex, PAH (16 speciated), pH, phenol (total), sulfate (water soluble), sulfide, nitrate	Leachate
Suite 3	Arsenic, boron (water soluble), beryllium, cadmium, chromium (total), copper, lead, mercury, nickel, selenium, vanadium, zinc, cyanide (free, total and complex, PAH (16 speciated), pH, phenol (total), sulfate (water soluble), sulfide, nitrate	Water
Suite 4	TPH Texas Banding Aliphatic/Aromatic Split, PAH (16 speciated), TOC	Soil
Suite 5	TPH Texas Banding Aliphatic/Aromatic Split, PAH (16 speciated)	Leachate
Suite 6	TPH Texas Banding Aliphatic/Aromatic Split, PAH (16 speciated)	Water
Suite 7	TPH Texas Banding Aliphatic/Aromatic Split, TOC, organic matter	Soil
Suite 8	Sulphur (total), sulphate (water and acid soluble), pH	Soil
Suite 9	Sulphate, ammoniacal nitrogen, dissolved magnesium, pH	Water
Suite 10	VOC, SVOC, TOC, organic matter	Soil
Suite 11	VOC, SVOC	Leachate
Suite 12	VOC, SVOC	Water
Suite 13	Organotins dibutyltin/ tributyl-tin/tetrabutyltin/triphenyl-tin, Tetraethyl-lead/tetramethyl-lead	Soil
Suite 14	Organotin	Leachate
Suite 15	Organotin	Water
Suite 16	TPH Texas Banding Aliphatic/Aromatic Split, BTEX, VOC, SVOC	Soil, water, leachate
Suite 17	TPH Texas Banding Aliphatic/Aromatic Split, BTEX, SVOC, VOC, arsenic, boron (water soluble), beryllium, cadmium, chromium (total), copper, lead, mercury, nickel, selenium, vanadium, zinc, cyanide (free, total and complex, pH, phenol (total), sulfate (water soluble), sulfide, nitrate	Soil, water, leachate
Concrete BRE suite	pH, sulphate (water and acid soluble), magnesium (water soluble), ammonia (water soluble), chloride, nitrate	Soil



MAPS Viewer Version 5.6.7.0

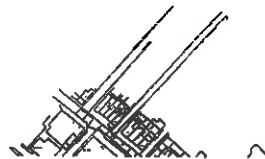
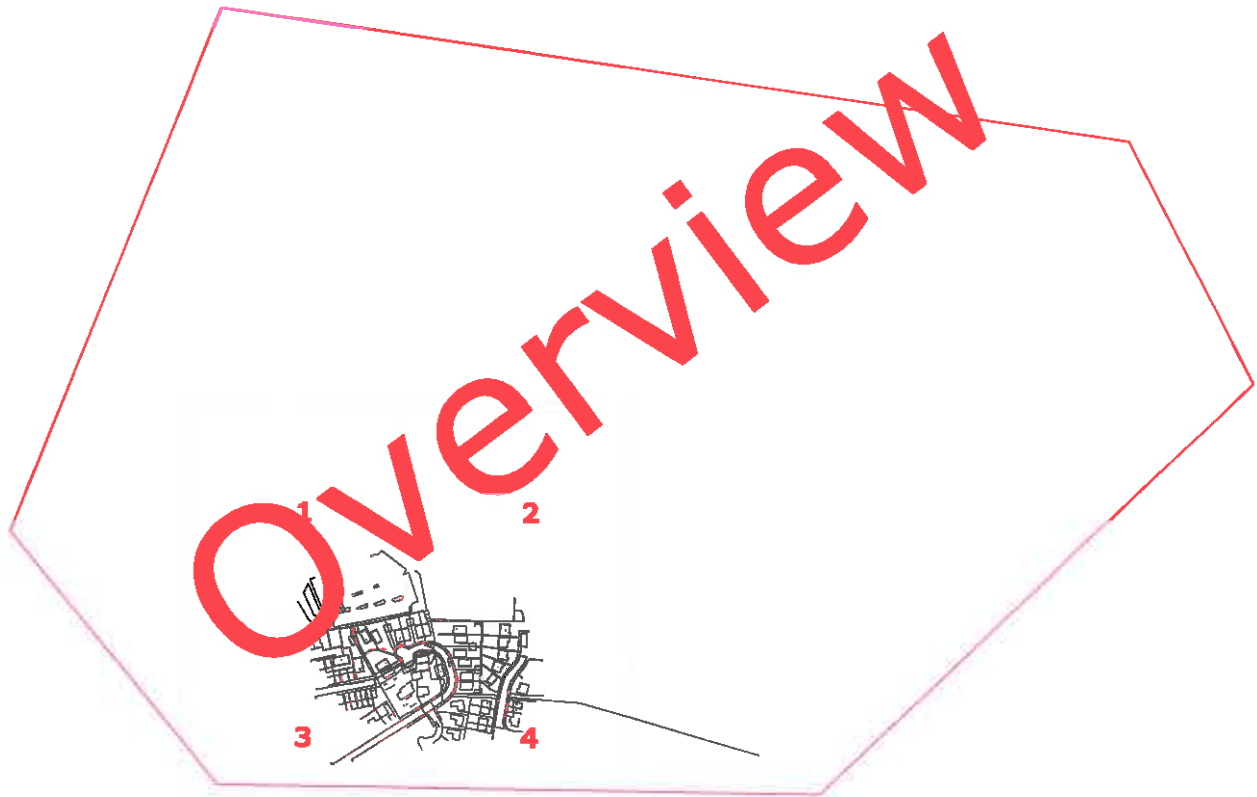
Local Machine

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SCALE: Not to scale	LP MAINS —	View	Reset
USER ID: wigralp	MP MAINS —	System	Change
DATE: 06/11/2015	IP MAINS - -	Change	Change
EXTRACT DATE: 15/06/2015	LHP MAINS - -	Change	Change
MAP REF: SD6037	IFP MAINS - -	Change	Change
CENTRE: 560328, 437960		Change	Change

From a selection of Plans View






Date Requested: 09/11/2015
 Requested by: Paul Wignall
 Job Reference: 7631462

Company: Barratt Homes Manchester
 Your Scheme/Reference: Chippings Lane



Key for Mains & Service Pipework

-  Existing LP mains or services operating up to 75 millibar gauge
-  Existing MP mains or services operating between 75 millibar and 2 bar gauge
-  Existing IP mains or services operating between 2 bar and 7 bar gauge

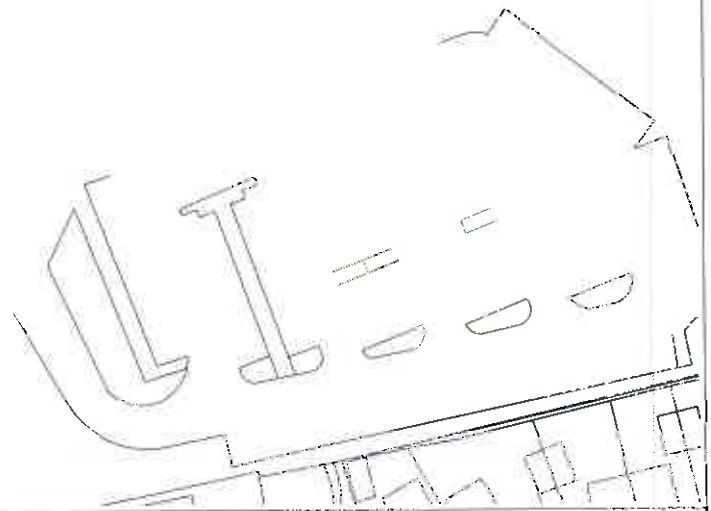
ESP Utilities Group Ltd
 Hazekdean, Station Road
 Leatherhead,
 Surrey, KT22 7AA
 Phone: 01372 227560
 Email: info@espipelines.com

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Dig Sites:
 Area  Line 
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 (excluding Overview map)




1



Date Requested: 09/11/2015
Requested by: Paul Wignall
Job Reference: 7631462



Company: Barratt Homes Manchester
Your Scheme/Reference: Chippings Lane

Key for Mains & Service Pipework

-  Existing LP mains or services operating up to 75 millibar gauge
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-  Existing IP mains or services operating between 2 bar and 7 bar gauge

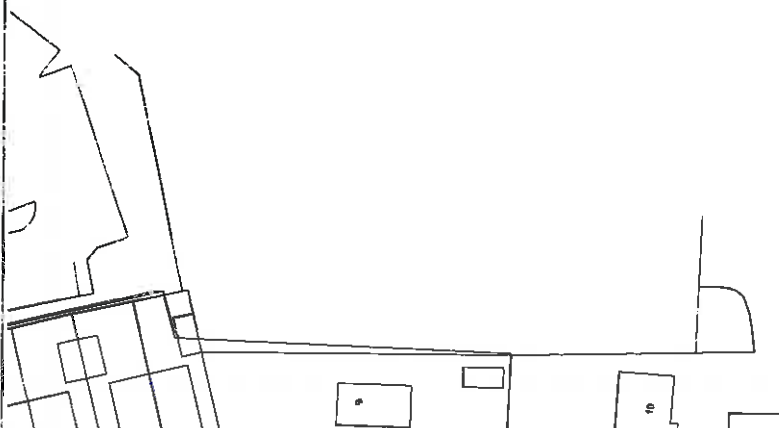


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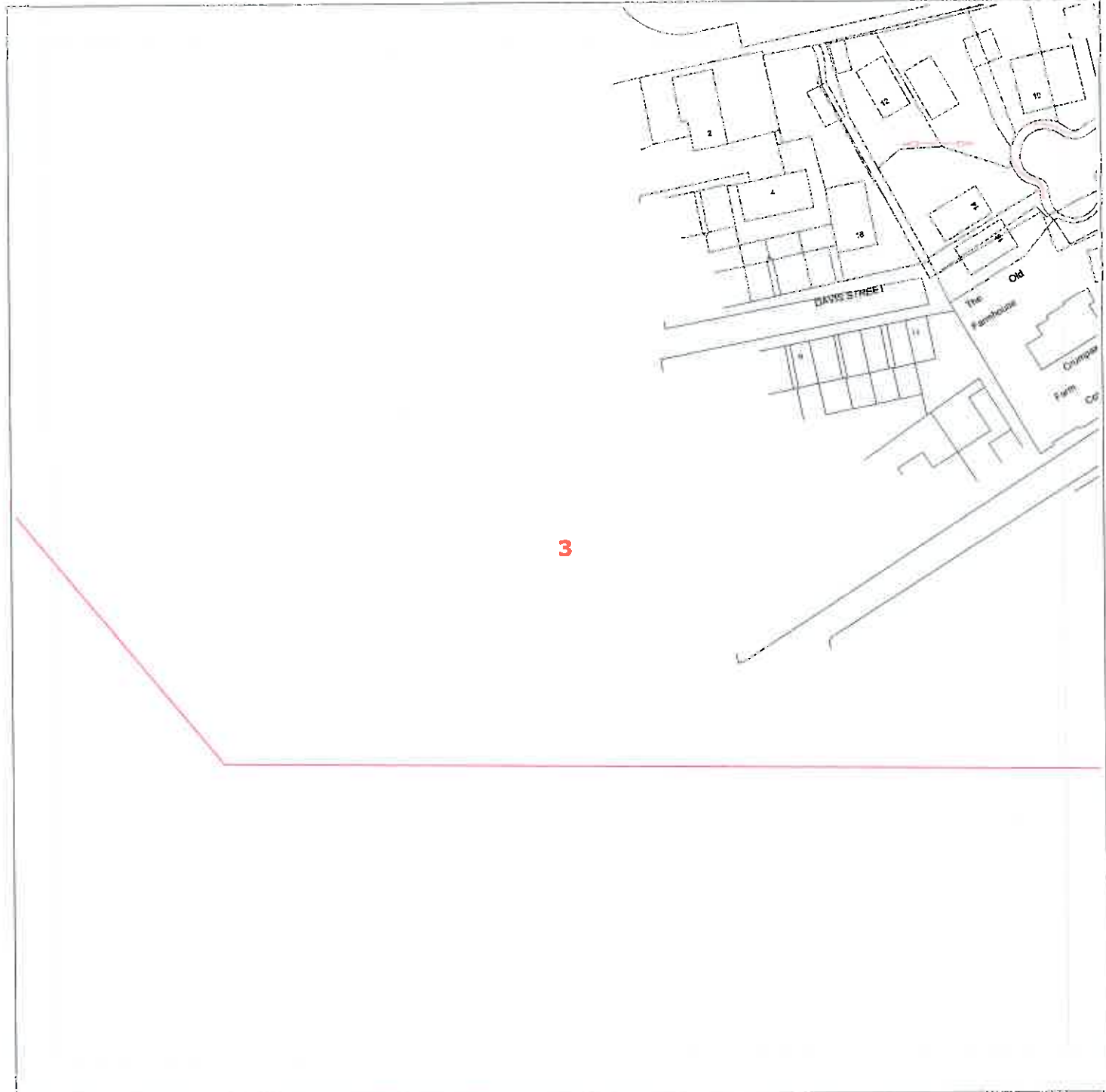


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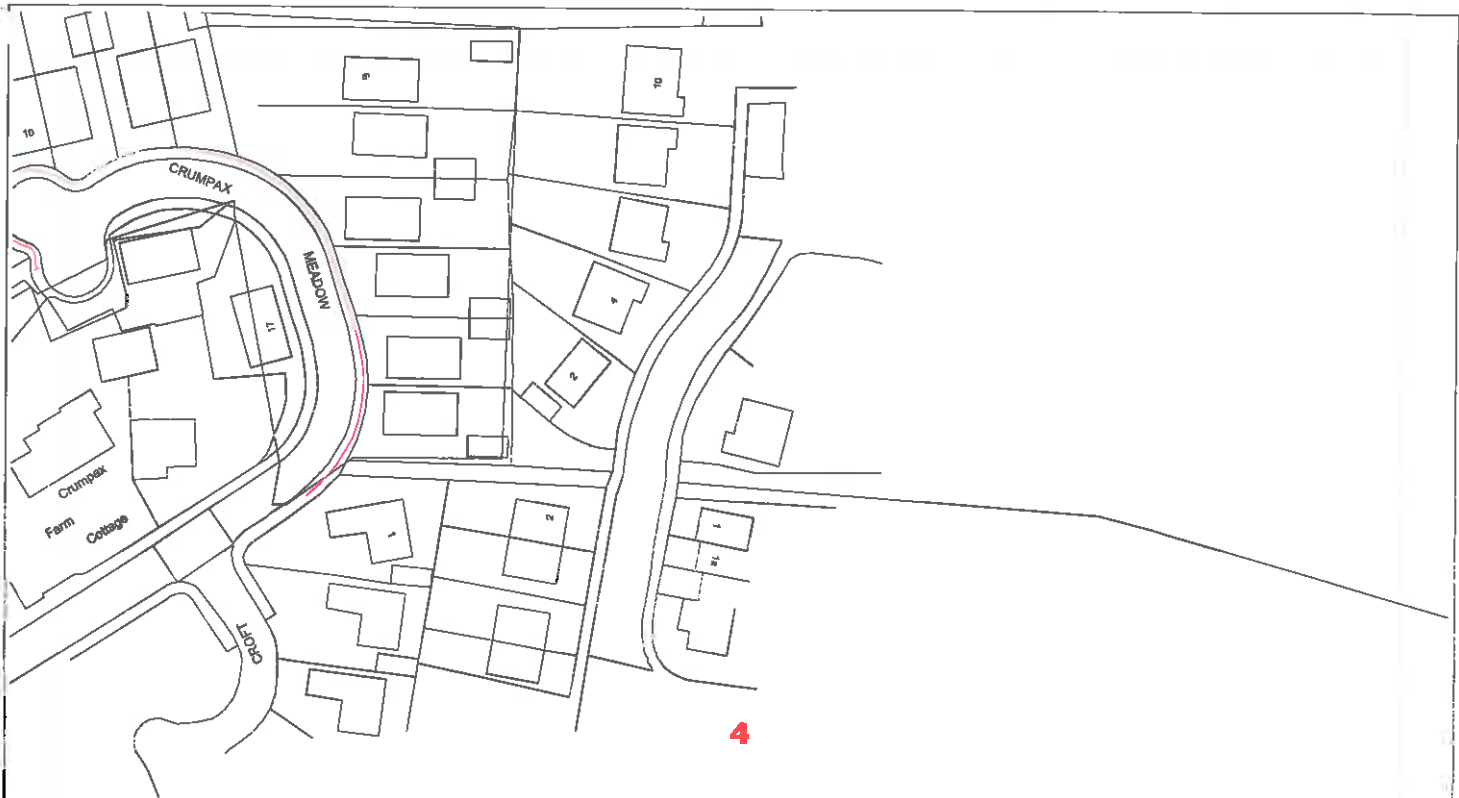


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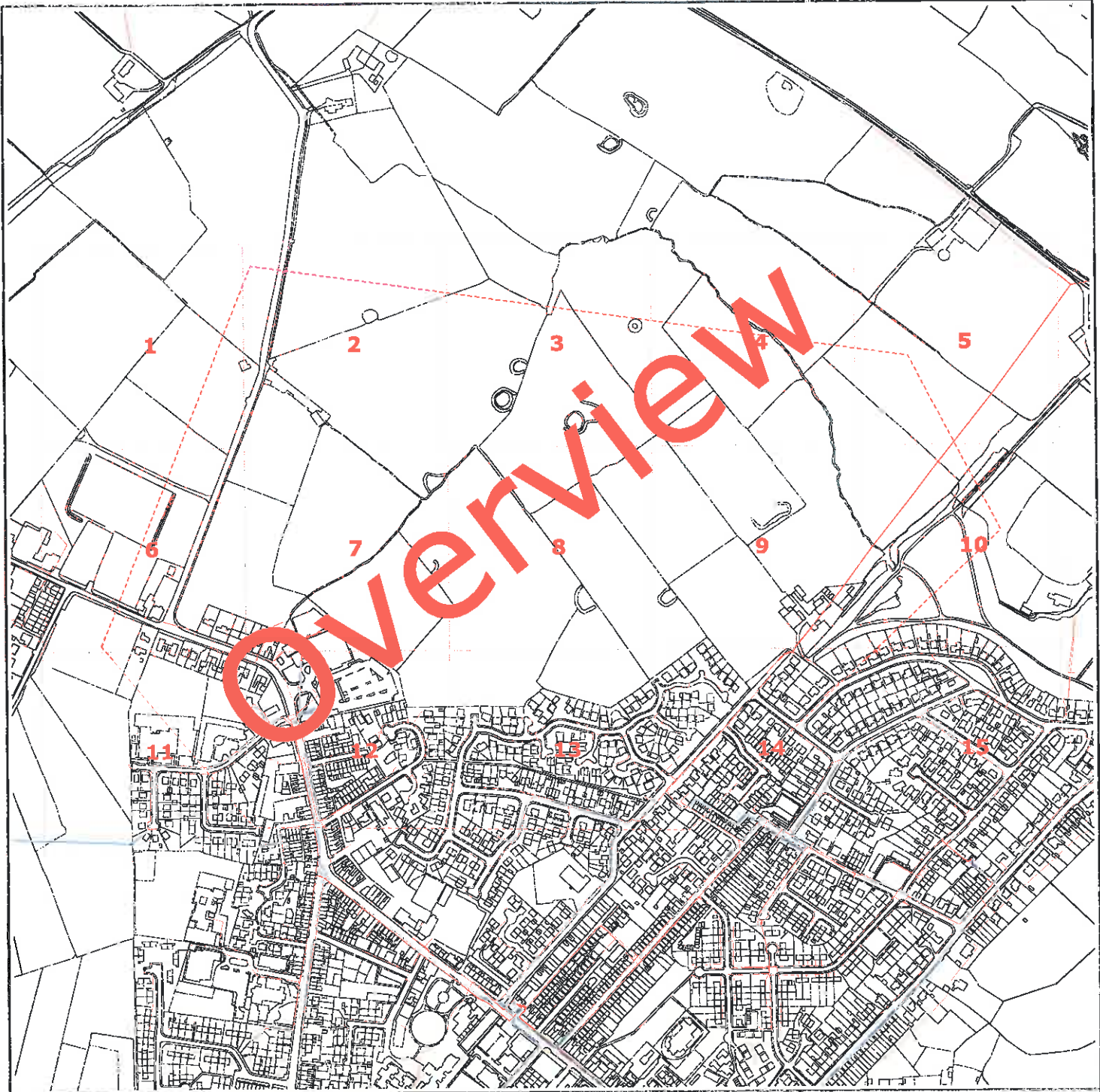


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Requested by: Paul Wignall
 Company: Barratt Homes Manchester
 Date Requested: 09/11/2015
 Job Reference: 7631462
 Your Scheme/Reference: Chippings Lane

Operating Voltage	Colour Code	Line Colour
132kV	Black	
33kV	Green	
22kV-25kV	Yellow	
11kV	Red	
6kV-6.6kV	Blue	
1kV-6kV	Violet	
LV	Orange	
Unknown Voltage	Brown	



Data Management
 Electricity North West
 Linley House
 Dickinson Street
 Manchester, M1 4LF
 Phone: 0800 195 4141
 Email: planrequest@enwl.co.uk

Scales on A4 paper:
 1:1250 Area dig site
 1:250 Line dig site

Dig Sites:
 Area Line

Unless otherwise indicated the depth of Electricity North West Limited cables are in accordance with NDUG (450mm for Low Voltage & 600mm for 11kV cables) 33kV and 132kV cables are laid at depths as marked. The depth and positions of Electricity North West Limited equipment was accurate as shown when the equipment was installed. However third parties may have altered the level & other reference data. Therefore Electricity North West Limited accept no responsibility for the position of Electricity North West Limited equipment being different from shown. No person, body or company, shall be relieved from liability for damage caused to Electricity North West Limited equipment by reason of being located differently to the indications on this drawing. Service cables are not necessarily shown but must be assumed to exist to all premises, streetlights and signs. There may be other Electricity North West Limited apparatus in the vicinity which is not indicated on the cable records. Other apparatus may also be present which is owned by a third party other than Electricity North West Limited.

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Mapping Type	Scale	Date	Dg
Lancashire And Furness	1:10,000	1847	3
Lancashire And Furness	1:10,000	1888	4
Lancashire And Furness	1:10,000	1913 - 1914	6
Lancashire And Furness	1:10,000	1833	8
Ordnance Survey Plan	1:10,000	1848	7
Ordnance Survey Plan	1:10,000	1868	8
Ordnance Survey Plan	1:10,000	1879	9
Ordnance Survey Plan	1:10,000	1879	10
Preston	1:10,000	1894	11
Ordnance Survey Plan	1:10,000	1994	12
10K Raster Mapping	1:10,000	2001	13
10K Raster Mapping	1:10,000	2008	14
VectorMap Local	1:10,000	2014	18

Russian Military Mapping Legends

1:5,000 and 1:10,000 mapping

1:25,000 mapping

Key to Numbers on Mapping

a. Not drawn to scale b. Drawn to scale

Government and Administrative Buildings

Military and Communication Areas

Fireproof Building

Non-Fireproof Building

Factory, mill and four mill with chimneys

Power Station, drawn to scale

Radio Station, drawn to scale

Abandoned Open-pit Mine or Quarry

Oil Deposit or Well

Oil Seepage

Oil Storage Tanks

Neutral Gas Tank

Burial Mound

Triangulation Point on Burial Mound

Single-track Railroad

Double-track Railway

Government and Administrative Buildings

Military and Communication Areas

Demolished Buildings

Built-Up Area with Fireproof Buildings Predominant

Individual Fireproof Building

Individual Dwelling, Fireproof

Factory or Mill with Chimney

Non-Operating Shaft or Mine

Small Hydroelectric Power Station

Gas Pump or Service Station

Power Station

Triangulation Point on Burial Mound

Telephone Office

Telegraph Office

Demolished Railroad

Railroad Under Construction

Military and Industrial Buildings

Subway Entrance

Demolished Buildings

Built-Up Area with Non-Fireproof Buildings Predominant

Prominent Industrial Building

Ruins of an Individual Dwelling

Factory or Mill without Chimney

Salt Mine

Gas Pump or Service Station

Power Station

Triangulation Point

Telephone Station

Telegraph Office

Demolished Railroad

Railroad Under Construction

Water Gauge



Lancashire And Furness Published 1847

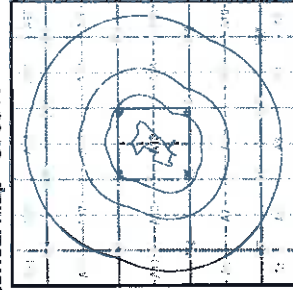
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:25,000 scale was adopted for mapping inland areas, these maps are used to update the 1:10,560 scale maps. The Ordnance Survey maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in adjoining areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unaltered - with all military camps and other strategic sites removed. These maps were initially overlaid with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



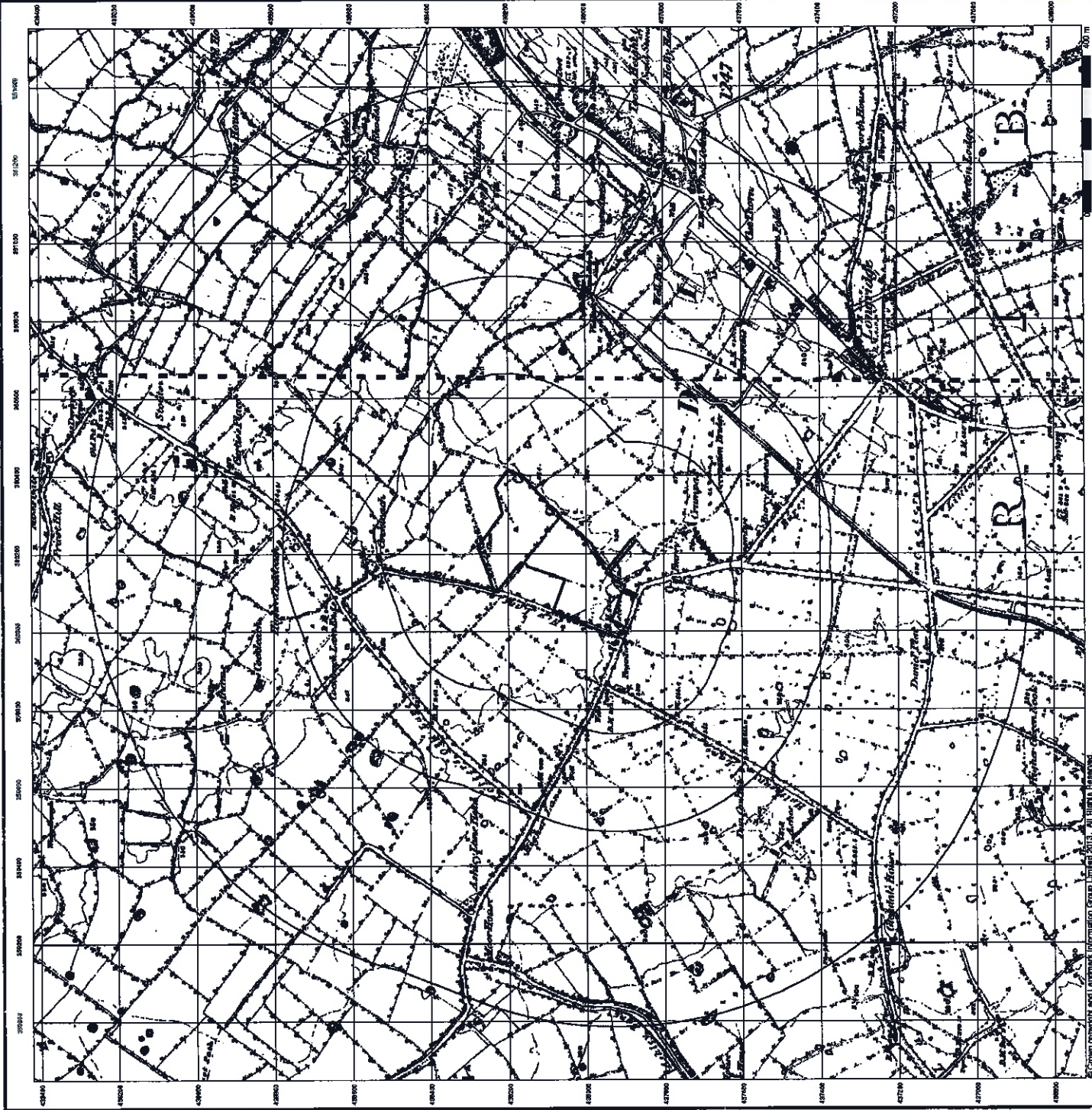
Historical Map - Slice A



Order Details
Order Number: 55312619_L1
Customer Ref: EB1355
National Grid Reference: 360190, 438070
Site:
Site Area (Hect): 7.22
Search Buffer (m): 1000
Site Details
Site at 360130, 438020



A Landmark Information Group Service. V17.2 14-Apr-2014 Page 3 of 18
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.earthcheck.co.uk





Lancashire And Furness Published 1895

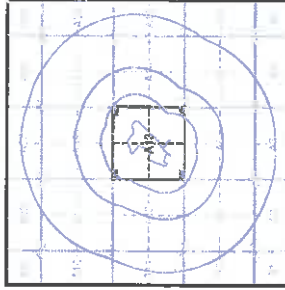
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held in the maps for England, Wales and Scotland in the 1840's. In 1864 the 1:10,560 maps were updated for the purpose of the Ordnance Survey. The maps were used to update the 1:10,560 maps. The maps were updated in 1895. The maps were often some years later than the surveyed data. Before 1838, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in adjoining areas. In the late 1840's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

OS4NE 1895 1:10,560	OS4NW 1895 1:10,560
OS6SE 1895 1:10,560	OS4SW 1895 1:10,560

Historical Map - Slice A

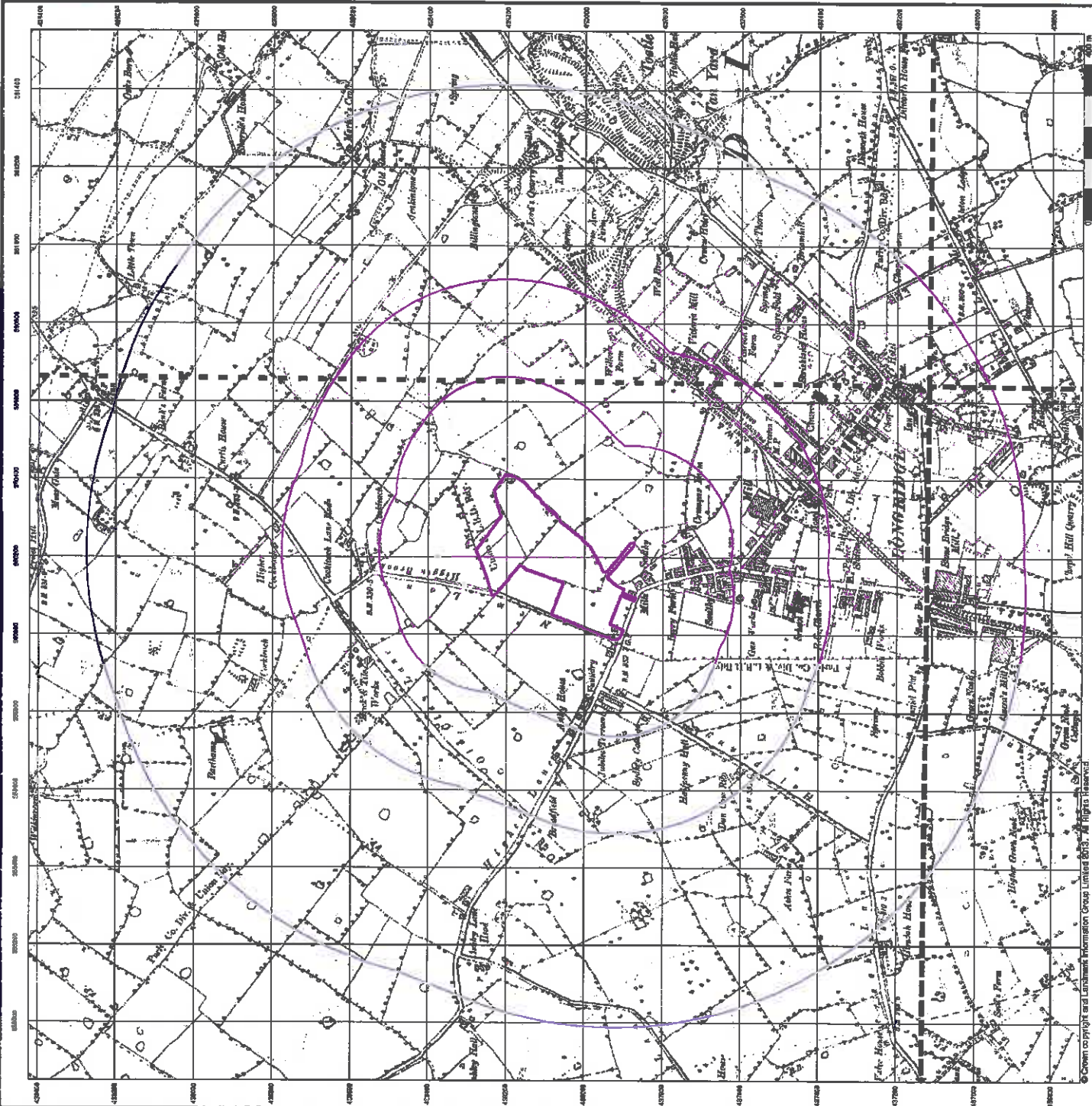


Order Details

Order Number: 56312619_1_1
 Customer Ref: EB1365
 National Grid Reference: 360190, 438070
 Slice: A
 Site Area (Ha): 7.22
 Search Buffer (m): 1000
 Site Details
 Site at 360130, 438020



Tel: 044 844 8822
 Fax: 044 844 8831
 Web: www.landmark.co.uk



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Lancashire And Furness Published 1913 - 1914

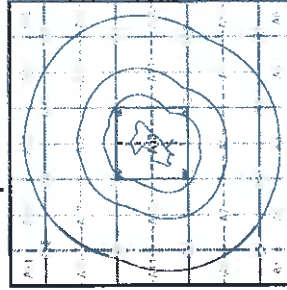
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the Ordnance Survey, Victoria and Scotland in the 1940's. In 1954 a 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in adjoining areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. This map appears unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued and recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

OS6NW	1913	1:10,560
OS6SE	1914	1:10,560

Historical Map - Slice A

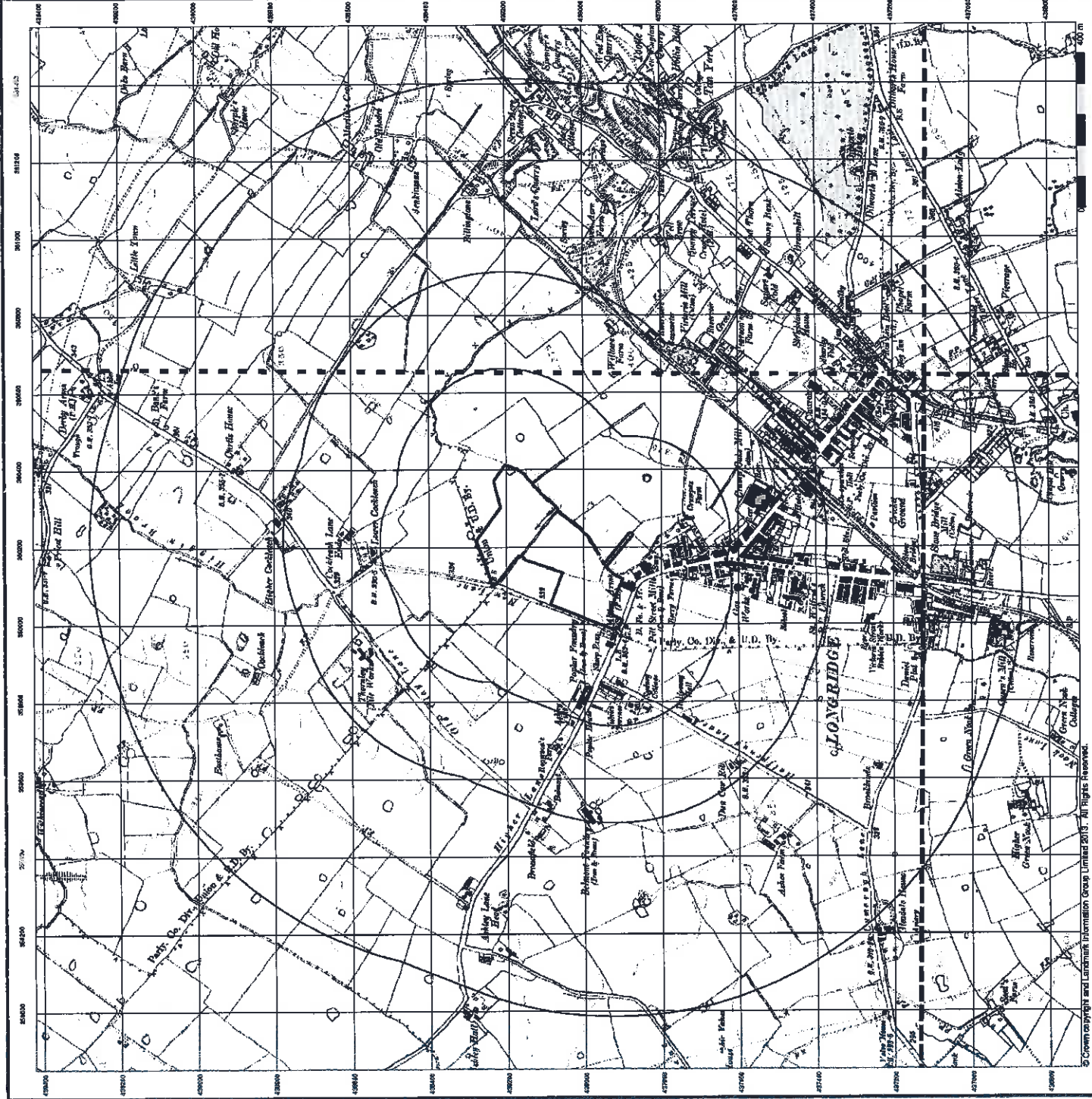


Order Details

Order Number: 55312619_1_1
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 National Grid Reference: 360190, 438070
 Site: A
 Site Area (Ha): 7.22
 Search Buffer (m): 1000
 Site Details
 Site at 360130, 438020



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 Fax: 0844 844 8951
 Web: www.landmark-uk.com
 A Landmark Information Group Stockley Wiltshire, UK
 14-Apr-2014 Page 5 of 18



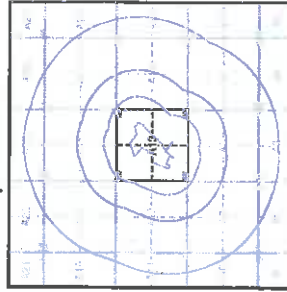
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The historical maps shown were reproduced from maps predominantly held in the archives of England, Wales and Scotland in the 1840's. In 1864 the Ordnance Survey was established and the first maps were produced. These maps were used to update the 1:10,560 maps. The maps were updated in 1893, all OS maps are based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in adjoining areas. In the late 1840's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overlaid with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

OS3NE 1982 1:10,560	OS4NW 1982 1:10,560
OS3SE 1982 1:10,560	OS4SW 1982 1:10,560

Historical Map - Slice A

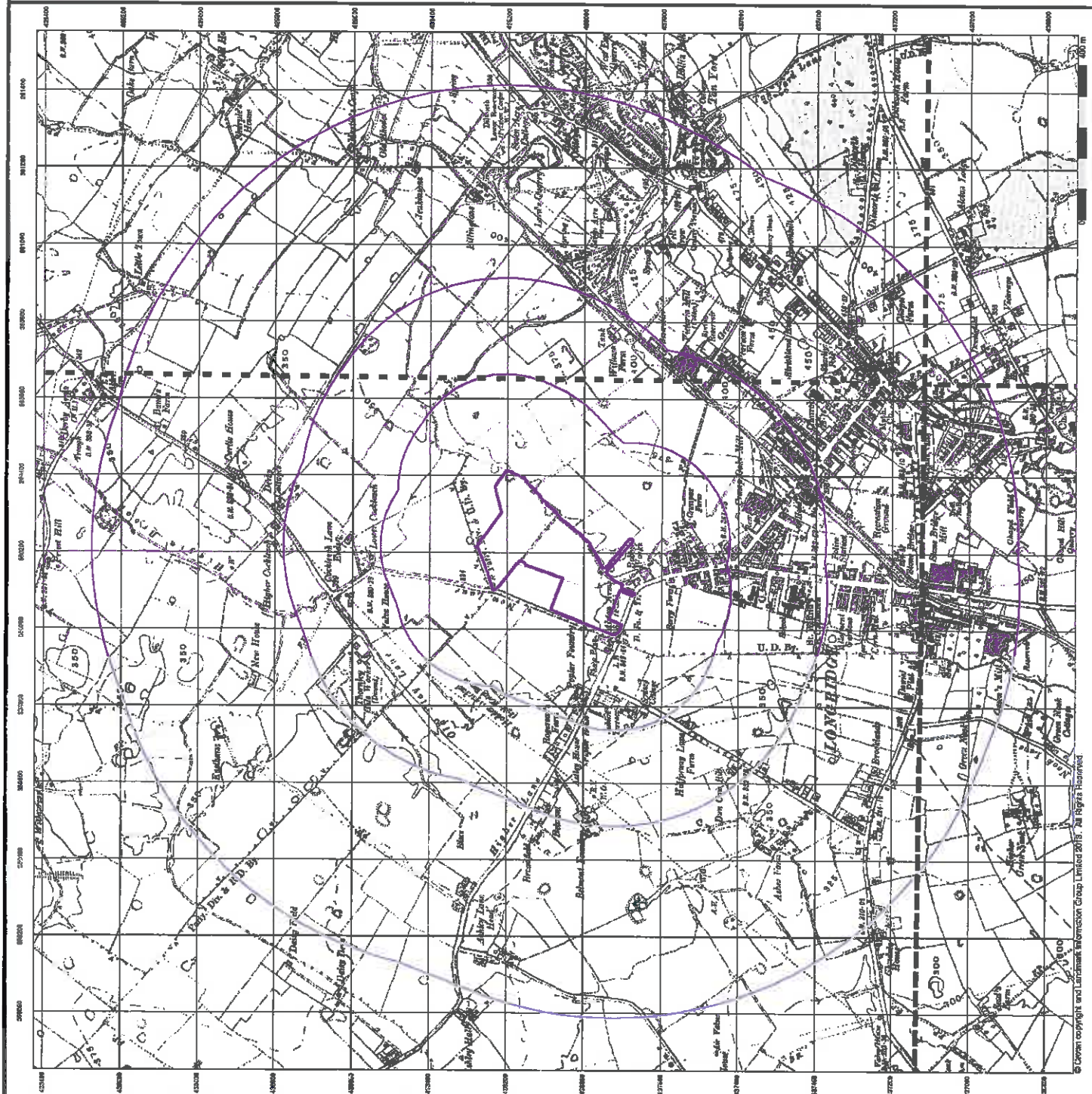


Order Details

Order Number: 55312819_1_1
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 Site Area (Ha): 7.22
 Search Buffer (m): 1000

Site Details

Site at 360130, 438020



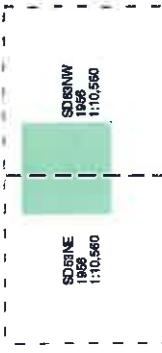


Ordnance Survey Plan Published 1956

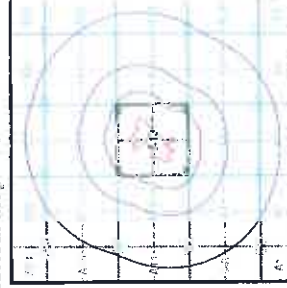
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the Ordnance Survey, which were produced in the 1840's. In 1854 the OS maps were updated for the 1:10,000 scale. These maps were then updated to the 1:10,000 scale. The published date given therefore is often some years later than the surveyed date. Between 1838, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1840's, a Provisional Edition was produced, which updated the 1:10,000 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overspread with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

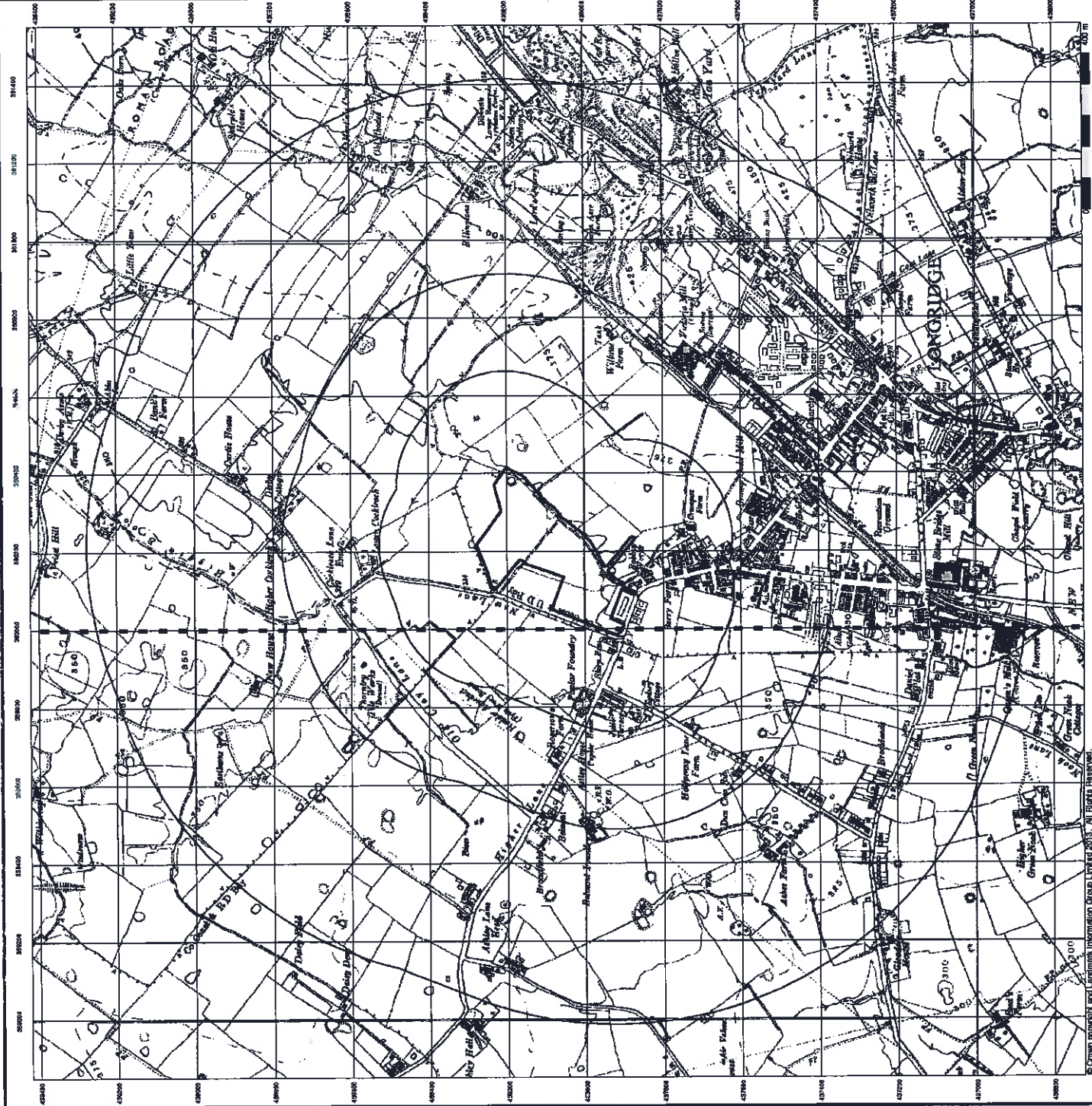


Order Details

Order Number: 55317619_1_1
 Customer Ref: EB1365
 National Grid Reference: 367190, 438070
 Slice: A
 Site Area (Ha): 7.22
 Search Buffer (m): 1000
 Site Details
 Site at 367130, 438020



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 Fax: 0844 844 8851
 Web: www.ordnancesurvey.co.uk



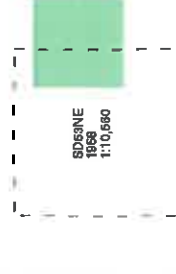


Ordinance Survey Plan Published 1968

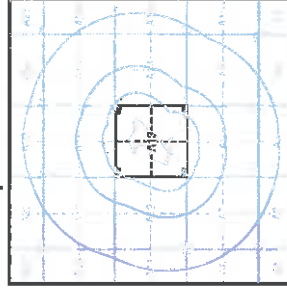
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the Ordnance Survey office in Southampton. The first edition of the 1:10,000 scale was adopted for mapping urban areas; these maps were used to update the 1:10,000 maps. The published data shown therefore is often some years later than the surveyed data. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in adjoining areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,000 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overlaid with the National Grid. In 1970, the first revision process commenced (and recently), with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

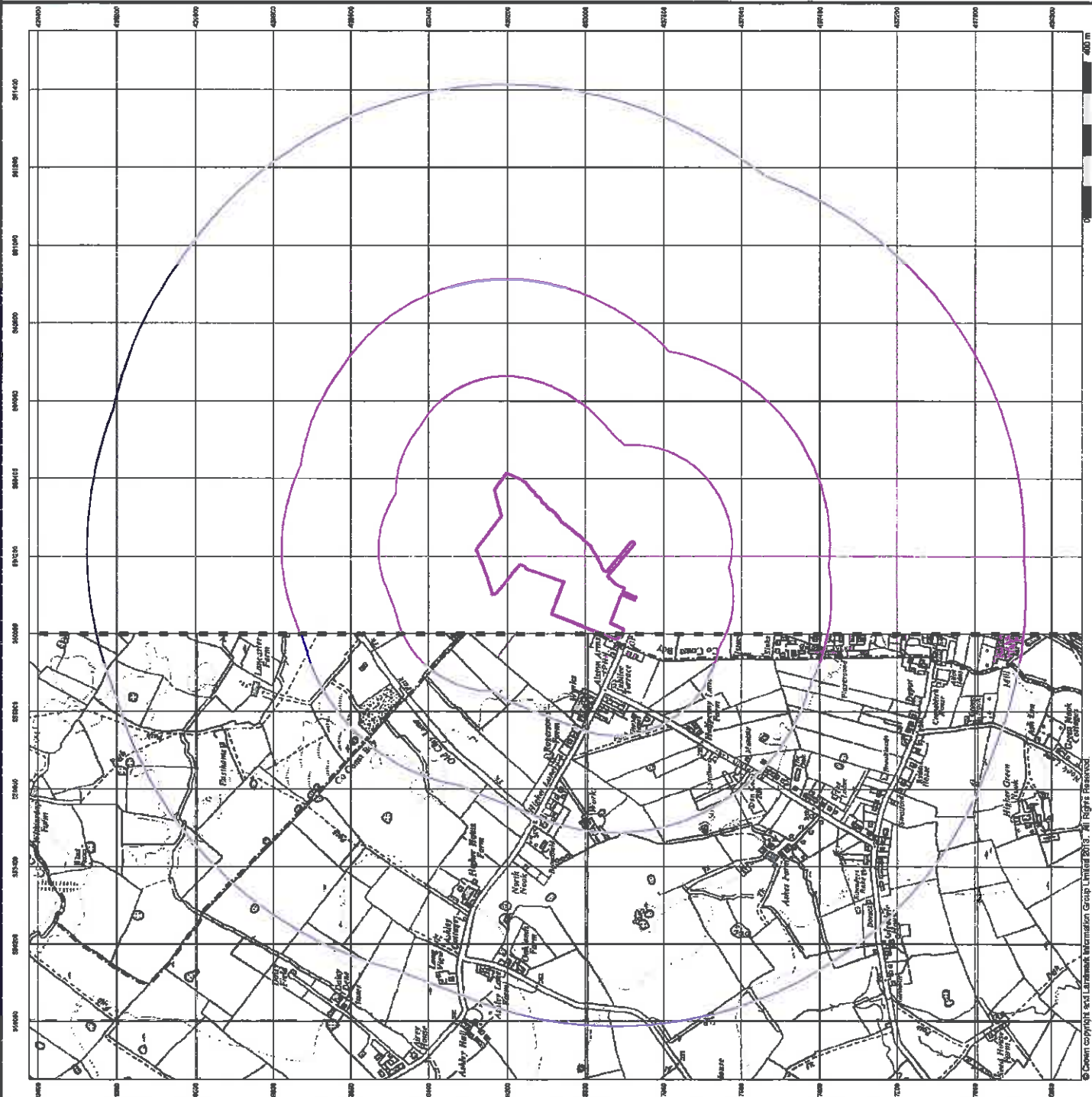
Order Number: 55312819_1_1
Customer Ref: EB1365
National Grid Reference: 360190, 438070
Slice: A
Site Area (Ha): 7.22
Search Buffer (m): 1000

Site Details

Site at 360130, 438020



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Fax: 0244 844 9551
Web: www.landmark.co.uk





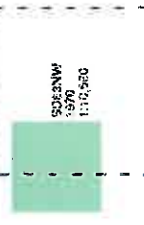
Ordnance Survey Plan

Published 1970

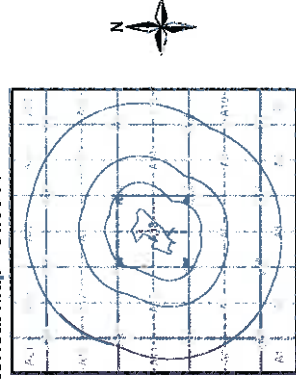
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the Ordnance Survey office in Southampton, England. Most were produced in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas: these maps were used to update the 1:10,000 maps. The published data given therefore is often some years later than the surveyed data. Before 1930, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in adjoining areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,000 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overlaid with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

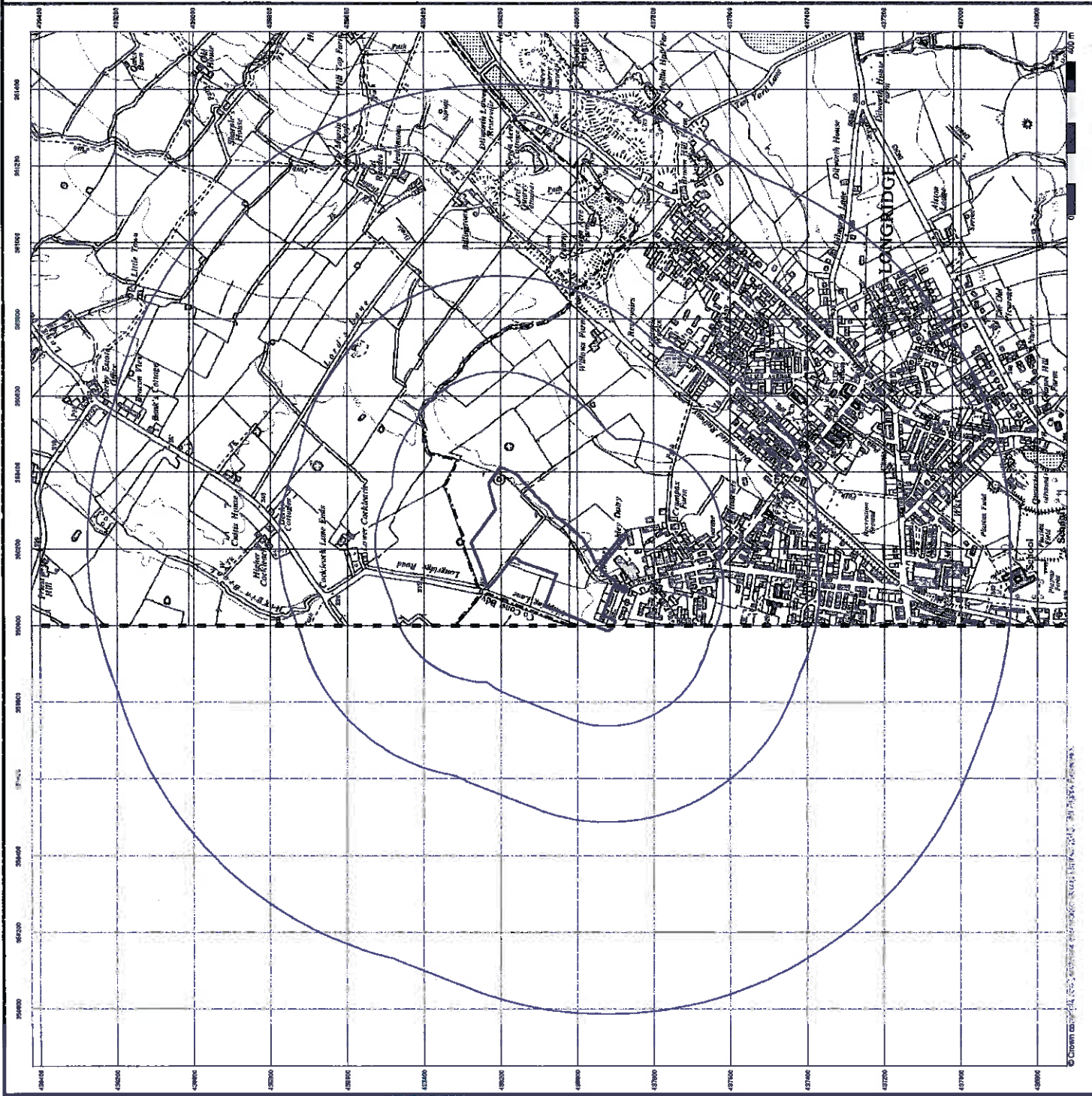
Map Name(s) and Date(s)



Historical Map - Slice A



Order Details
 Order Number: 55312619_L1
 Customer Ref: EB1355
 National Grid Reference: 360190, 438070
 Slice: A
 Site Area (Ha): 7.22
 Search Buffer (m): 1000
Site Details
 Site at 360130, 438020



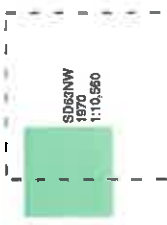


Ordinance Survey Plan Published 1970

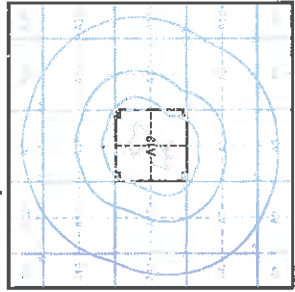
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,000 maps. The published data given therefore is often some years later than the surveyed data. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys in varying country or group of counties, giving rise to significant inaccuracies in adjoining areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,000 mapping from a number of sources. The maps appear unaltered - with all military camps and other strategic sites removed. These maps were tidily overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 55312619_1_1
Customer Ref: EB1355
National Grid Reference: 360180, 436070

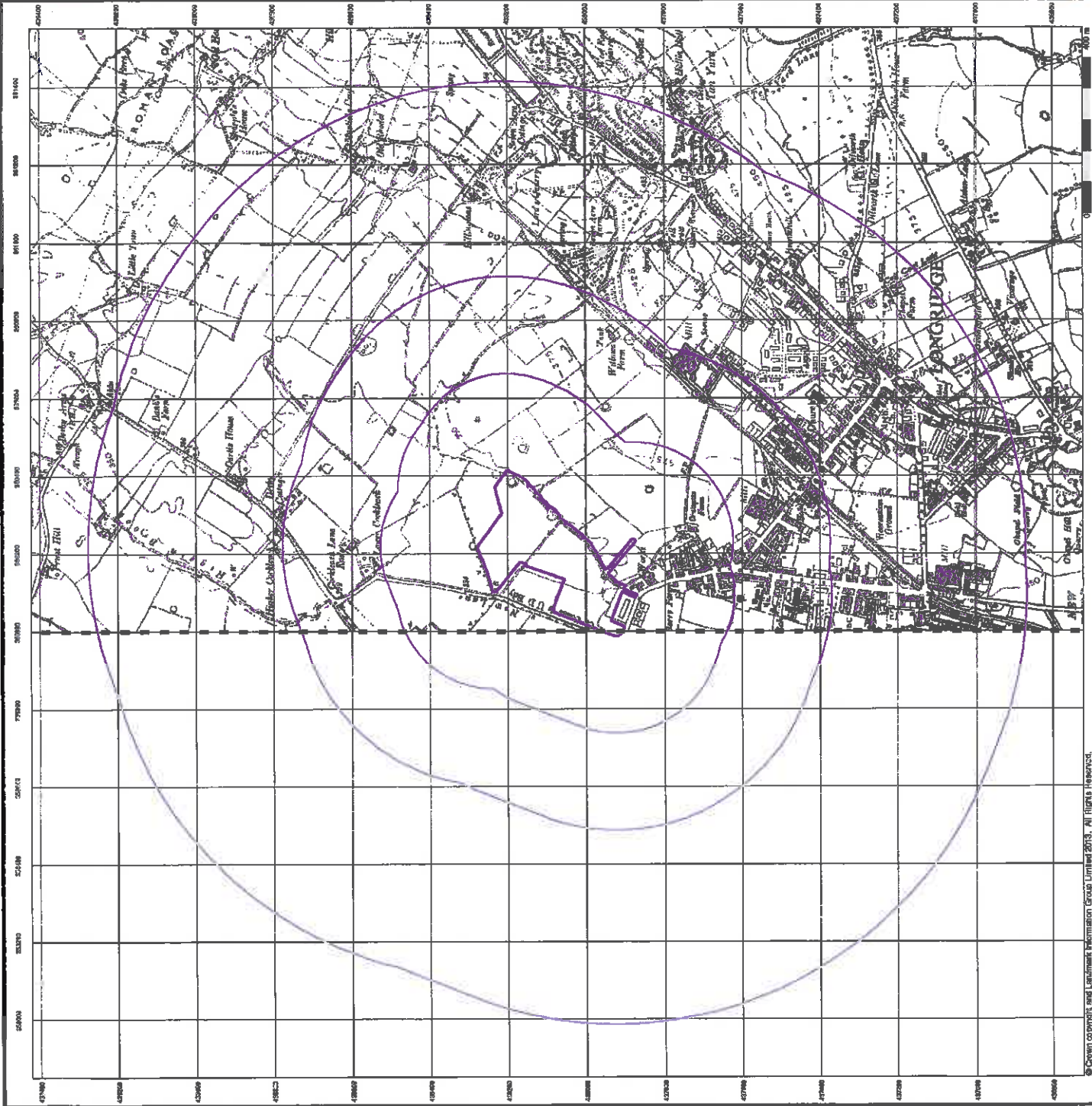
Slice: A
Site Area (ha): 7.22
Search Buffer (m): 1000

Site Details

Site at 360130, 436020



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Web: www.landmark.co.uk





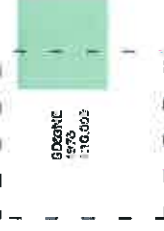
Preston

Published 1976

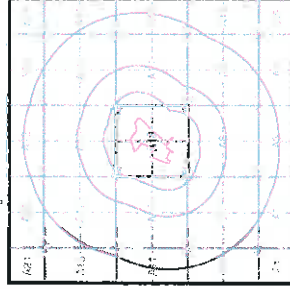
Source map scale - 1:10,000

These maps were produced by the Russian military during the Cold War between 1950 and 1997, and cover 103 towns and cities throughout the UK. The maps are produced at 1:25,000, 1:10,000 and 1:5,000 scale, and show detailed land use, with colour-coded areas for development, green areas, and non-developed areas. Buildings are coloured black and important building uses (such as hospitals, power centres, factories etc.) are highlighted, with a red outline. They were produced by the Russians for the benefit of navigation, as well as strategic military sites and transport hubs, for use if they were to have invaded the UK. The detailed information provided indicates that the areas were surveyed using land-based personnel, on the ground, in the cities that are mapped.

Map Name(s) and Date(s)



Russian Map - Slice A



Order Details

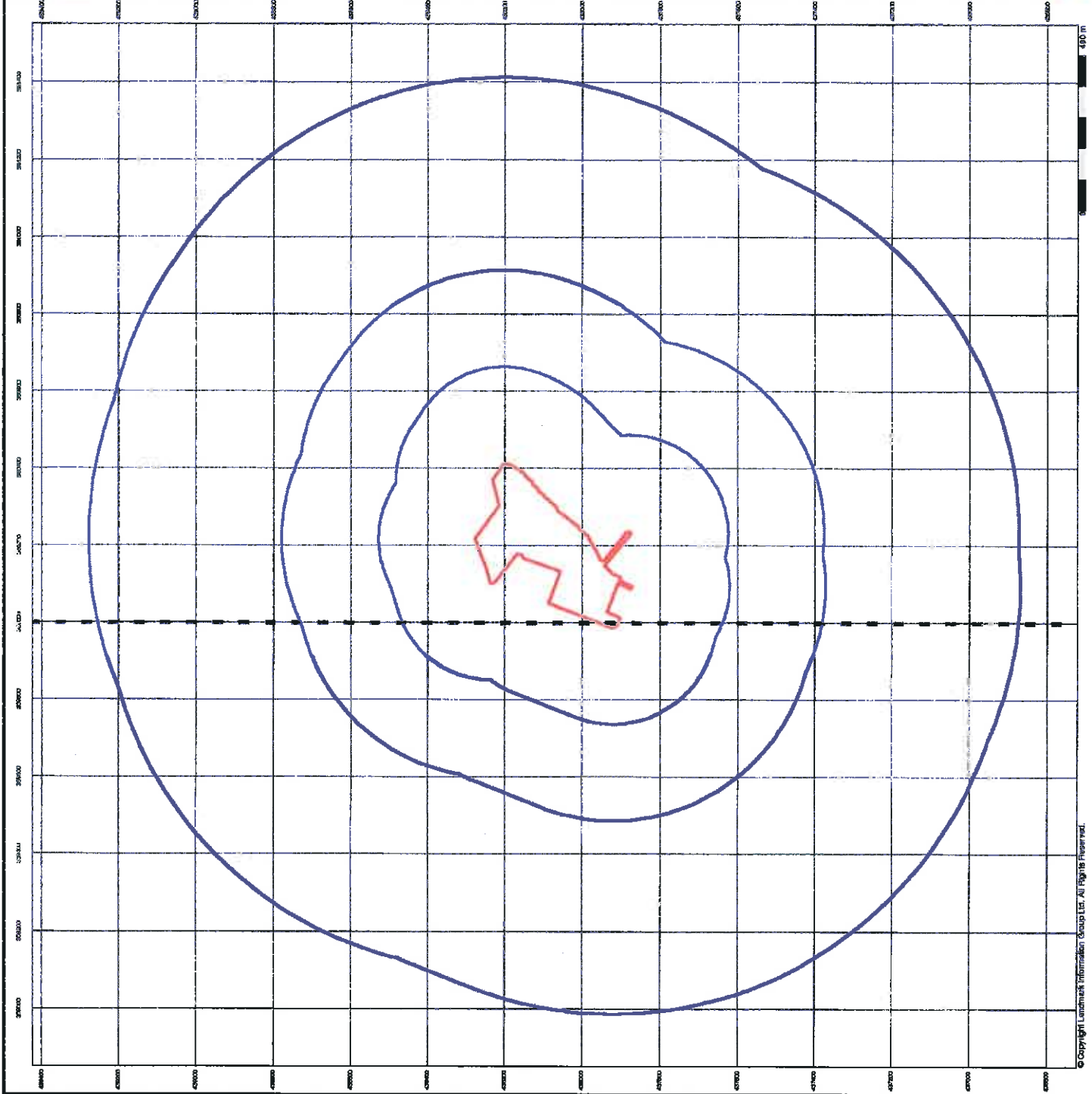
Order Number: 55312619_A_1
Customer Ref: EB1355
National Grid Reference: 360190, 438070
Slice: A
Site Area (Ha): 7.22
Search Buffer (m): 1000

Site Details

Site at 360130, 438020



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Web: www.landmark.co.uk



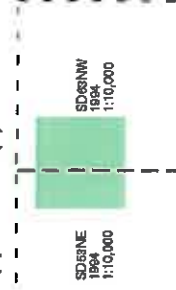


Ordinance Survey Plan Published 1994

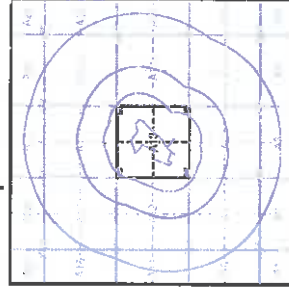
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held in the Ordnance Survey archives for England, Wales and Scotland in the 1940's. In 1986 the 1:2,500 maps were updated to the 1:10,000 scale. The published data shown for maps were often some years later than the surveyed data. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in adjoining areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,000 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overlaid with the National Grid. In 1970, the first revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

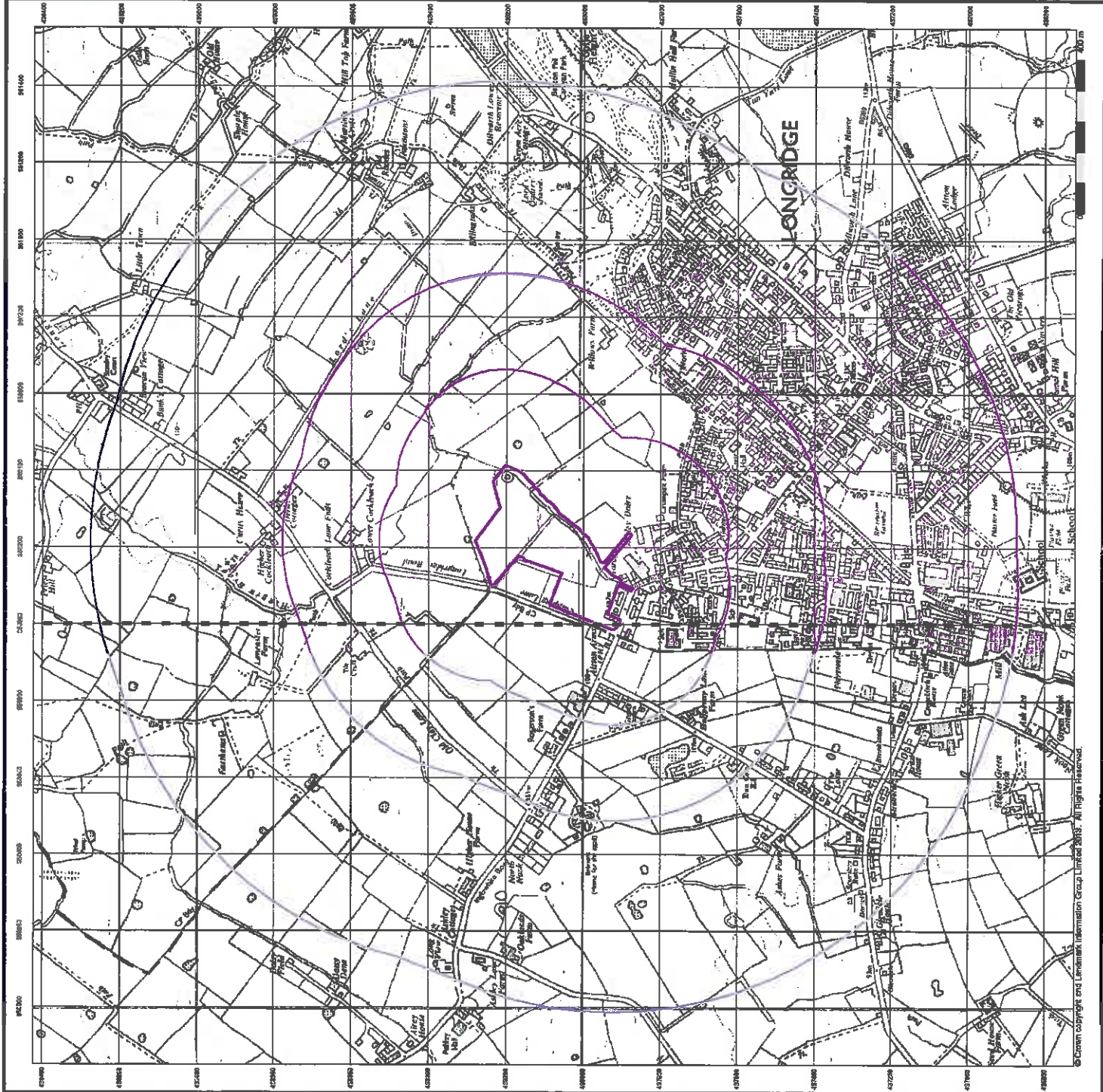
Order Number: 56312619_1_1
Customer Ref: EB1365
National Grid Reference: 360190, 436070
Slice: A
Site Area (Ha): 7.22
Search Buffer (m): 1000

Site Details

Site at 360130, 436020



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Web: www.landmark.co.uk



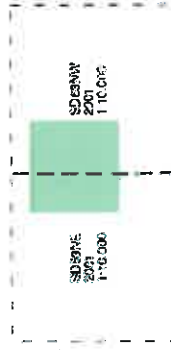


10k Raster Mapping Published 2001

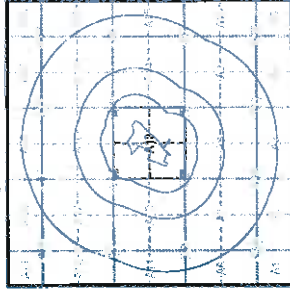
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster mapping. These maps are derived from the data which replaced the old 1:10,000 maps originally held by the Ordnance Survey. The data is digitised and the maps are published as a series of 10k slices. The data is in a vector format and the maps are published as a series of 10k slices. The data is digitised and the maps are published as a series of 10k slices. The data is digitised and the maps are published as a series of 10k slices.

Map Name(s) and Date(s)

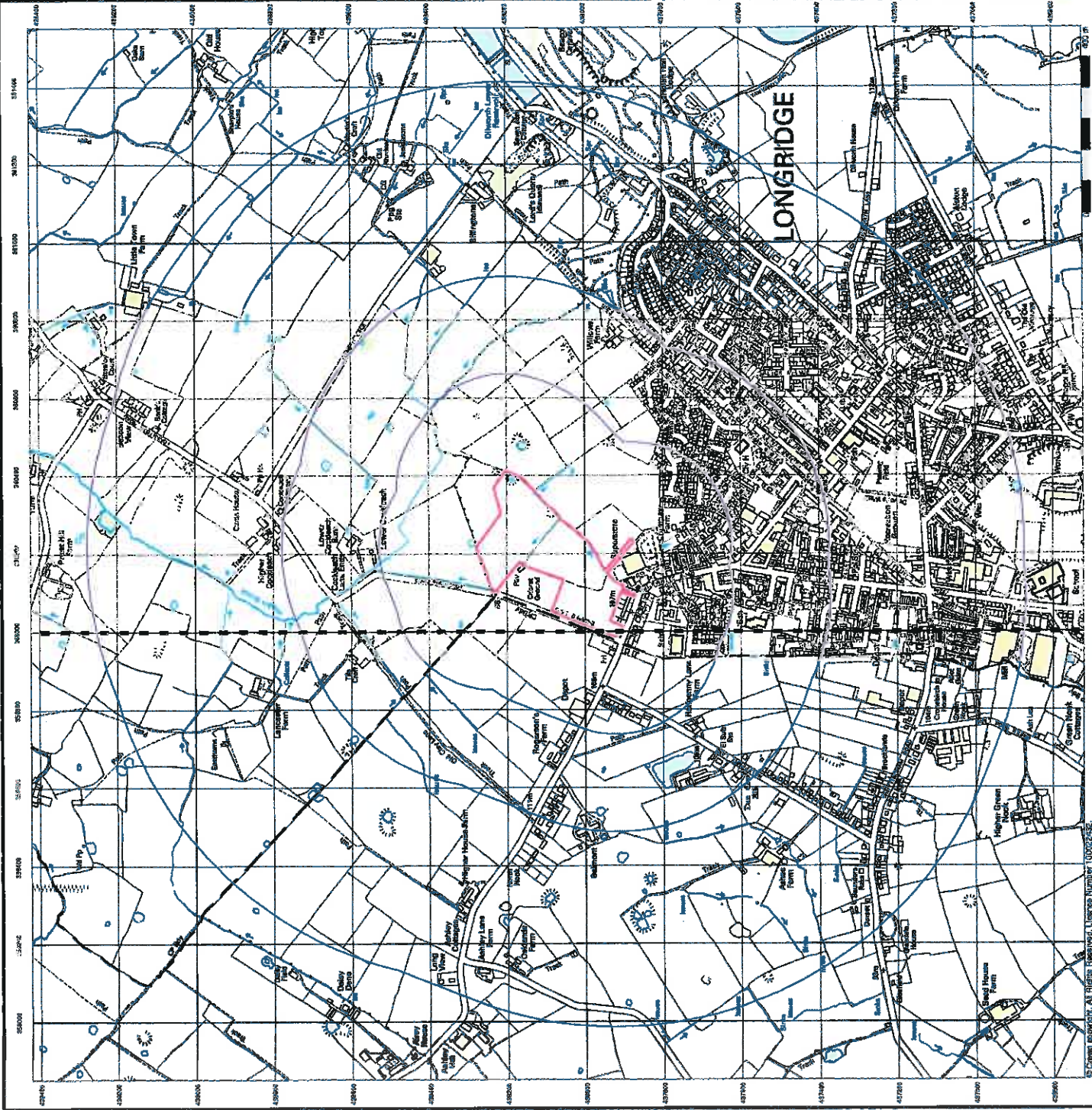


Historical Map - Slice A



Order Details

Order Number: 5512619_1_1
Customer Ref: EB1355
National Grid Reference: 360190, 438070
Site: A
Site Area (Ha): 7.22
Search Buffer (m): 1000
Site Details
Site at 360130, 438020



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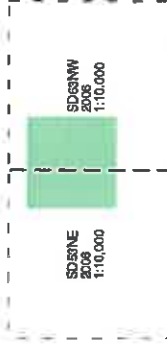


10k Raster Mapping Published 2006

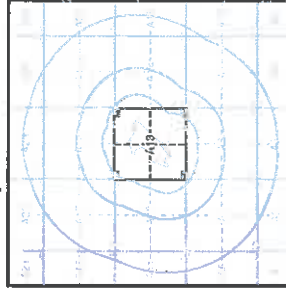
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster mapping. These maps are derived from London which released five old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depicts the includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)



Historical Map - Slice A

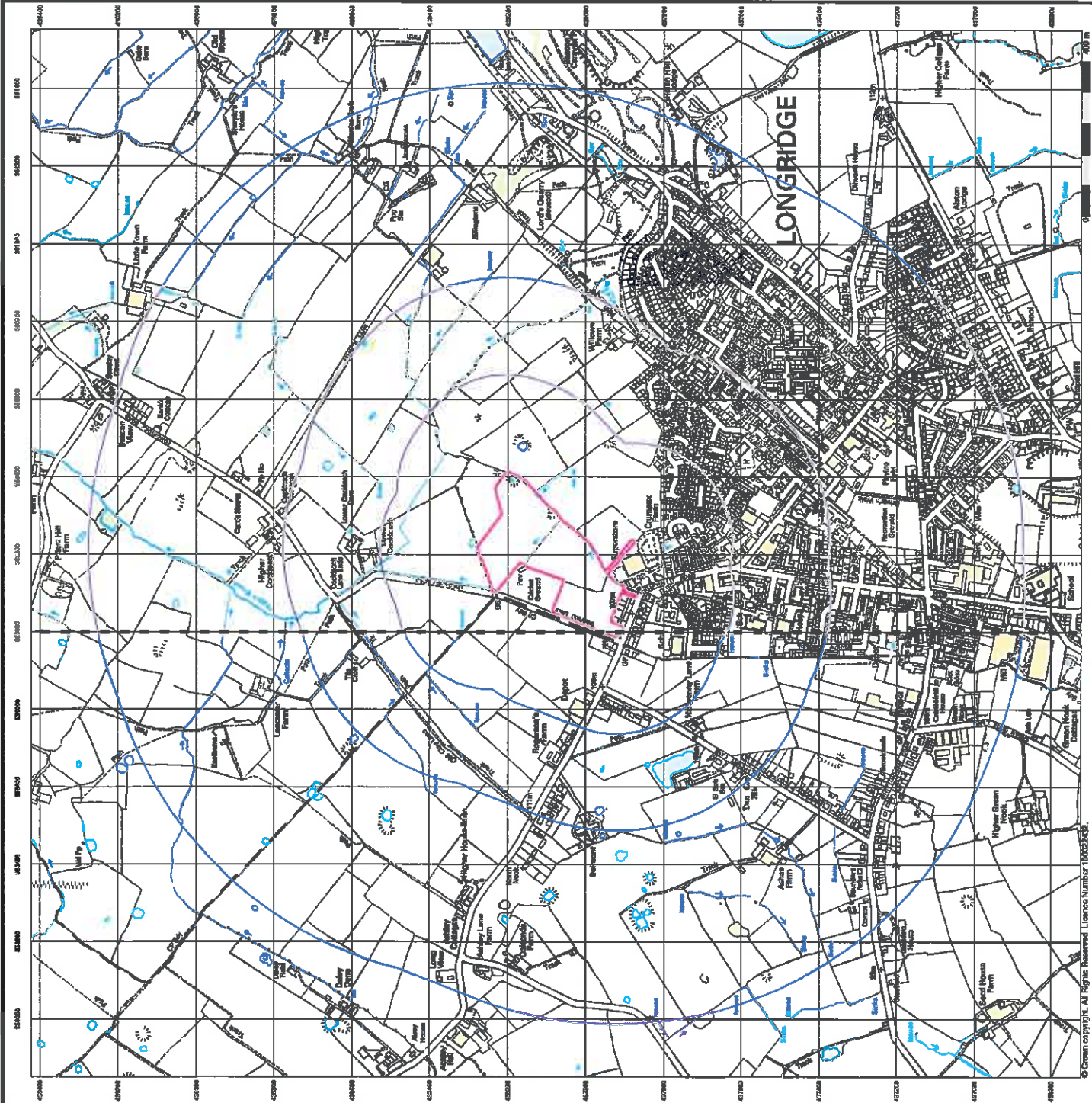


Order Details

Order Number: 56312619_1_1
Customer Ref: EB1365
National Grid Reference: 360190, 436070
Site:
Site Area (Ha): 7.22
Search Buffer (m): 1000
Site at 360130, 436020



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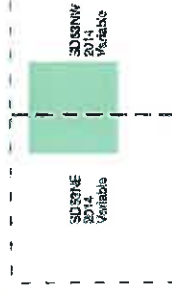


VectorMap Local Published 2014

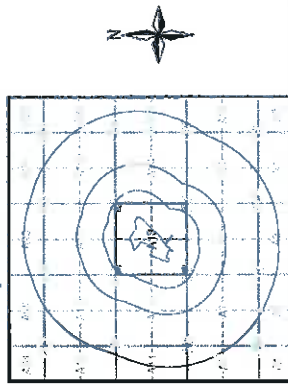
Source map scale - 1:10,000

VectorMap Local (Raster) is Ordnance Survey's highest detailed 'backdrop' mapping product. These maps are produced from OS's VectorMap Local, a simple vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain. It has been designed for creating graphical mapping. OS VectorMap Local is derived from digital information surveyed at 1:2500 scale (contour map areas) and 1:2500 scale (contour map areas), and 1:10,000 scale (contour, road and other salient areas).

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

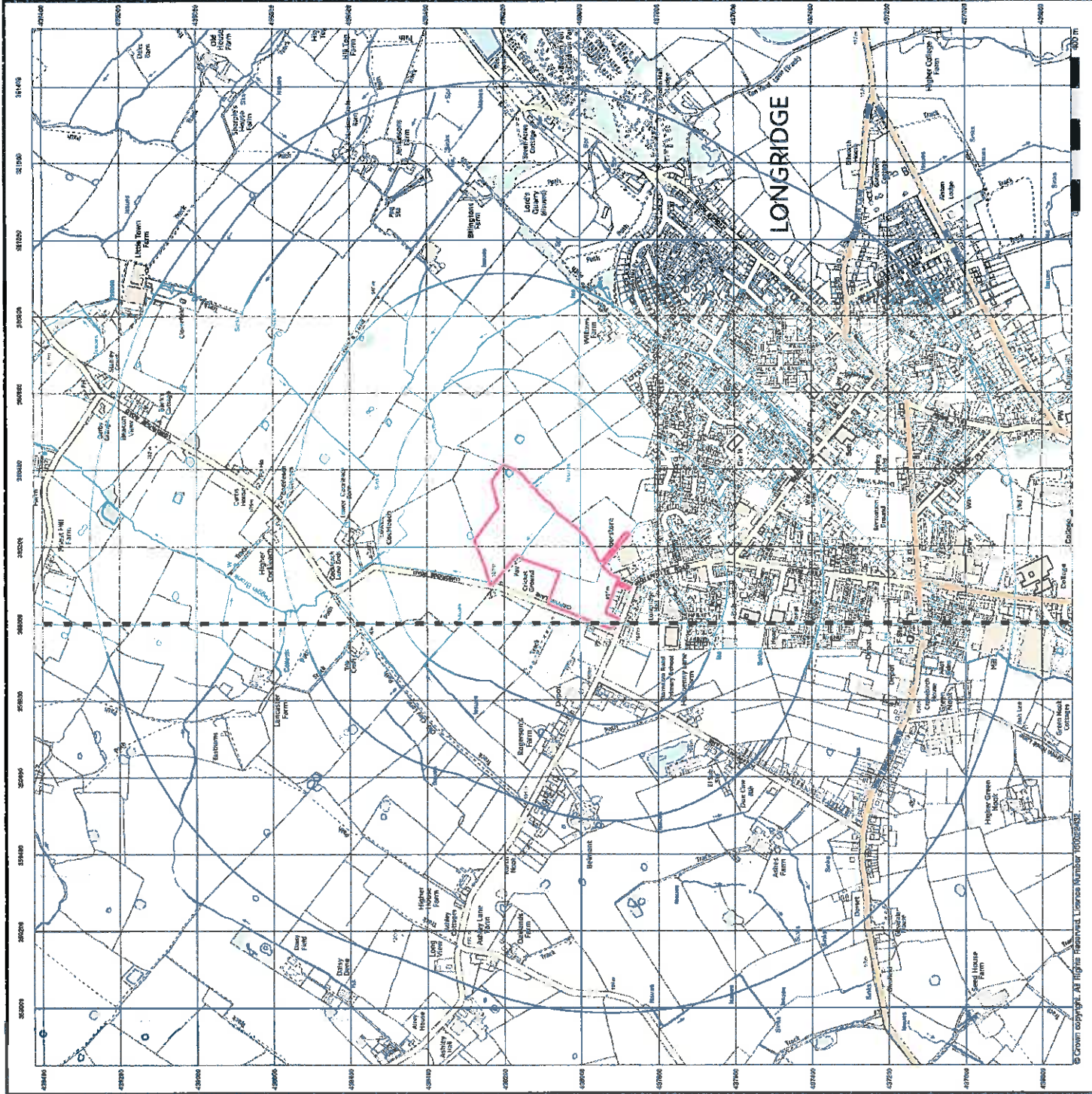
Order Number: 55312619_1_1
 Customer Ref: EB1355
 National Grid Reference: 360190, 436070
 Slice: A
 Site Area (Ha): 7.22
 Search Buffer (m): 1000

Site Details

Site at 360190, 436020



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 FAX: 0844 844 9971
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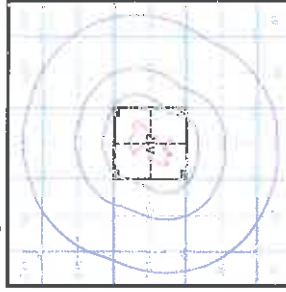
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General
 ○ Specified Site
 ○ Bearing Reference Point

Agency and Hydrological (Flood)

Extreme Flooding from Rivers or Seas without Defences (Zone 2)
 Flooding from Rivers or Seas without Defences (Zone 3)
 Area Benefitting from Flood Defence
 Flood Water Storage Areas
 Flood Defences

Flood Map - Slice A



Order Details

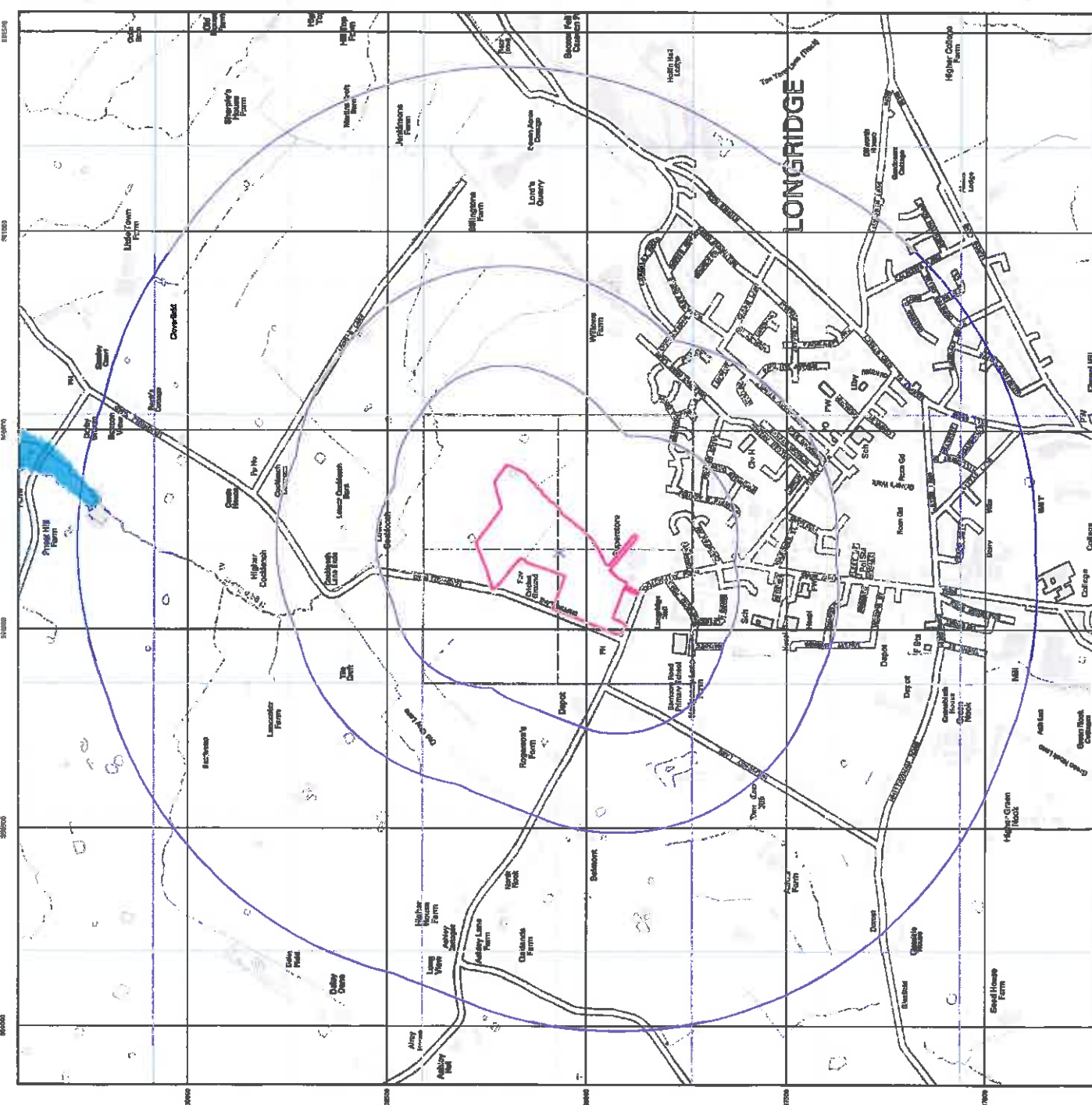
Order Number: 55312619_1_1
 Customer Ref: EB1355
 National Grid Reference: 360190, 438070
 Site: A
 Site Area (Ha): 7.22
 Search Buffer (m): 1000

Site Details

Site at 360130, 438020



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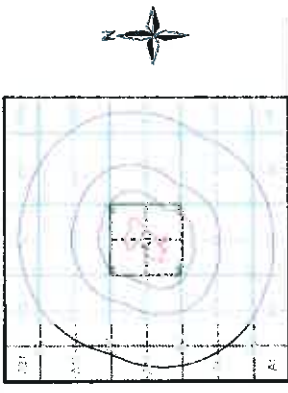
- Contour Lines
- Property Boundaries
- Search Buffer
- Borehole Location
- Other Features

AGRICULTURE and Hydrological (Boreholes)

- Borehole Path 0-10m
- Borehole Path 10-20m
- Borehole Path 20-30m
- Borehole Path 30-40m
- Borehole Path 40-50m
- Borehole Path 50-60m
- Borehole Path 60-70m
- Borehole Path 70-80m
- Borehole Path 80-90m
- Borehole Path 90-100m
- Borehole Path 100-110m
- Borehole Path 110-120m
- Borehole Path 120-130m
- Borehole Path 130-140m
- Borehole Path 140-150m
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- Borehole Path 810-820m
- Borehole Path 820-830m
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- Borehole Path 890-900m
- Borehole Path 900-910m
- Borehole Path 910-920m
- Borehole Path 920-930m
- Borehole Path 930-940m
- Borehole Path 940-950m
- Borehole Path 950-960m
- Borehole Path 960-970m
- Borehole Path 970-980m
- Borehole Path 980-990m
- Borehole Path 990-1000m

For Borehole information please refer to the Borehole .csv file which accompanied this slice.
A copy of the BGS Borehole Ordering Form is available to download from the Support section of www.courtins.co.uk.

Borehole Map - Slice A

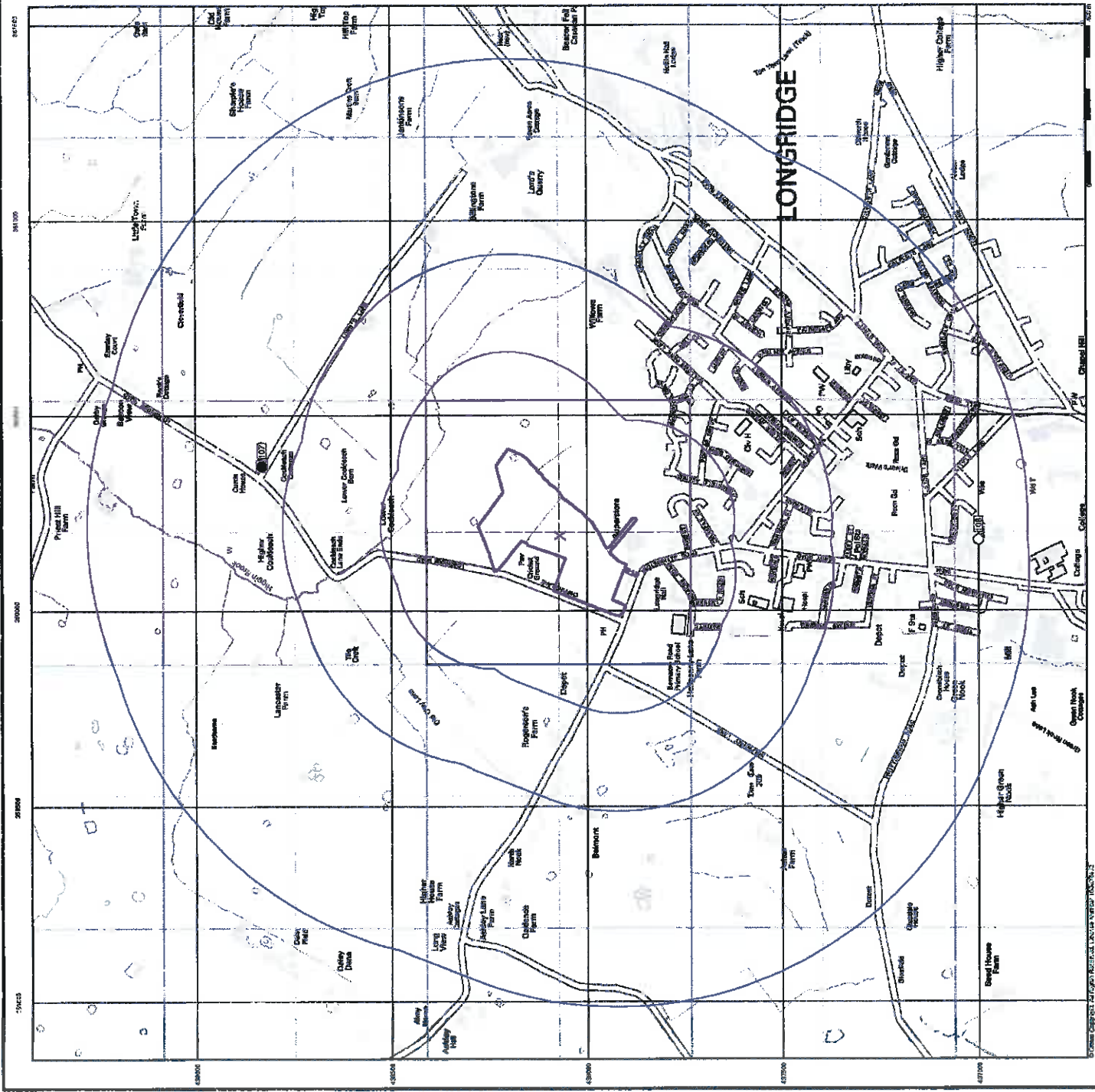


Order Details

Order Number: 55312819_1_1
 Customer Ref: EB1355
 National Grid Reference: 360190, 438070
 Slice: A
 Site Area (Ha): 7.22
 Search Buffer (m): 1000
 Site Details
 Site at 360130, 438020



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General
 Specified Site
 Specified Feature
 Bearing Reference Point
 Map ID

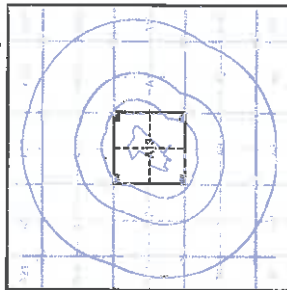
EA Detailed River Network Data

- Primary River
- Secondary River
- Tertiary River
- Canal
- Canal Tunnel
- Undefined River
- Lake/Reservoir
- Office Drainage Feature
- Extended Current (greater than EDM)
- Underground River (reference)
- Underground River (local knowledge)
- Downstream of High Water Mark
- Downstream of Sewered Extension
- Not assigned River feature

Contours (Height in metres)

- Sanded Contour
- Index Contour
- Spot Height
- At Height

EA Detailed River Network Map - Slice A



Order Details

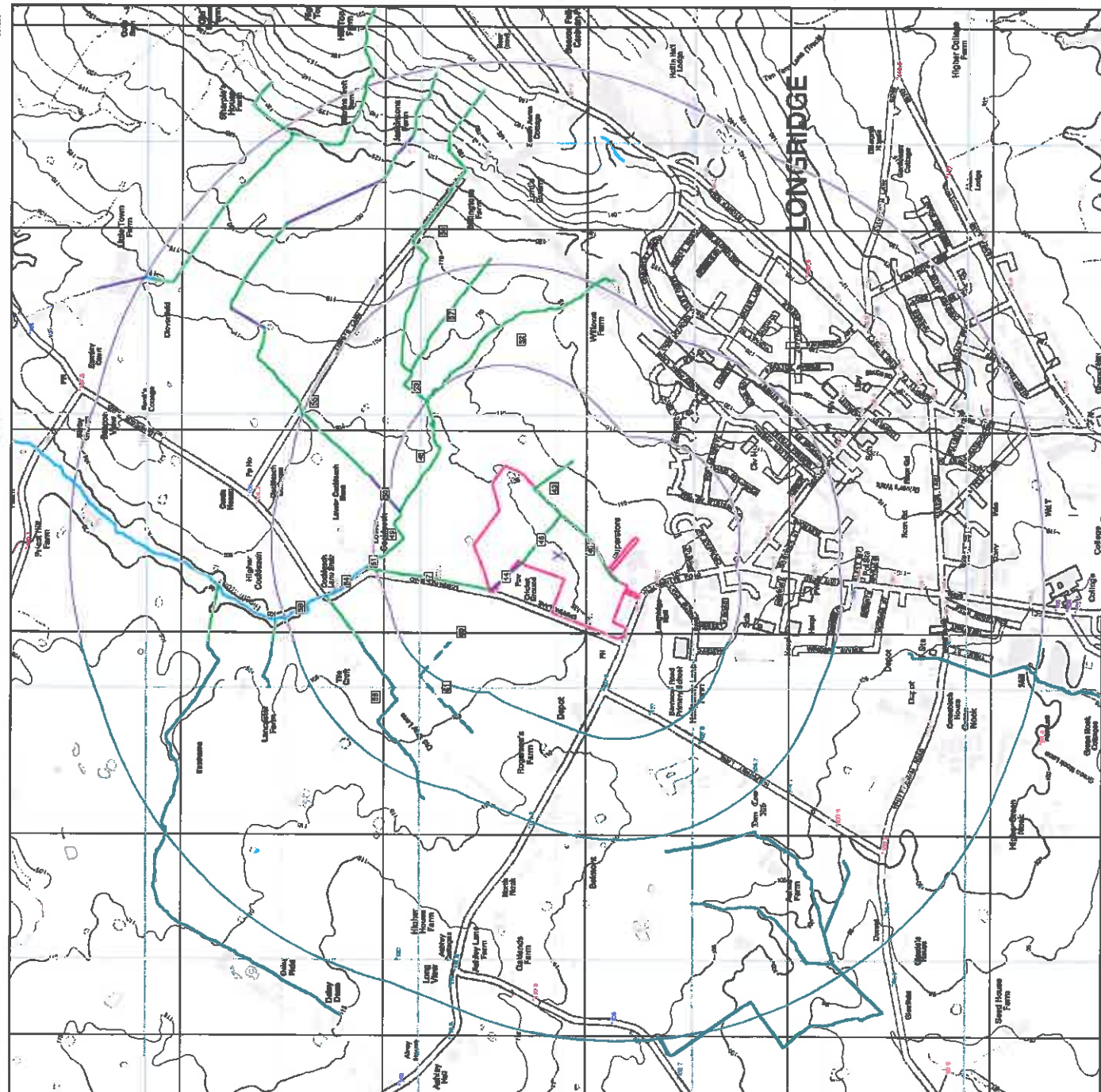
Order Number: 55312619_1_1
 Customer Ref: EB1355
 National Grid Reference: 360190, 438070
 Slice: A
 Site Area (Ha): 7.22
 Search Buffer (m): 1000

Site Details

Site at 360130, 438020



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 Fax: 0844 844 5553
 Web: www.landmark.co.uk



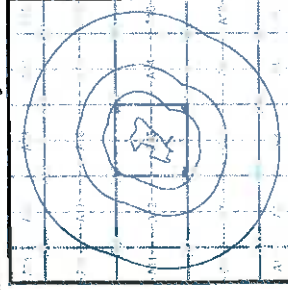
General

Surveyed Site
 Surveyed Reference Point
Estimated Soil Chemistry Arsenic

Arsenic Concentrations mg/kg



Estimated Soil Chemistry Arsenic - Slice A

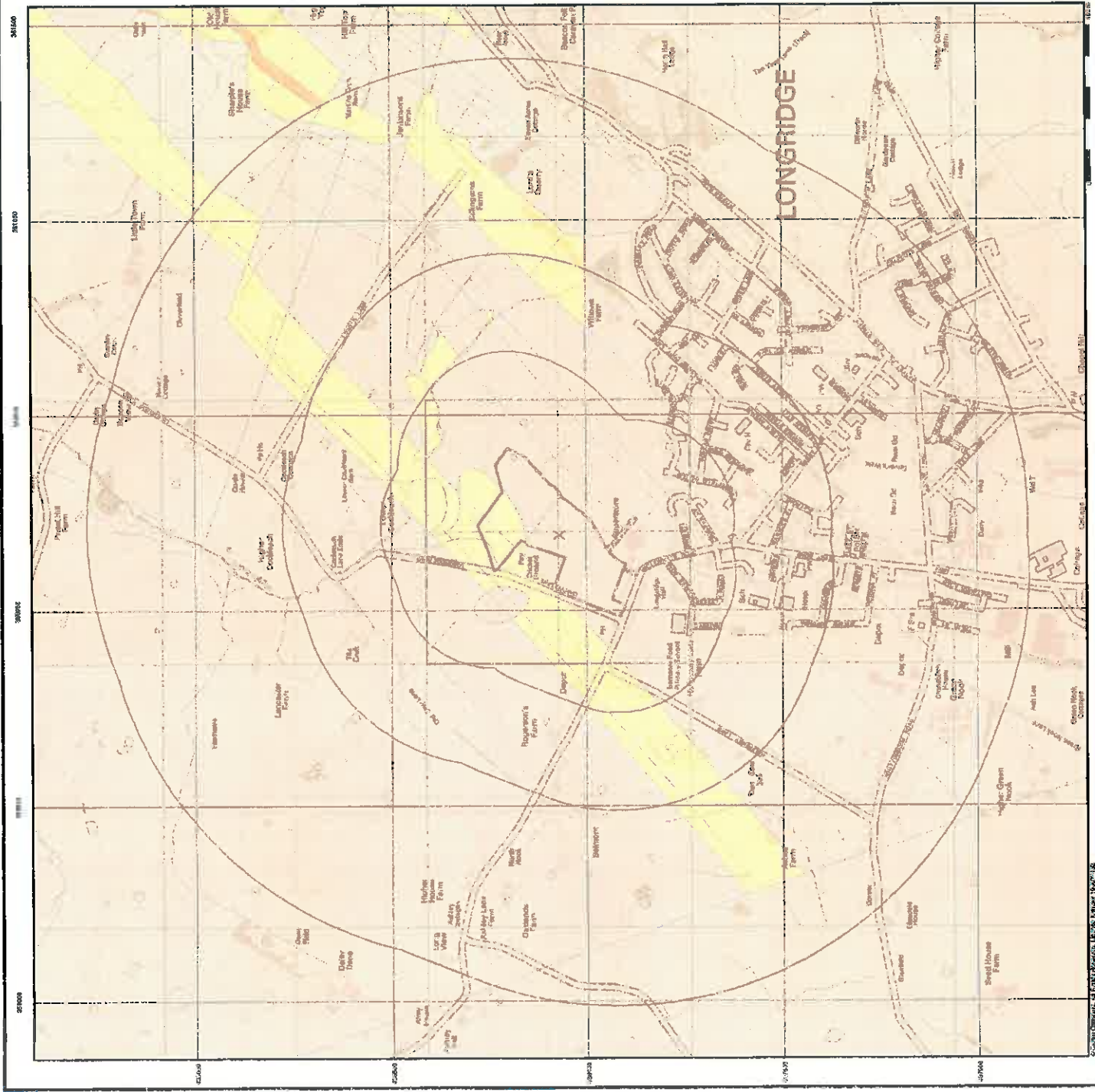


Order Details

Order Details: 55312619_1_1
 Customer Ref: EB1355
 National Grid Reference: 360190, 438070
 Slice: A
 Site Area (Ha): 7.22
 Search Buffer (m): 1000

Site Details

Site at 360190, 438020





General

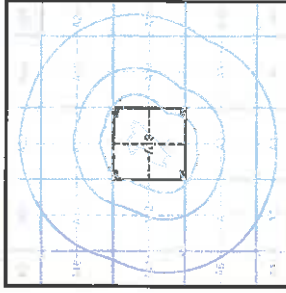
- Specified Site
- Specified Buffer(s)
- X Existing Buildings (if)

Estimated Soil Chemistry Cadmium

Cadmium Concentrations mg/kg



Estimated Soil Chemistry Cadmium - Slice A



Order Details

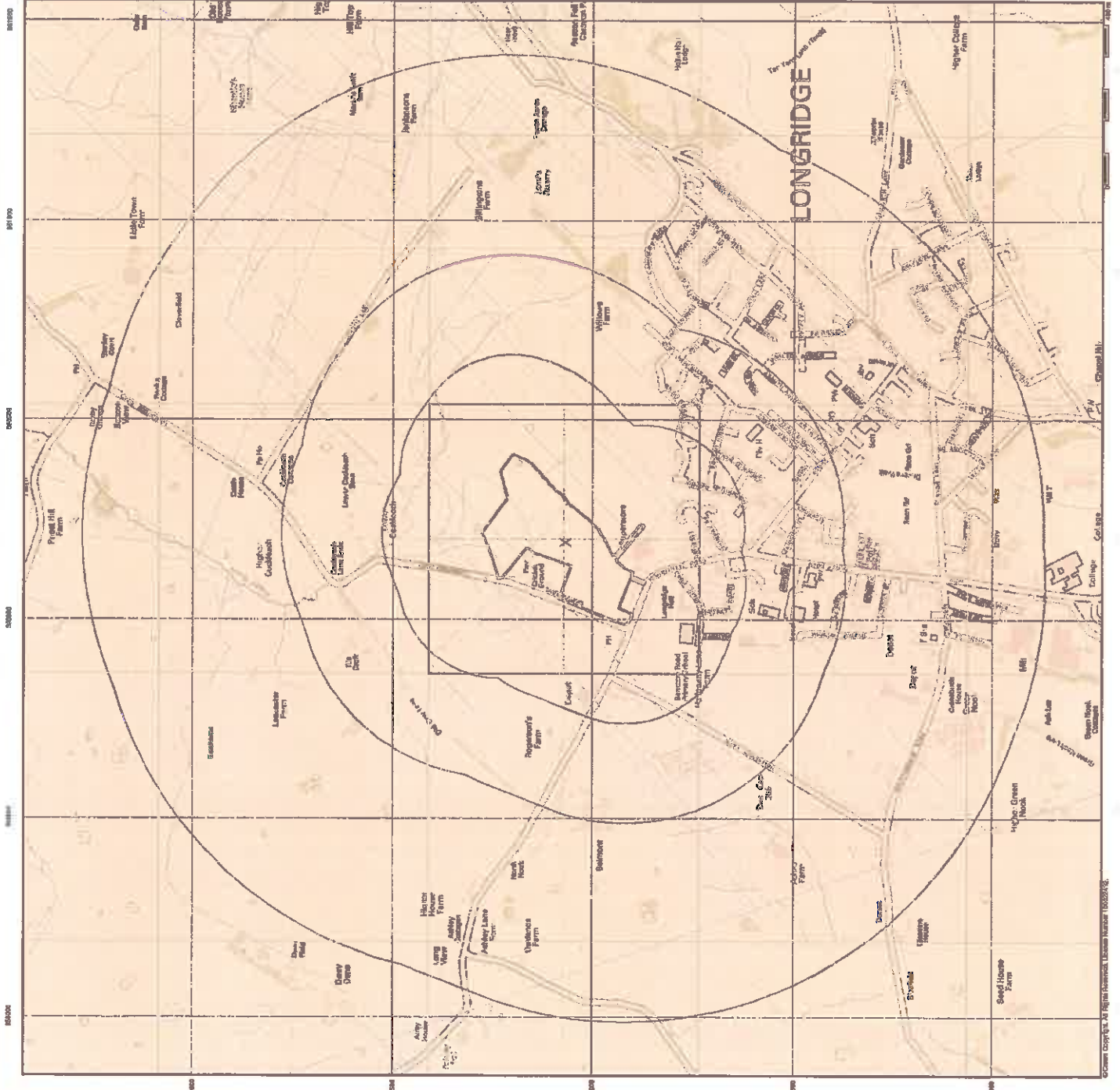
Order Details: 55312619_1_1
 Customer Ref: EB1355
 National Grid Reference: 360190, 438070
 Site: A
 Site Area (Ha): 7.22
 Search Buffer (m): 1000

Site Details

Site at 360130, 438020



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General

X Sewing Retainers Area

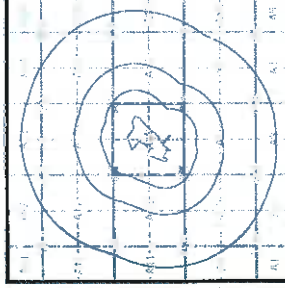
○ Suspected Borehole

Estimated Soil Chemistry Chromium

Chromium Concentrations (mg/kg)



Estimated Soil Chemistry Chromium - Slice A



Order Details

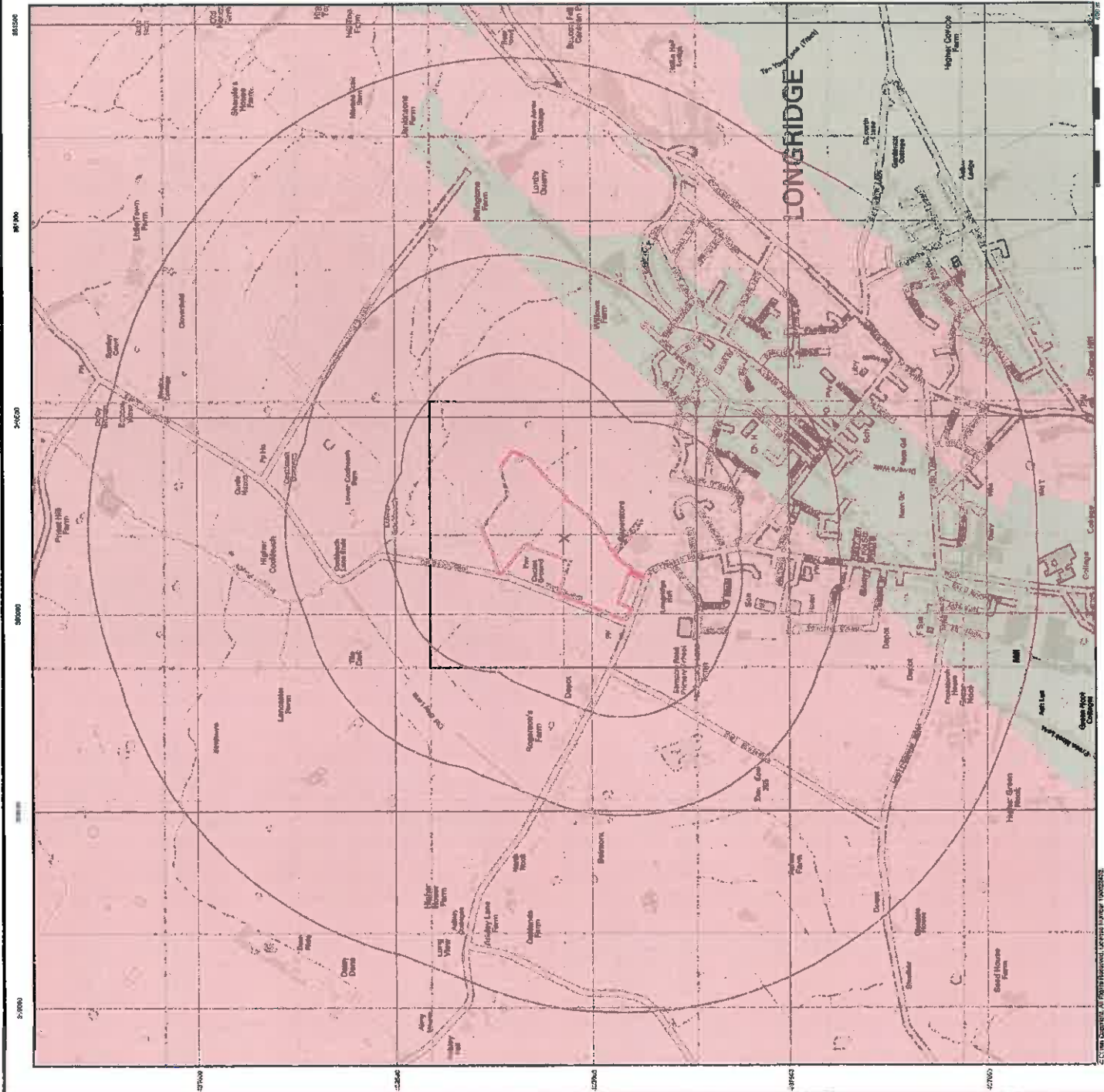
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 Customer Ref: EB1355
 National Grid Reference: 360190, 438070
 Site: A
 Site Area (Ha): 7.22
 Search Buffer (m): 1000

Site Details

Site at 360130, 438020



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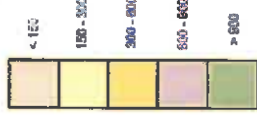


General

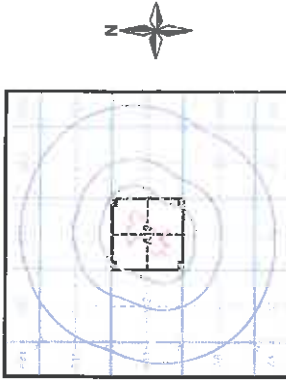
○ Specified Site X Specified Reference Point

Estimated Soil Chemistry Lead

Lead Concentrations mg/kg



Estimated Soil Chemistry Lead - Slice A



Order Details

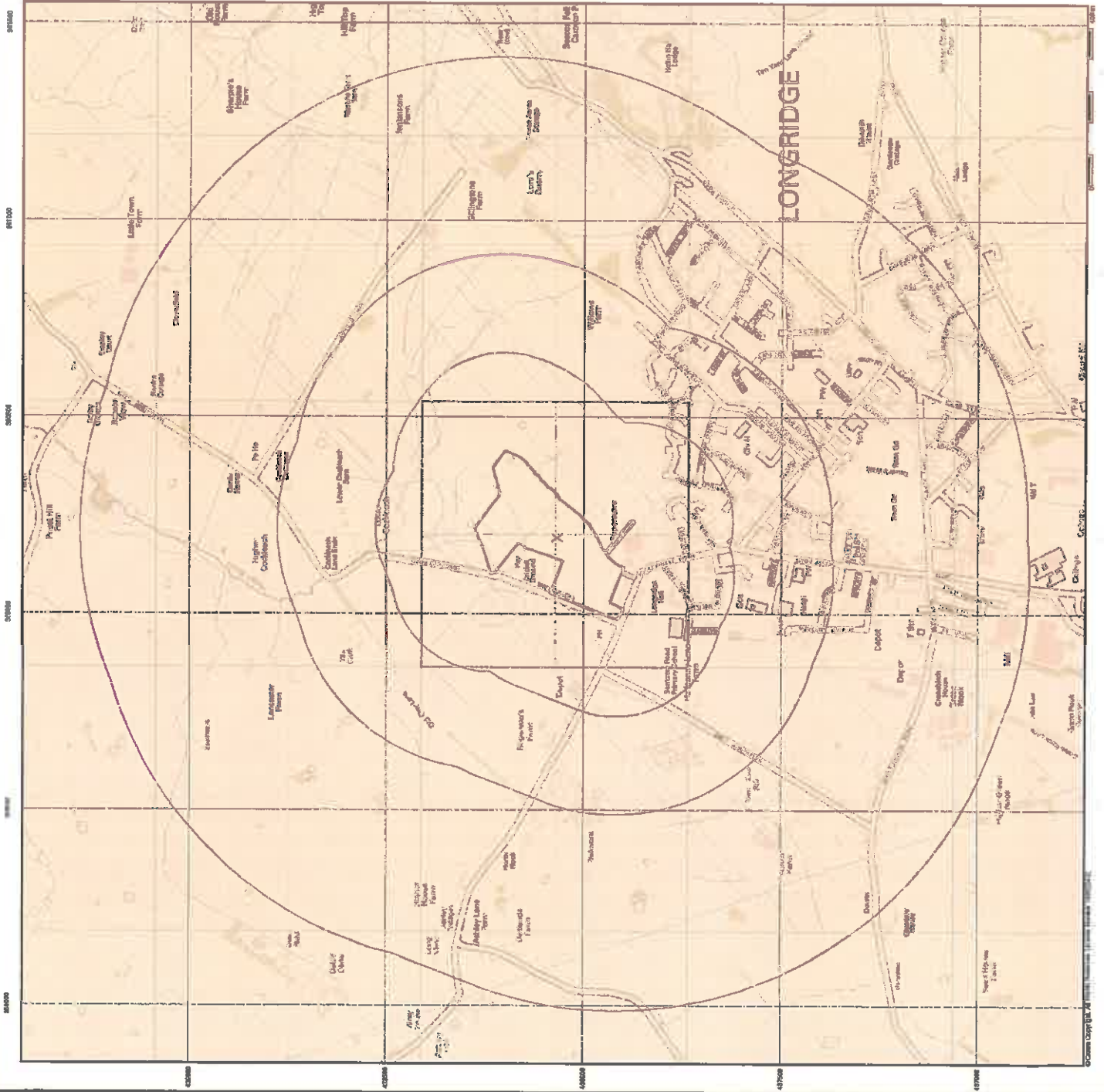
Order Details: 56312619_1_1
 Customer Ref: EB1355
 National Grid Reference: 360190, 438070
 Site: A
 Site Area (Ha): 7.22
 Search Buffer (m): 1000

Site Details

Site at 360130, 438020



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General

Site Specific

Estimated Soil Chemistry

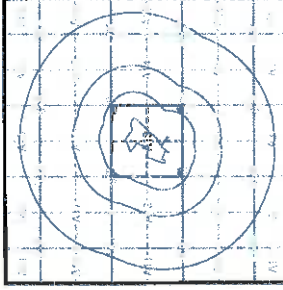
Estimated Nickel

Estimated Soil Chemistry Nickel

Nickel Concentration mg/kg



Estimated Soil Chemistry Nickel - Slice A

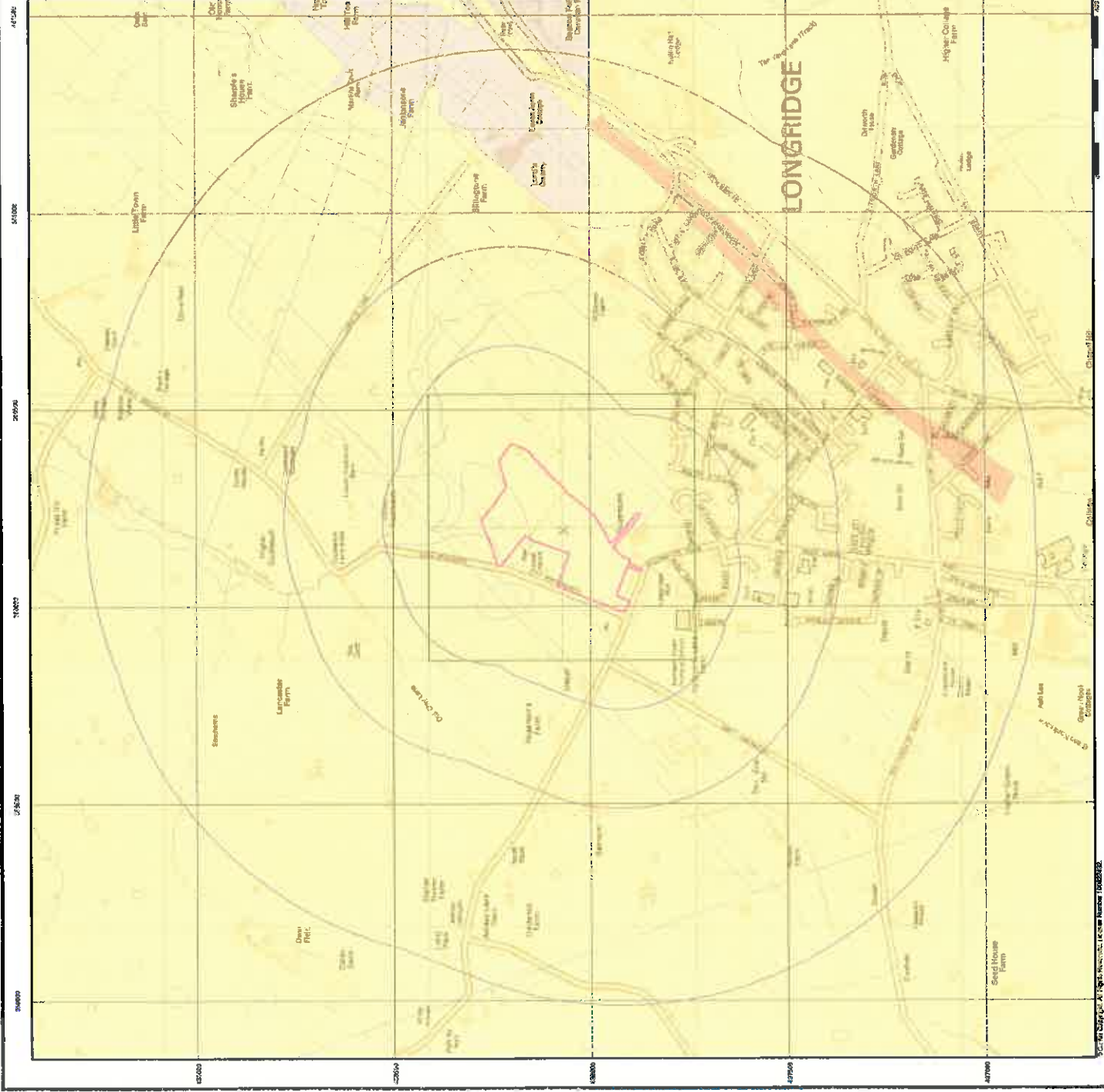


Order Details

55312819_1_1
 EB1355
 National Grid Reference: 360190, 438070
 A
 Site Area (Ha): 7.22
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 Site Details
 Site at 360130, 438020



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 Fax: 0844 844 8881
 Web: www.landmark.co.uk

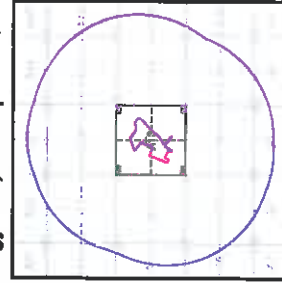




Geology 1:50,000 Maps
 This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps.
 The various geological layers - artificial and landslide deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page. Not all layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:50,000 Maps Coverage
 Map ID: 1 067
 Map Sheet No: 067
 Map Name: Gwent
 Bedrock Geology: Available
 Superficial Geology: Available
 Artificial Deposits: Not Supplied
 Landslip: Available
 Rock fragments: Not Supplied

Geology 1:50,000 Maps - Slice A



Order Details:
 Order Number: 56312619_1_1
 Customer Reference: EB1355
 National Grid Reference: 360190, 438070
 Slice: A
 Site Area (Ha): 7.22
 Search Buffer (m): 1000

Site Details:
 Site at: 360130, 438020



Geology 1:50,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	RMGR	Made Ground (Undivided)	Artificial Deposit	Holocene - Holocene
	SLIP	Landslip Deposit	Unknown/Unclassified Entry	Quaternary - Quaternary
		Red Brook Mudstone Member	Mudstone	Holkerian - Holkerian
		Hodder Mudstone Formation	Mudstone	Holkerian - Chadian
		Faults		

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay, Silt, Sand and Gravel	Flandrian - Flandrian
	TILL	Till, Devensian	Claystone	Devensian - Devensian
	GFDUD	Glaciofluvial Deposits, Devensian	Sand and Gravel	Devensian - Devensian
	PEAT	Peat	Peat [Unified Deposits Coding Scheme]	Quaternary - Quaternary
	RTDU	River Terrace Deposits (Undifferentiated)	Sand and Gravel	Quaternary - Quaternary

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	SDSH	Sablon Shales	Mudstone and Siltstone	Kinderhookian - Ambergian
	PG	Pende Grit Member	Sandstone and Siltstone, Interbedded	Pendleian - Pendleian
	PG	Pende Grit Member	Sandstone, Silty	Pendleian - Pendleian
	PG	Pende Grit Member	Mudstone	Pendleian - Pendleian
	WAG	Wainey Wise Grit	Sandstone	Pendleian - Pendleian
	PNDS	Pendleian Sandstone Member	Sandstone	Brigantian - Brigantian
	BBG	Bowland Shale Formation	Mudstone and Siltstone	Yeadonian - Ashian
	BSG	Bowland Shale Formation	Mudstone	Yeadonian - Ashian
	FDL	Pendleian Limestone Formation	Limestone	Ashian - Holkerian
	BOH	Hodderian Limestone Formation	Limestone	Holkerian - Holkerian



Artificial Ground and Landslip

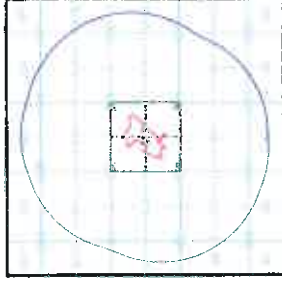
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions and unstable ground.

Artificial ground includes:

- Made ground - man-made deposits such as embankments and spoil heaps on the natural ground surface.
- Worked ground - areas where the ground has been cut away such as quarries and road cuttings.
- Infilled ground - areas where the ground has been cut away then wholly or partially backfilled.
- Landscaped ground - areas where the surface has been reshaped.
- Disturbed ground - areas of ill-defined shallow or near surface mineral workings where it is impracticable to map made and worked ground separately.

Mass movement (landslip) deposits on BGS geological maps are primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground. The dataset also includes rounded strata, where the ground has collapsed due to subsidence.

Artificial Ground and Landslip Map - Slice A



Order Details:

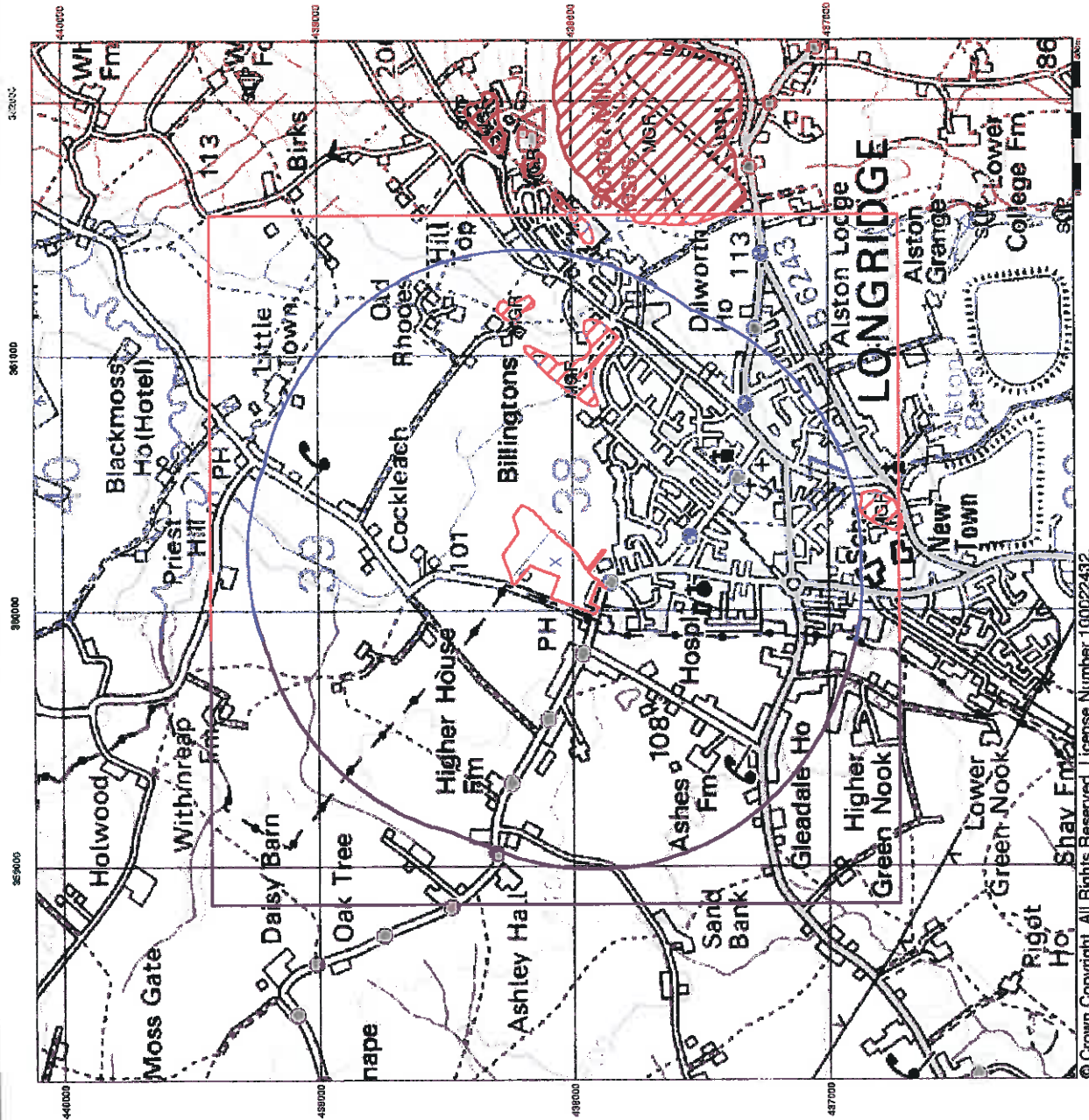
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 Slice: A
 Site Area (ha): 7.22
 Search Buffer (m): 1000

Site Details:

Site at 380130, 498020



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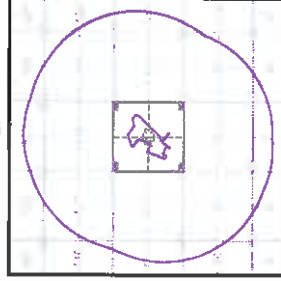
Superficial Geology

Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and elsewhere they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A



Order Details:

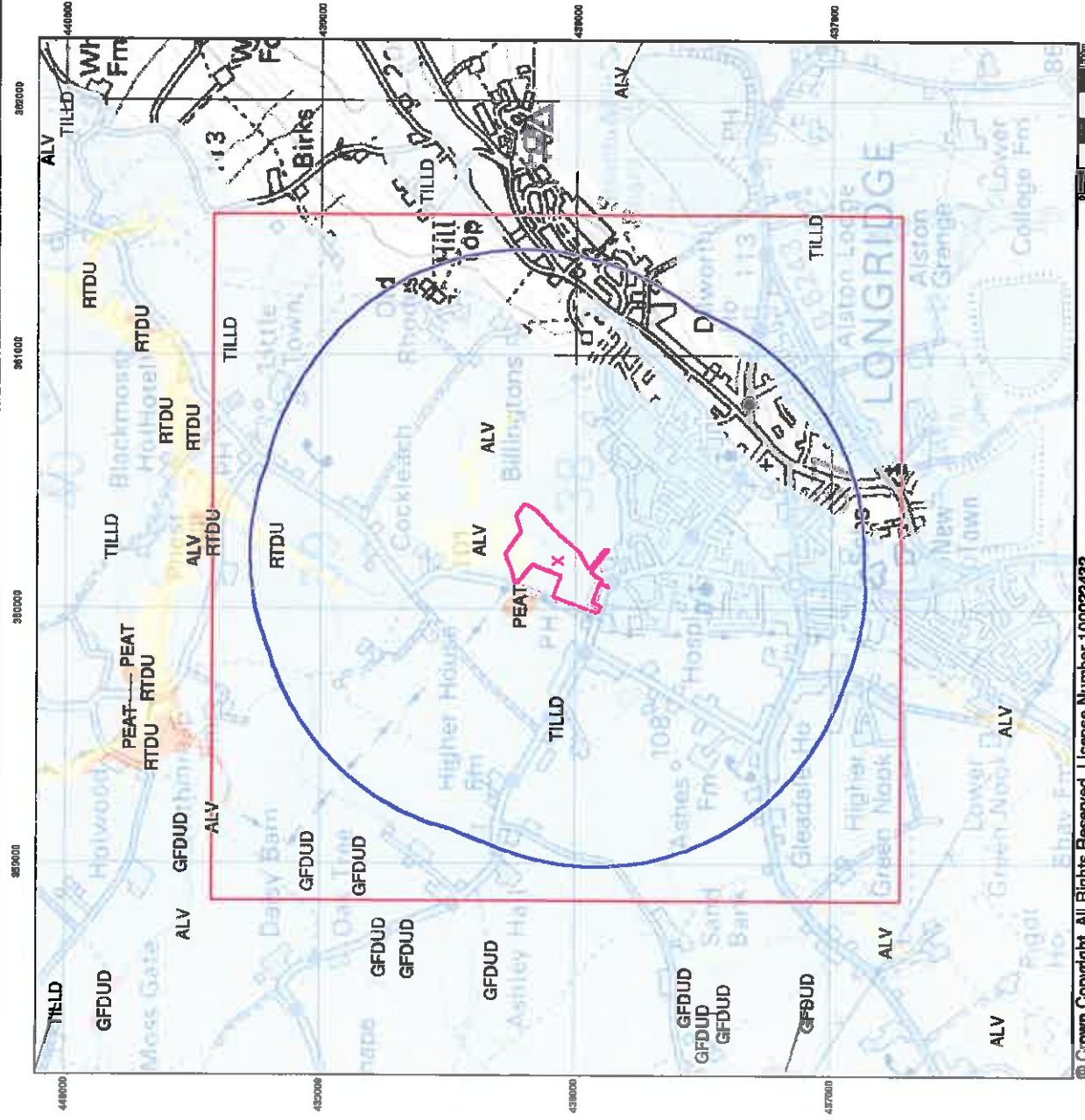
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National Grid Reference: 560180, 438070
Slice: A
Site Area (Ha): 7.22
Search Buffer (m): 1000

Site Details:

Site at 360130, 438020



THE
MARK





Bedrock and Faults

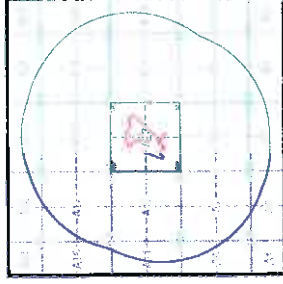
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults (e.g. normal, thrust), and thin beds mapped as lines (e.g. coal seam, gypsum bed). Some of these are linked to other particular 1:50,000 Geology datasets, for example, coal seams are part of the bedrock sequence, most faults and mineral veins primarily affect the bedrock but cut across the strata and post date its deposition.

Bedrock and Faults Map - Sites A



Order Details:

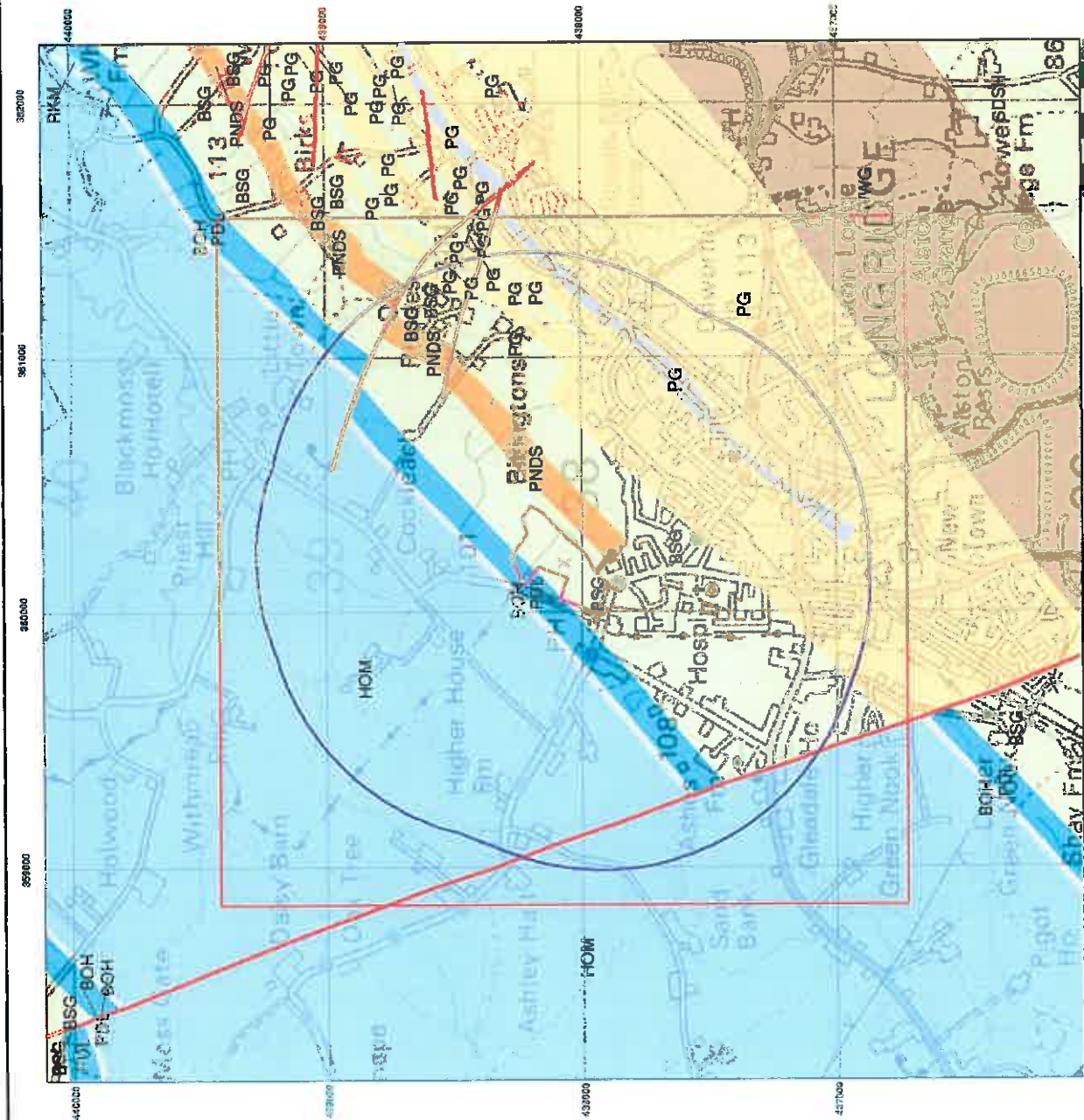
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National Grid Reference: 360190, 438070
Site: A
Site Area (Ha): 7.22
Search Buffer (m): 1000

Site Details:

Site at 360190, 438070



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Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

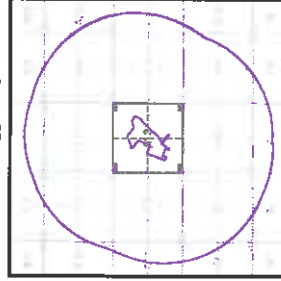
Additional Information

More information on 1:50,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the 'BGS Lexicon of Named Rock Units'. This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

British Geological Survey
Keyhole Durham Centre
Keyworth
Nottingham
NG12 5GG
Telephone: 0115 938 3143
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A



Order Details:

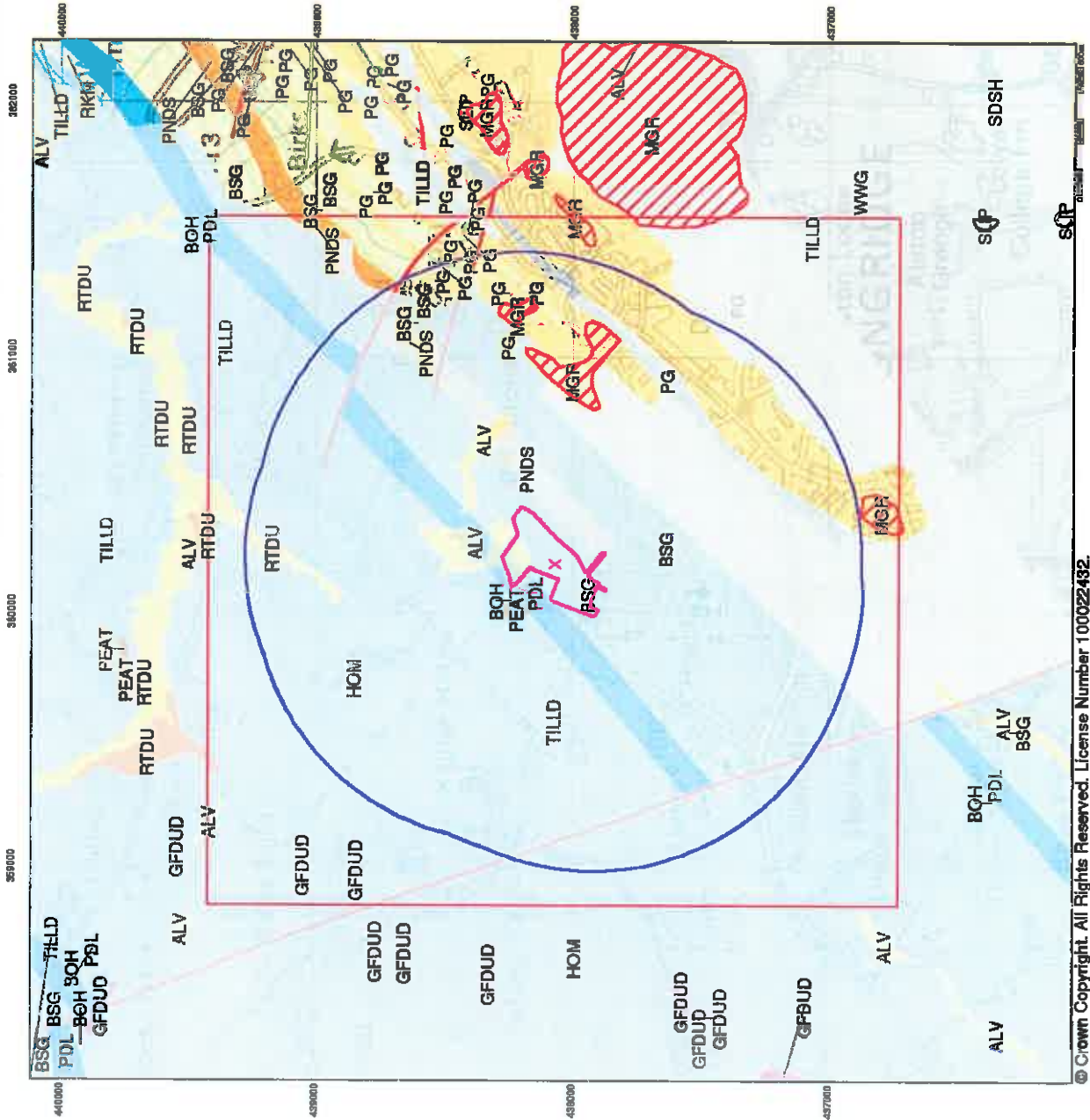
Order Number: 56312619_1.1
Customer Reference: EB1355
National Grid Reference: 360190, 438070
Slice: A
Site Area (Ha): 7.22
Search Buffer (m): 1000

Site Details:

Site at 360130, 438020



15.0 14-Apr-2014





Groundwater Vulnerability

General

- Specified Site
- Receiving Entity
- Bounding Reference Point
- Site
- N/A

Agency and Hydrological

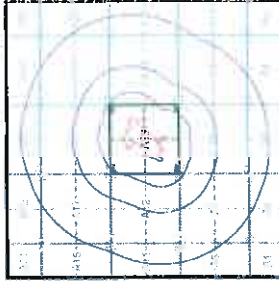
Geological Classes

- Major Aquifer (Highly Permeable)
- Minor Aquifer (Virtually Permeable)
- Non Aquifer (Negligibly Permeable)
- Water or Sea
- Drift Deposit

Soil Classes

- High (H) 1, 2, 3, U
- Intermediate (I) 1, 2
- Low
- High (H) 1, 2, 3, U
- Intermediate (I) 1, 2
- Low

Site Sensitivity Context Map - Slice A



Order Details

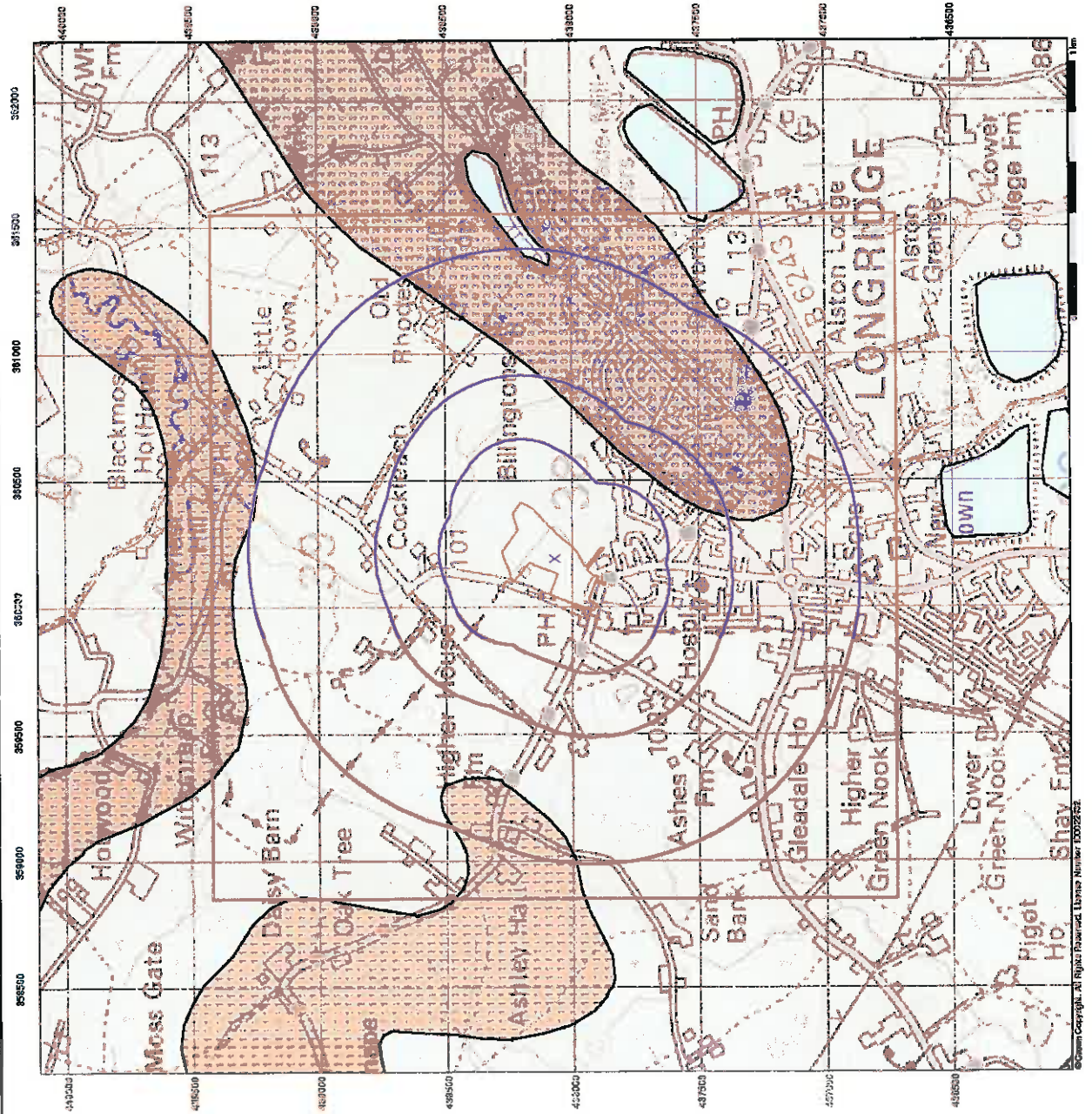
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Site Details

Site at 360190, 436020



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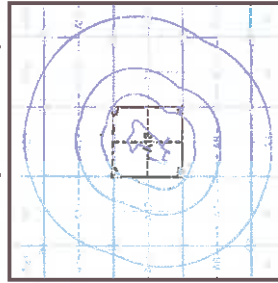




Bedrock Aquifer Designation

- General**
- Specified Site
 - Specified Buffer(s)
 - Map ID
 - Bearing Reference Point
- Agency and Hydrological**
- Principal Aquifer
 - Secondary A Aquifer
 - Secondary B Aquifer
 - Secondary Undifferentiated
 - Unproductive Strata
 - Unknown
- Geological Classes**
- Principal Aquifer
 - Secondary A Aquifer
 - Secondary B Aquifer
 - Secondary Undifferentiated
 - Unproductive Strata
 - Unknown

Site Sensitivity Context Map - Slice A



Order Details

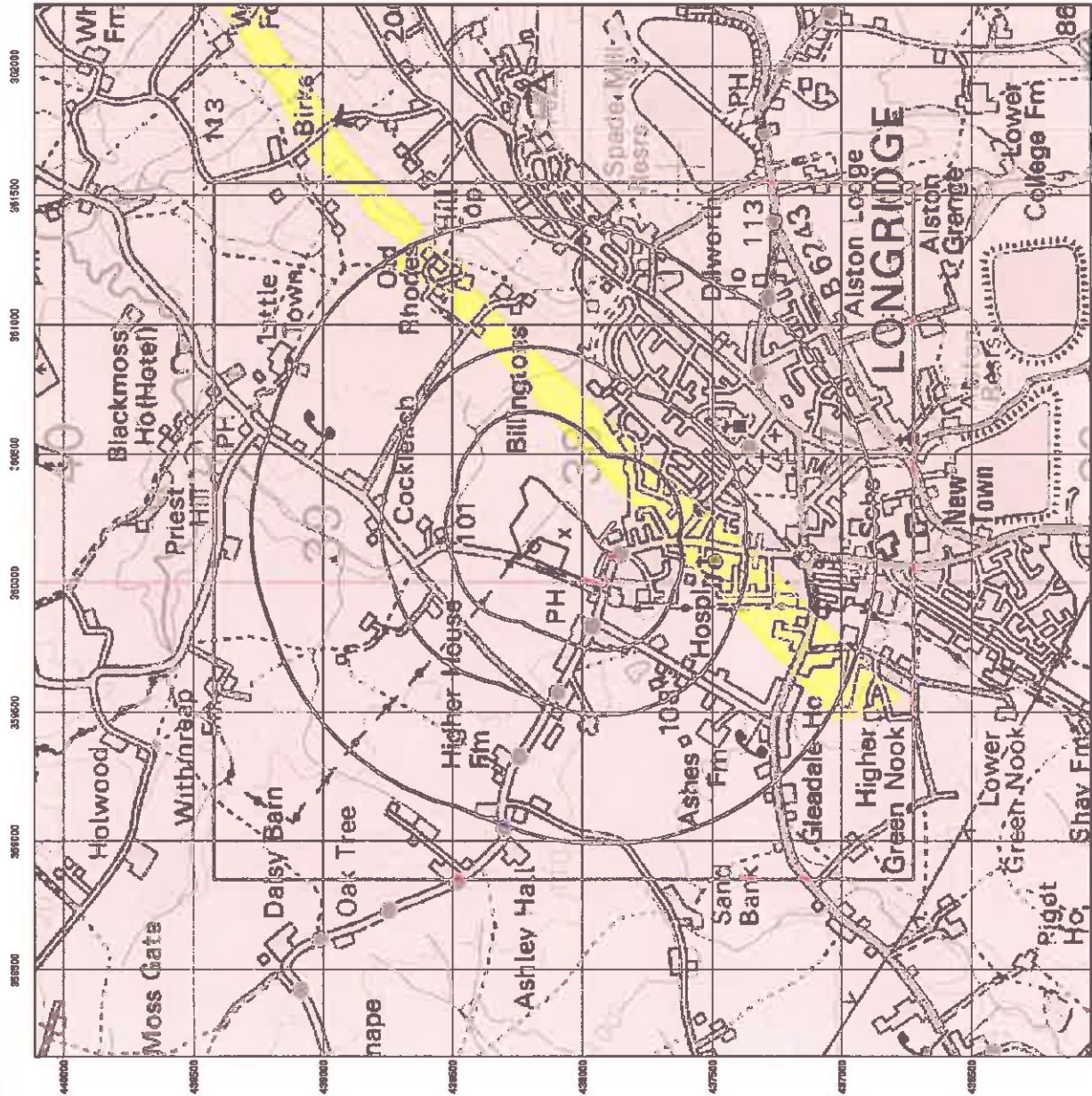
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Site Details

Site at: 360190, 498020



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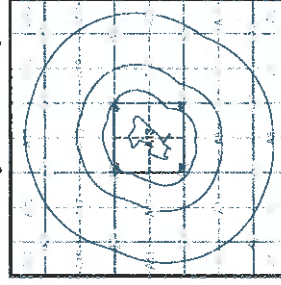




Superficial Aquifer Designation

- General**
- Specified Site
 - Specified Buffer(s)
 - Map ID
 - Beating Reference Point
- Agency and Hydrological**
- Geological Class****
- Principal Aquifer
 - Secondary A Aquifer
 - Secondary B Aquifer
 - Secondary Unidentified
 - Unproductive Strata
 - Unknown

Site Sensitivity Context Map - Slice A



Order Details

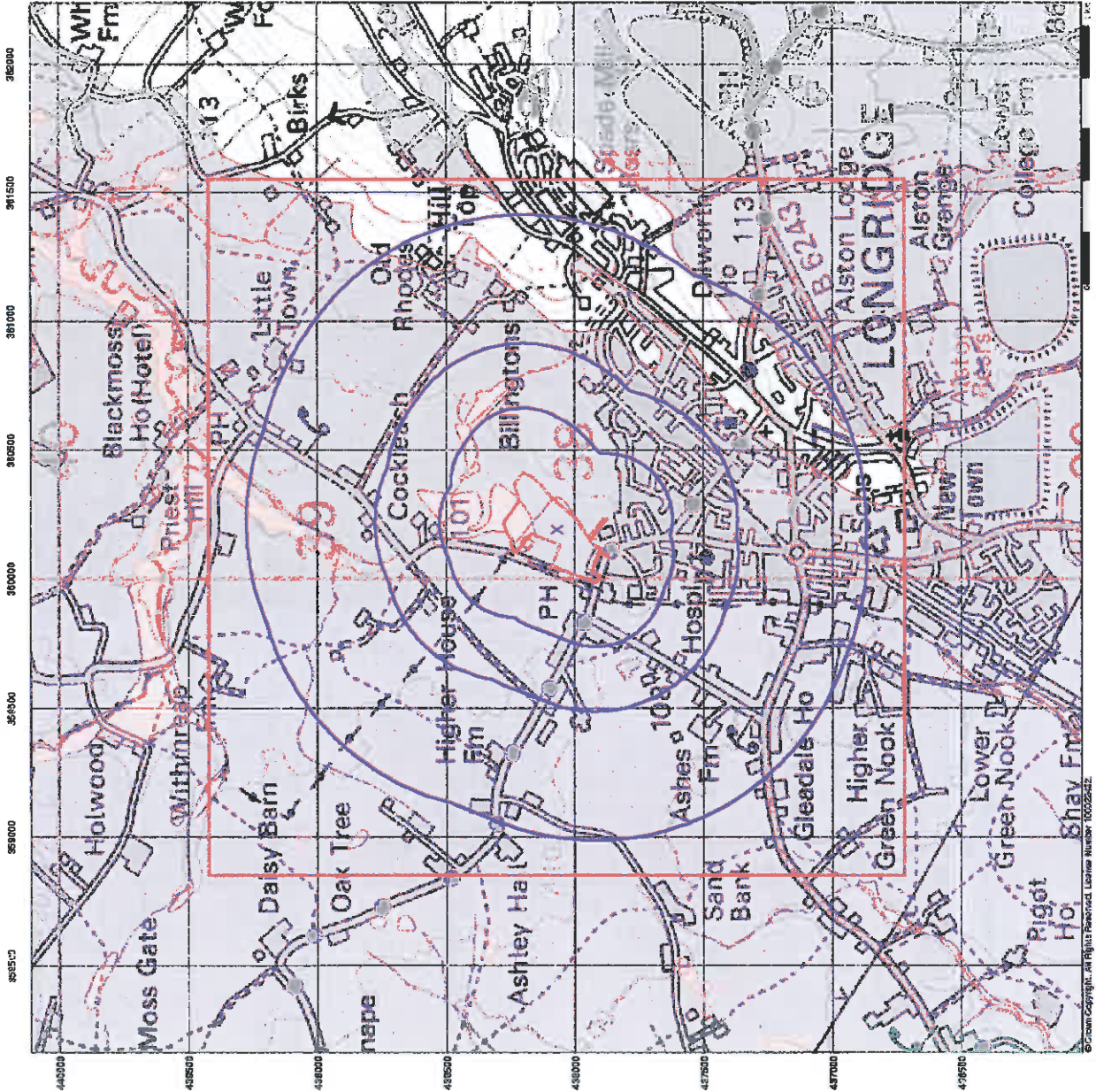
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 Site Area (Ha): 7.22
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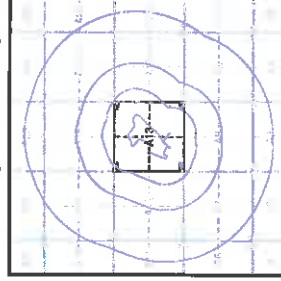
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Source Protection Zones

- General**
- Specified Site
 - Specified Buffer(s)
 - Map ID
 - Beating Reference Point
- Agency and Hydrological**
- Source Protection Zone I
 - Source Protection Zone II
 - Source Protection Zone III
 - Zone of Special Interest
 - Source Protection Zone Breach

Site Sensitivity Context Map - Slice A



Order Details

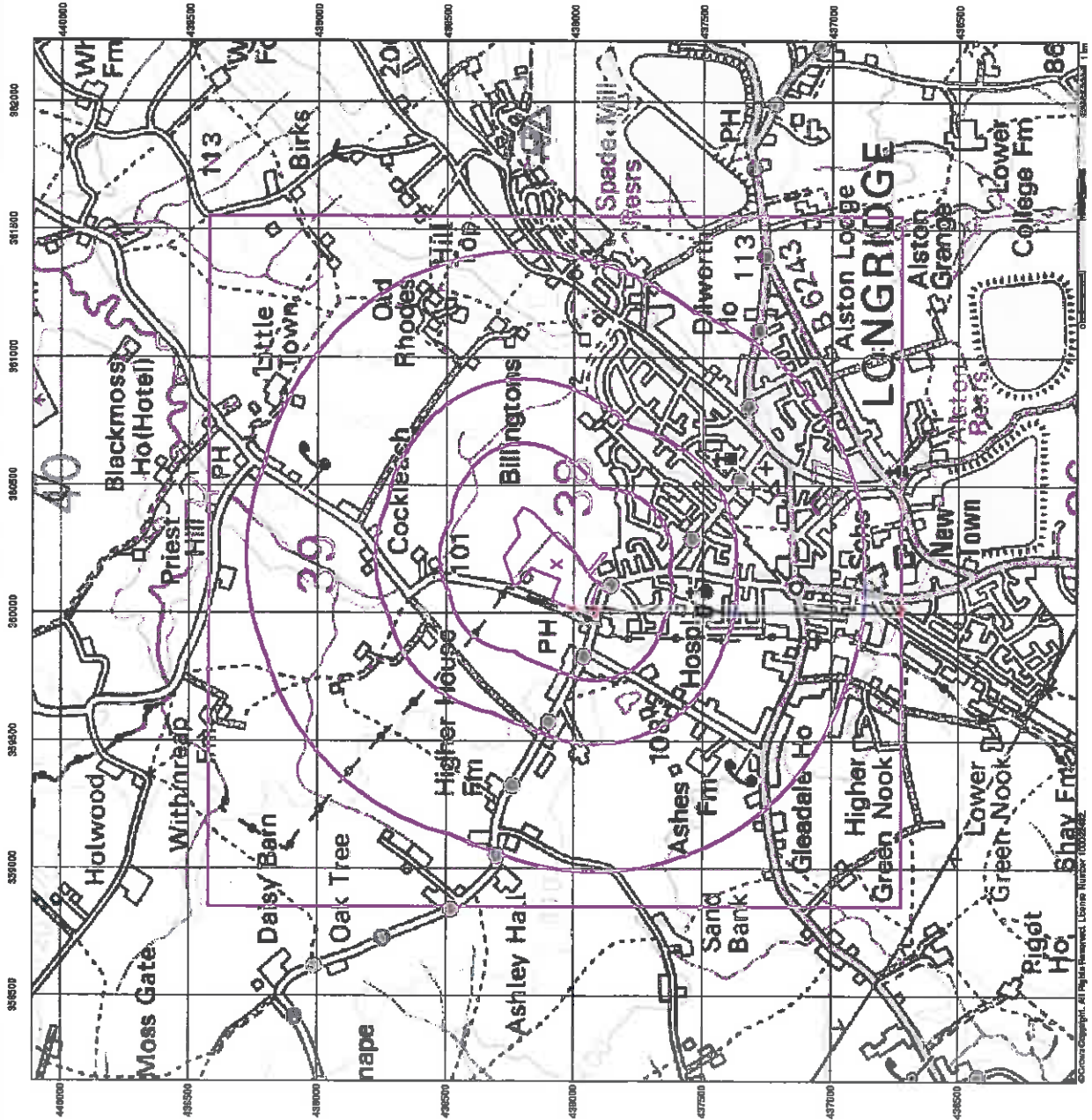
Order Number: 55312819_1.1
 Customer Ref: EB1355
 National Grid Reference: 360180, 438070
 Slice: A
 Site Area (Ha): 7.22
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Site Details

Site at 360130, 438020



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 Fax: 0844 344 1887
 Web: www.landmark.co.uk



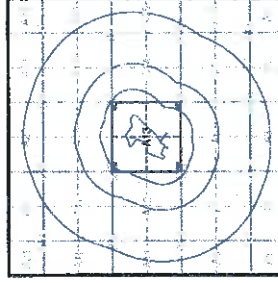
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Sensitive Land Uses

- General**
- Specified City
 - Specified Buffer(s)
 - Specified Buffers
 - Map ID
 - Meeting Reference Point
- Sensitive Land Uses**
- Area of Adapted Green Belt
 - Area of Unadapted Green Belt
 - Area of Outstanding Natural Beauty
 - Area of Cultural/Landscape Natural Beauty
 - Environmentally Sensitive Area
 - Forest Park
 - Local Nature Reserve
 - Nature Notes Reserve
 - National Nature Reserves
 - National Park
 - Nature Sensitive Area
 - Nature Valence/Life Zone
 - Ramsar Site
 - Site of Special Scientific Interest
 - Special Area of Conservation
 - Special Protection Area

Site Sensitivity Context Map - Slice A



Order Details

Order Number: 55312619_1.1
 Customer Ref: EB1355
 National Grid Reference: 360190, 438070
 Slice: A
 Site Area (Ha): 7.22
 Search Buffer (m): 1000

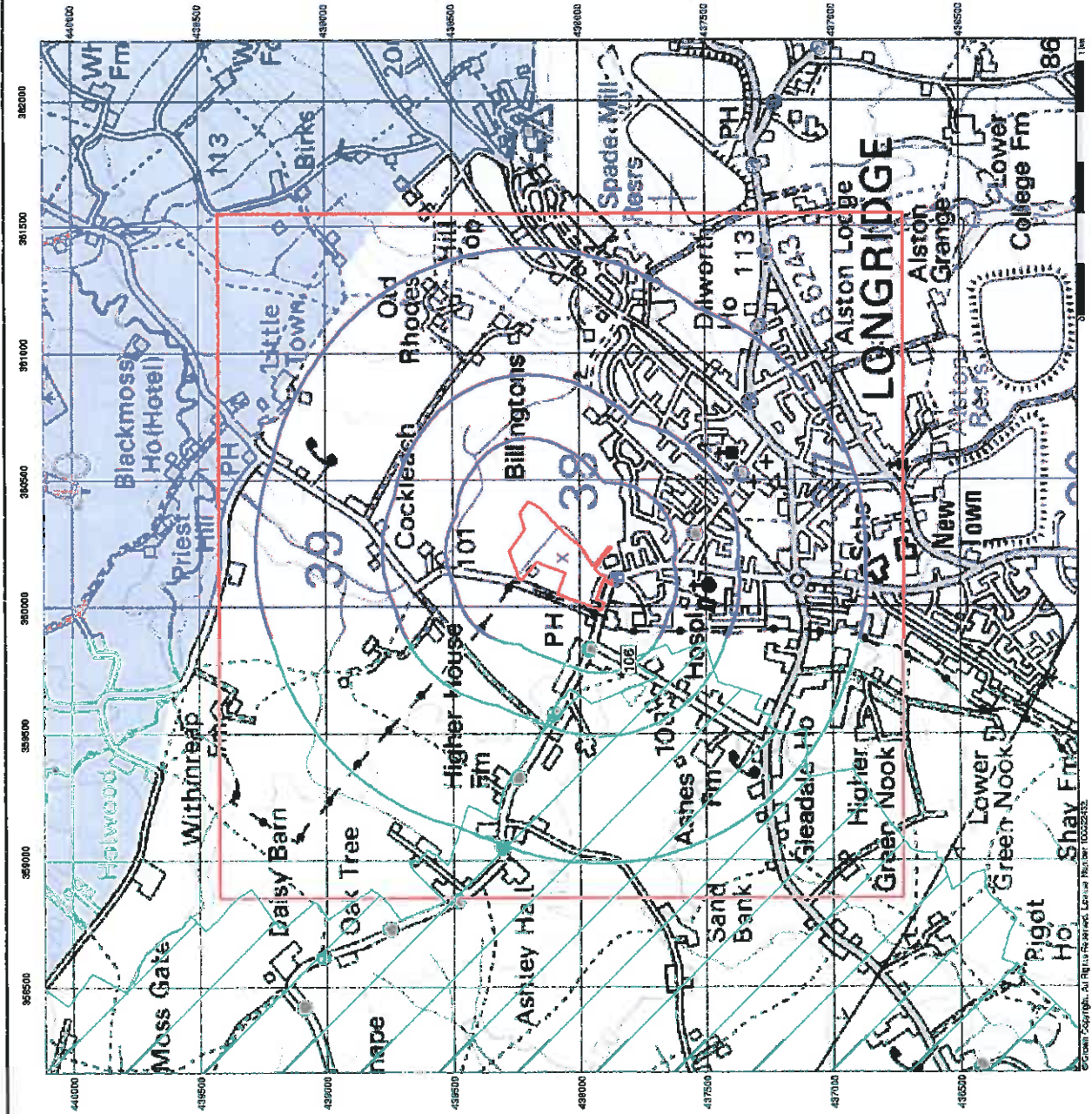
Site Details

Site at 360190, 438020



The
 Plot
 Web

0844 644 6882
 0144 644 6883
 www.landmark.co.uk





Index Map

For ease of identification, your site and buffer have been split into Slices, Segments and Quadrants. These are illustrated on the Index Map opposite and explained further below.

Slice
Each slice represents a 1:10,000 plot area (2.7km x 2.7km) for your site and buffer. A large site and buffer may be made up of several slices (separated by a red outline), that are referenced by letters of the alphabet, starting from the bottom left corner of the slice "grid". This grid does not relate to National Grid lines but is designed to give best fit over the site and buffer.

Segment
A segment represents a 1:2,500 plot area. Segments that have plot lines are shaded with a dark green, others in light blue. These are numbered from the bottom left hand corner within each slice.

Quadrant
A quadrant is a quarter of a segment. These are labelled as NW, NE, SW, SE and are referenced in the dashboard to allow features to be quickly located on plots. Therefore a feature that has a quadrant reference of A/NW will be in Slice A, Segment 7 and the NW Quadrant.

A selection of organisations who provide data within this report



Enriched reports are compiled from 136 different sources of data

Client Details

Ms G Lowndsbrough, Curtins Consulting Ltd, 10 Oxford Court, Blithesgate, Manchester, M2 3WQ

Order Details

Order Number: 55312619_1_1
Customer Ref: EB1365
National Grid Reference: 360200, 438080
Site Area (Ha): 7.22
Search Buffer (m): 1000

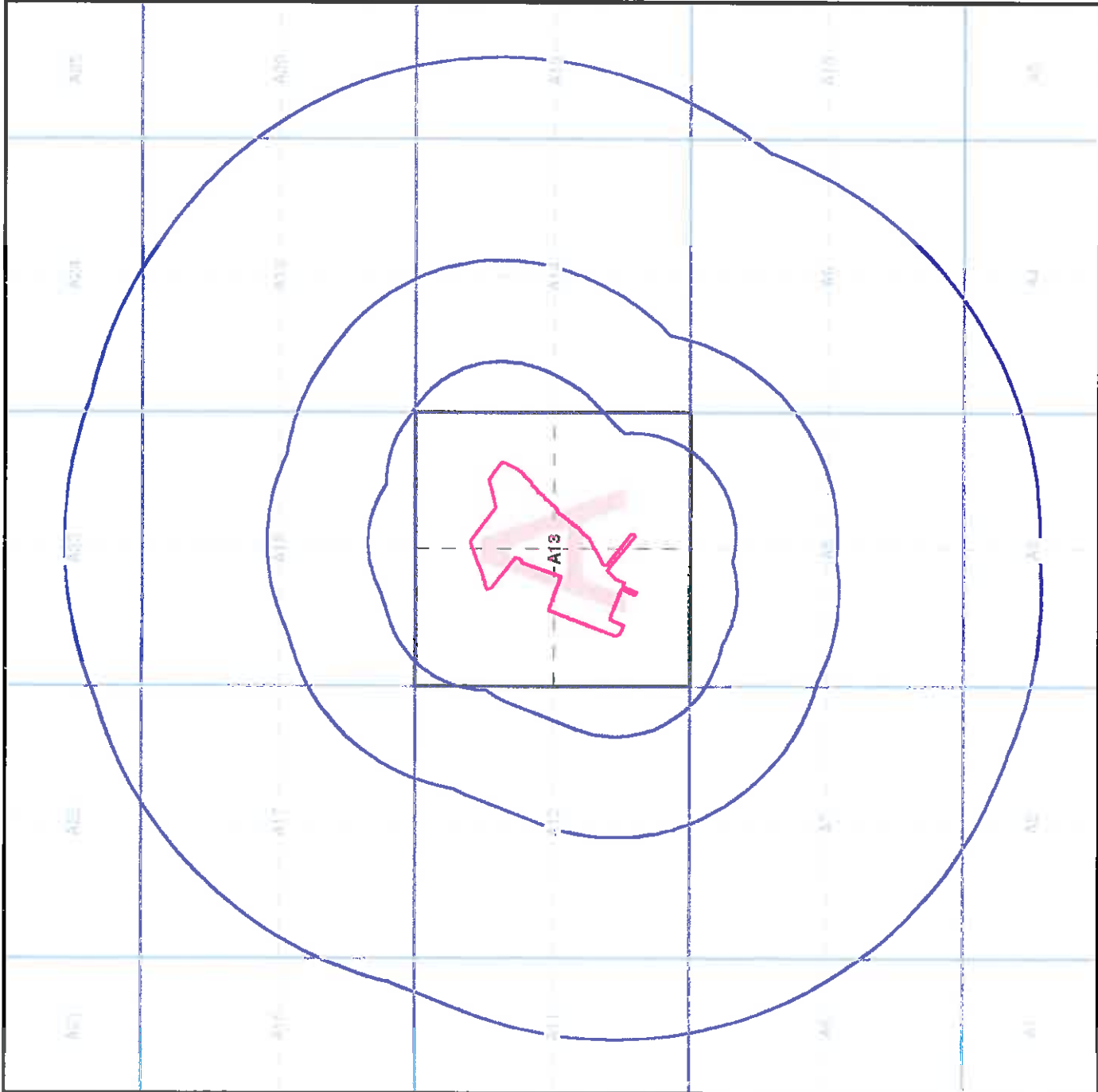
Site Details

Site at 360130, 438020

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<http://www.landmarkinfo.co.uk/Terms/Show515>



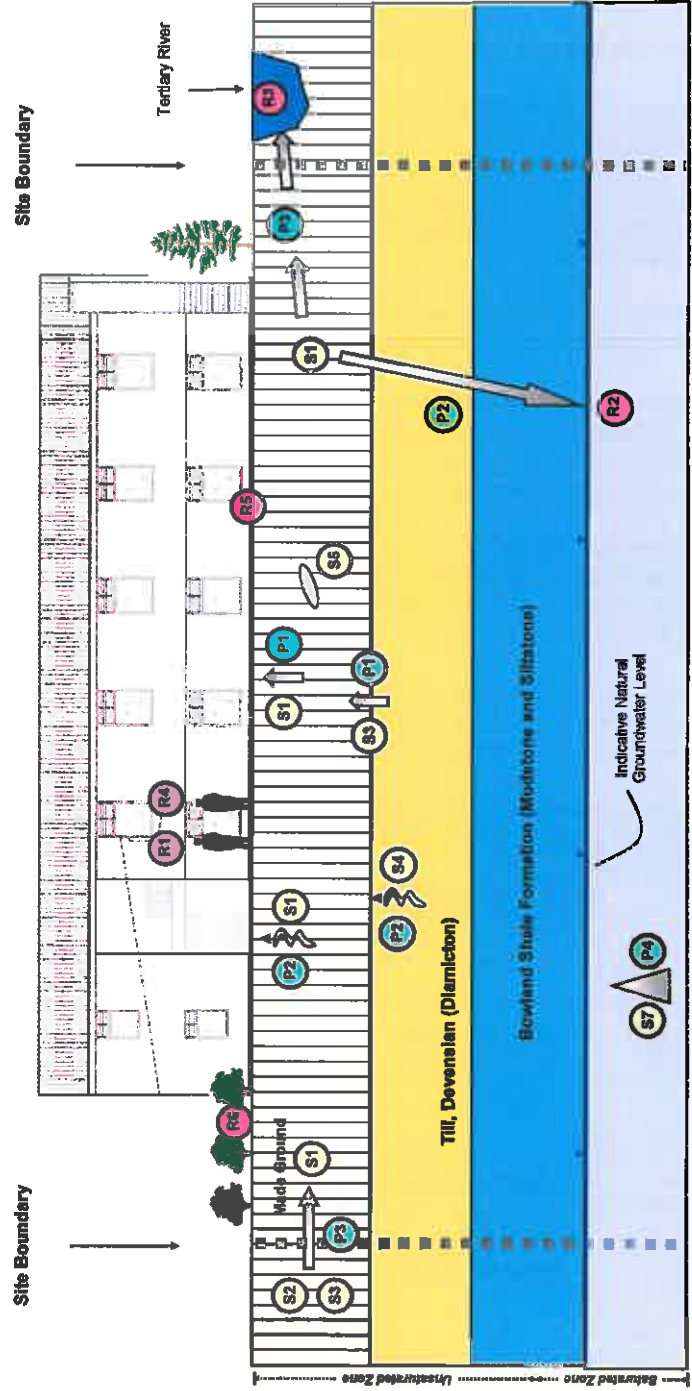
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Web: www.landmark.co.uk



Appendix A3 – Diagrammatic Conceptual Model

Boland Meadow, Higgin Brook

- Sources**
- S1 Made-ground (On site)
 - S2 Made-ground (Off site)
 - S3 Natural soils (On & off site)
 - S4 Ground gas sources
 - S5 Unexploded ordnance
 - S6 Radon geology
 - S7 Mine workings
- Pathways**
- P1 Direct contact, ingestion and or inhalation
 - P2 Vertical migration
 - P3 Horizontal migration
 - P4 Collapse
- Receptors**
- R1 End users
 - R2 Groundwater
 - R3 Surface water
 - R4 Construction workers
 - R5 Construction materials
 - R6 Local ecology



10 Oxford Court, Bishopsgate,
Manchester, M2 3WQ
Tel: 0161 236 2394

Project
Boland Meadow, Higgin Brook

Drawing Title
Diagrammatic Conceptual Model

Job Reference
EB1355

Date
28.03.2014

Author
GL

Checked
AW

Client
Barnatt Homes

Scale
Not to scale

Appendix A4 – Qualitative Risk Assessment Rationale

The site-specific qualitative risk assessment of environmental harm, as detailed in Section 3.0 of this reporting, is summarised in Table A4.1 hereafter; the principle being to establish connecting links between a hazardous source to a potential receptor via an exposure pathway.

The qualitative risk assessment corresponds with the **total** site area.

Risk assessment is the process of collating known information on a hazard or set of hazards in order to estimate actual or potential risk to receptors. The receptor may be humans, a water resource, a sensitive local ecosystem or future construction materials. Receptors can be connected to the hazardous source by one or several exposure pathways such as direct contact for example. Risks are generally managed by isolating the receptor or intercepting the exposure pathway or by isolating or removing the hazard.

Without the three essential components of a source, pathway and receptor there can be no risk. Therefore the presence of hazard on a site does not necessarily mean there is a risk.

By considering where a viable pathway exists which connects a source with a receptor the risk assessment in Section 3.0 and Table A4.1 identifies where pollutant linkage exists. If there is no pollutant linkage there is no risk and only where a pollutant linkage is established does the risk assessment consider the level of risk.

The risk assessment considers the likelihood of a particular event taking place (accounting for the presence of the hazard and receptor and the integrity of the exposure pathway) in conjunction with the severity of the potential consequence (accounting for the potential severity of the hazard and the sensitivity of the receptor).

In the risk assessment the consequence of the hazard has been classified as severe or medium or mild or minor and the probability (likelihood) of the circumstances actually occurring classified as high likelihood or likely or low likelihood or unlikely.

The consequences and probabilities are subsequently cross-correlated to give a qualitative estimation of the risk using Department of the Environment risk classifications as detailed in the table below and as referenced in CIRIA C552.

		Consequence			
		Severe	Medlum	Mild	Minor
Probability (Likelihood)	High Likelihood	Very High Risk	High Risk	Moderate Risk	Negligible Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Negligible Risk
	Low Likelihood	High/Moderate Risk	Moderate/Low Risk	Low Risk	Negligible Risk
	Unlikely	Moderate/Low Risk	Low Risk	Negligible Risk	Negligible Risk

In accordance with DoE guidance, the following categorisation of consequence has been developed.

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem or organisation forming part of such ecosystem.	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health. Pollution of sensitive water resources. A significant change in a particular ecosystem or organism forming part of such ecosystem.	Concentration of a contaminant from site exceeds the generic or site-specific assessment criteria. Leaching of contaminants from a site to a Principal or Secondary A aquifer. Death of a species within a designated nature reserve. Lesser toxic and asphyxiate effects
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater (inc. Secondary B aquifers). Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discoloration of concrete.

In accordance with DoE guidance, the following categorisation of **probability** has been developed.

Classification	Definition
High Likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

In accordance with DoE guidance, the following categorisation of **risk** has been developed.

Classification	Definition
Very High Risk	There is a <i>high probability</i> that <i>severe harm</i> could arise to a designated receptor from an identified hazard at the site without appropriate further action.
High Risk	<i>Harm is likely to arise</i> to a designated receptor from an identified hazard at the site without appropriate further action.
Moderate Risk	<i>It is possible</i> that without appropriate further action <i>harm could arise</i> to a designated receptor. It is relatively <i>unlikely</i> that any such harm would be <i>severe</i> , and if any harm were to occur it is <i>more likely</i> that such harm would be <i>relatively mild</i> .
Low Risk	<i>It is possible</i> that <i>harm could arise</i> to a designated receptor from an identified hazard. It is <i>likely</i> that, at worst, if any harm was realised any effects would be <i>mild</i> .
Negligible Risk	The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.

The term 'risk' in this instance refers to the risk that the source, pathway, receptor linkage for a given source of contamination is complete. It does not refer to immediate risk to individuals or features present on the site from potential contaminants and is intended to be used as a tool to assess the necessity of further investigation.



Appendix A4.1 – Table and Summary of Potential Risks, Sheet 1

Source	Conceptual Site Model			Qualitative Risk Assessment		
	Pathway(s)	Receptor(s)	Consequence (Potential Severity)	Likelihood of Occurrence	Risk*	
S1: Made ground soils on site	P2: Vertical migration	R2: Controlled waters (Groundwater)	Medium	Low Likelihood	Moderate/Low	
	P3: Horizontal migration	R3: Controlled waters (Surface Waters)	Medium	Low Likelihood	Moderate/Low	
	P1: Direct contact, ingestion, inhalation (dust and vapours)	R1: End user of site	Medium	Low Likelihood	Moderate/Low	
	P1: Direct contact, ingestion, inhalation (dust and vapours)	R4: Construction workers	Minor	Low Likelihood	Negligible	
	P1 & P3: Direct contact, ingestion, inhalation (dust and vapours) and horizontal migration	R5: Construction materials	Mild	Low Likelihood	Low	
	P1 & P3: Direct contact, ingestion, inhalation (dust and vapours) and horizontal migration	R6: Local ecology	Minor	Low Likelihood	Negligible	
S2: Made ground soils off site	P3 & P1: Horizontal migration and direct contact, ingestion, inhalation (dust and vapours)	R1: End user of site	Medium	Likely	Moderate	
	P3 & P1: Horizontal migration and direct contact, ingestion, inhalation (dust and vapours)	R4: Construction workers	Minor	Likely	Negligible	

Appendix A4.1 – Table and Summary of Potential Risks, Sheet 2

Conceptual Site Model		Qualitative Risk Assessment			
Source	Pathway	Receptor	Consequence (Potential Severity)	Likelihood of Occurrence	Risk*
S3: Natural soils on or off site	P1 & P3: Direct contact, ingestion, inhalation (dust and vapours) and horizontal migration	R1: End user of site	Medium	Unlikely	Moderate/Low
	P1 & P3: Direct contact, ingestion, inhalation (dust and vapours) and horizontal migration	R4: Construction workers	Minor	Unlikely	Negligible
S4: Ground gases	P2 & P3: Vertical and horizontal migration	R1: End user of site	Severe	Low Likelihood	High/Moderate
S5: Radon	P2 & P3: Vertical and horizontal migration	R1: End user of site	Medium	Unlikely	Low
	P1: Direct contact	R1: End user of site	Severe	Unlikely	Moderate/Low
S6: Unexploded ordnance	P1: Direct contact	R4: Construction workers	Severe	Unlikely	Moderate/Low

*Risk refers to the potential risk that the Source, Pathway, Receptor linkage is complete and is used to determine if any further investigation is required. It does not indicate immediate emergency risk to any individual or feature present on the site unless specifically noted.

Our Locations

Birmingham

2 The Wharf
Bridge Street
Birmingham B1 2JS
T. 0121 643 4694
birmingham@curtins.com

Bristol

3/8 Redcliffe Parade West
Bristol
BS1 6SP
T. 0117 925 2825
bristol@curtins.com

Cardiff

3 Cwrt-y-Parc
Earlswood Road
Cardiff
CF14 5GH
T. 029 2068 0900
cardiff@curtins.com

Douglas

Valley House
29-31 Duke Street
Douglas Isle of Man
IM1 2AZ
T. 01624 624 585
douglas@curtins.com

Edinburgh

35 Manor Place
Edinburgh
EH3 7DD
T. 0131 225 2175
edinburgh@curtins.com

Kendal

28 Lower Street
Kendal
Cumbria LA9 4DH
T. 01539 724 823
kendal@curtins.com

Leeds

Woodside Mews
Clayton Wood Close
Leeds LS16 6QE
T. 0113 274 8509
leeds@curtins.com

Liverpool

Curtin House
Columbus Quay
Riverside Drive
Liverpool L3 4DB
T. 0151 726 2000
liverpool@curtins.com

London

Units 5/6
40 Compton Street
London
EC1V 0BD
T. 020 73242240
london@curtins.com

Manchester

10 Oxford Court
Bishopsgate
Manchester M2 3WQ
T. 0161 236 2394
manchester@curtins.com

Nottingham

56 The Ropewalk
Nottingham
NG1 5DW
T. 0115 941 5551
nottingham@curtins.com



