

**LAND AT
COPPICE SIDE
SWADLINCOTE**

**DESK BASED
COAL MINING
RISK ASSESSMENT**



Prepared for:

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LK Consult Ltd
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Site Address	Land at Coppice Side, Swadlincote, Derbyshire, DE11 9AA.		
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It should be noted this report pertains solely to potential ground stability issues relating to potential shallow mining within the proposed planning boundary only.

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1 INTRODUCTION

1.1 Background

LK Consult (LKC) has been commissioned by HB Villages Developments Ltd to provide a Desk Based Coal Mining Risk Assessment Report for Coppice Side, Swadlincote. The report is required in support of a planning application to develop the site for the construction of an assisted living apartment block with communal gardens and car parking

A Coal Mining Risk Assessment Report is required for a planning application within a designated 'Coal Mining Development High Risk Area'. 'Coal Mining Development High Risk Areas' are areas, based upon Coal Authority records, where the potential land instability and other safety risks associated with former coal mining activities are likely to be greatest. They include, for example, areas of known or suspected shallow coal mining, recorded mine entries and areas of former surface mining.

This assessment is based upon guidance provided by the Coal Authority¹ and comprises a review of available desk based information.

The scope of this Coal Mining Risk Assessment (as per Coal Authority guidance) is to:

- Present a desk-based review of all available information on the coal mining issues which are relevant to the application site.
- Use the above information to identify and assess the risks to the proposed development from coal mining legacy, including the cumulative impact of issues.
- Set out appropriate mitigation measures to address the coal mining legacy issues affecting the site, including any necessary remedial works and/or demonstrate how coal mining issues have influenced the proposed development.
- Demonstrate to the Local Planning Authority that the application site is, or can be made, safe and stable to meet the requirements of national planning policy with regard to development on unstable land.

1.2 Site Details

A summary of site settings is presented in Table 1. Figures 1 and 2 indicate the site location and boundary.

Location	To the east of Hastings Road, Swadlincote, DE11 9AA. Centred at approximate National Grid Reference 430130E, 319260N.
Area	0.39 Ha.
Topography	Approximately 111-113 metres above ordnance datum (AOD). Site slopes down to southeast.
Current Land Use	<u>Site</u> Vacant site with remains of former depot building present. <u>Surrounding Area</u> North: Residential Properties and Aldi supermarket. East: Coppice Side and trees beyond. South: Residential properties and Hastings Road. West: Residential properties and Alleyne Close.
Proposed Development	Assisted living apartment block with communal gardens and car parking.

Table 1-1: Summary of site details.

¹Risk Based Approach to Development Management. Guidance for Developers. Version 3 2014.

2 REVIEW OF INFORMATION

LKC have obtained and reviewed information from the following sources, which is summarised in Section 2:

- Review of Published BGS Geological Mapping including:
 - Sheet 141 Loughborough Solid, Published 2001, Scale 1:50,000.
 - Digital mapping, dated 2000, Scale 1:10,000 (Appendix A).
- Coal Authority Non-Residential Mining Report (Appendix B).
- Coal Authority Development High Risk Area from WMS mapping² (Figure 4).
- Historical BGS boreholes within the site vicinity³ (Appendix C).
- Historical mapping (Appendix D).
- Publicly available historical mapping⁴.

2.1 Geological Mapping

Made ground is recorded across site on BGS Sheet mapping (Sheet 141) 1:50,000 scale. No artificial or superficial deposits have been recorded on site.

The bedrock is mapped as the Pennine Lower Coal Measures Formation (Sandstone, Siltstone and Mudstone). There are no noted dips/strikes onsite, and due to faulting in the area, the dip of the strata in the wider area varies considerably. The rocks in the wider area are noted to dip variably from approximately 2-8° to the southeast, 5° southwest and 28° northeast.

Several faults are indicated within the area. A fault is present approximately 5m east from the site (possibly present at the eastern boundary) striking north-south, with a downthrow to the northwest and also approximately 20m southeast of the site striking northeast-southwest, with a downthrow to the northwest. Another fault is present approximately 110m west striking northwest-southeast. However, downthrow is not noted on mapping for this fault.

BGS Sheet mapping (Sheet 141) 1:50,000 scale shows a coal seam anticipated to be the P41 Coal Seam to be subcropping approximately 65m north of the site. The next mapped coal seam in the sequence is anticipated to be the P39/40 Coal Seam, subcropping approximately 45m north of the site. A coal seam is anticipated to subcrop close to or along the southwestern boundary of the site however the name of this seam is unclear. The Aegiranum Marine Band (AMB) is mapped approximately 75m southwest of the site.

Given that coal seams are present to the north the site, irrespective of the strata dip, coal seams are anticipated to be present at shallow depth below site.

Table 2-1 shows the coal seams in sequence (from north to south) from the generalized vertical section from Sheet 141 (bold indicates coal seam anticipated to subcrop on site):

Coal Seam	Approximate distance from site (m)
P41	65
P39/40	45
Unknown nomenclature	0

Table 2-1: Extract of generalized vertical section from Sheet 141 Loughborough Solid and Drift, dated 2001, scale 1:50,000.

² http://mapapps2.bgs.ac.uk/ArcGIS/services/CoalAuthority/coalauthority_coalfield_consultation/MapServer/WMServer?

³ <http://mapapps2.bgs.ac.uk/geoindex/home.html>

⁴ <https://www.old-maps.co.uk/#!/Map/430204/319332>

2.2 Coal Authority Non-Residential Mining Report

The Coal Authority Mining Report indicates:

- The property is in the likely zone of influence from workings in 9 seams of coal at 140m to 440m depth, and last worked in 1964. Any ground movements from these coal workings should have stopped by now.
- In addition the property is in an area where the Coal Authority believes there is coal at or close to the surface. This coal may have been worked at some time in the past.
- There are no known coal mine entries within 20 metres of the boundary of the property.
- The property does not lie within 200m boundary of an opencast site from which coal has been removed by opencast methods.
- There is no record of a damage notice or claim for the subject property, or any property within 50 metres, since 31st October 1994.
- There is no record of a mine gas emission requiring action.

2.3 Coal Authority Development High Risk Area

The Coal Authority WMS data has been reviewed which include areas where the potential land instability and other safety risks associated with former coal mining activities are likely to be greatest.

The whole site lies within a Development High Risk Area, shown as 'Probably Shallow Coal Mine Workings'.

2.4 Historical BGS Logs

The borehole records located closest to the site are summarised below.

Ref: SK31NW331, approximately 21m south east of site:

- Made ground to 1.1mbgl.
- Firm to stiff silty CLAY to 2.3mbgl.
- COAL and SHALE to 4.0mbgl.

Ref: SK31NW332, approximately 29m south east of site:

- Made ground to 1.6mbgl.
- Firm to stiff Silty CLAY to 4.0mbgl.
- SANDSTONE / MUDSTONE to >4.0mbgl.

2.5 Historical Mapping

The following historical features have been identified associated with coal mining:

- Granville Colliery is present approximately 370m east of the site from 1885 mapping until 1968 mapping with associated old air shafts.
- Several shafts have been identified within the surrounding area. The nearest being located approximately 88m E and present from 1923 mapping until 1955 mapping.
- Several pumping shafts are present to the south of the site on 1883 mapping.

3 COAL MINING RISK ASSESSMENT

Table 3-1 below summarises the potential risks associated with coal mining legacy for the proposed development site, identified from the review of information section.

Coal Mining Issue	Yes	No	Risk Assessment
Underground coal mining (recorded at shallow depths)		X	No recorded shallow underground workings below the site.
Underground coal mining (probable at shallow depths)	✓		Expected below the site. Further assessment required.
Mine entries (shafts / adits) within 20m of the site boundary		X	No recorded mine entries within 20m of site. There may however be mine entries/additional mine entries in the local area which the Coal Authority has no knowledge of.
Coal mining geology (fissures)		X	No recorded coal mining geology.
Record of past mine gas emissions		X	No recorded past mine gas emissions.
Recorded coal mining surface hazard		X	No recorded coal mining surface hazard.
Surface mining (opencast workings)		X	No recorded surface mining (opencast workings).

Table 3-1: Potential Coal Mining Risks.

A probable risk from underground coal mining at shallow depth has been identified.

Map evidence indicates that a coal seam (the name of which is unclear) is likely to subcrop at rockhead beneath the site along the southwestern boundary assuming the strata is dipping either northeast or southeast/southwest. Assuming a dip of 2-8° to the southeast / southwest it is also likely that the P39/40 Coal Seam, mapped as subcropping approximately 45m to the north of the site, is present at shallow depth beneath the site and also the P41 Coal Seam mapped as subcropping approximately 65m north of the site. The coal seams which are expected to dip below the site with their anticipated depths are listed in Table 3-2 below;

Coal Seam	Distance from site (m)	Anticipated depth below site (mbgl)
P41	65	2.3-9.1 (assuming a dip to SE/SW)
P39/40	45	1.6-6.3 (assuming a dip to SE/SW)

Table 3-2: Anticipated depth of coal seams below site.

In order to confirm the ground instability risk posed from probable shallow coal workings, intrusive investigation work is recommended.

4 CONCLUSIONS AND RECOMMENDATIONS

Summary

Based upon the available information, LKC conclude that there is a risk from probable shallow coal mining below the whole site. This is assumed to be associated with coal seams subcropping to the north which are expected to dip at shallow depths below the site, and a coal seam subcropping along the southwestern boundary which is expected to be present at a shallow depth below site. If these seams have been worked, there could be a risk of ground instability.

Considering the available information and guidance given in CIRIA SP32⁵, LKC consider that an intrusive investigation should be undertaken to confirm if underground shallow workings have occurred below the site.

The following investigation work is anticipated:

- Rotary drilling across the site to confirm the depth and thickness of coal seams and possible shallow workings.

Investigation work should be carried out in line with CIRIA SP32 and Coal Authority guidance.

It is also recommended that the risk of ground gas to the proposed development is also considered and investigated. This should include gas monitoring during drilling and post investigation work.

A Coal Authority Permit⁶ is required for intrusive activities which will disturb or enter any coal seams, coal mine workings or coal mine entries (shafts and adits).

Mitigation Measures

If shallow voids or workings are encountered and they are considered to present an instability risk to the proposed development then mitigation options may include inter alia:

- Relocation of the building to any 'safe areas' of the site;
- Stabilisation of any workings beneath the proposed buildings;
- Use of a reinforced raft foundation sat on a granular blanket;
- Use of piled foundations taken to below the level of workings; or,
- Use of flexible foundations.

Measures to protect against the ingress of mine gas could typically include a vented sub-floor and gas protection measures. This should be assessed further depending on prevailing ground conditions.

Conclusions and Safe Development

At this stage the possibility for shallow workings can only be ascertained from site investigation; however, LKC consider that the site could be safely developed with regards to shallow mining subject to an appropriate site investigation and, if required, appropriate mitigation measures which may include some of those measures as detailed above.

⁵ CIRIA (1984). "Construction over abandoned Mine Workings". SP32

⁶ <https://www.gov.uk/get-a-permit-to-deal-with-a-coal-mine-on-your-property>

Therefore LKC consider the study site should be capable of being made safe and stable to meet the requirements of national planning policy with regard to development on unstable land.

FIGURES

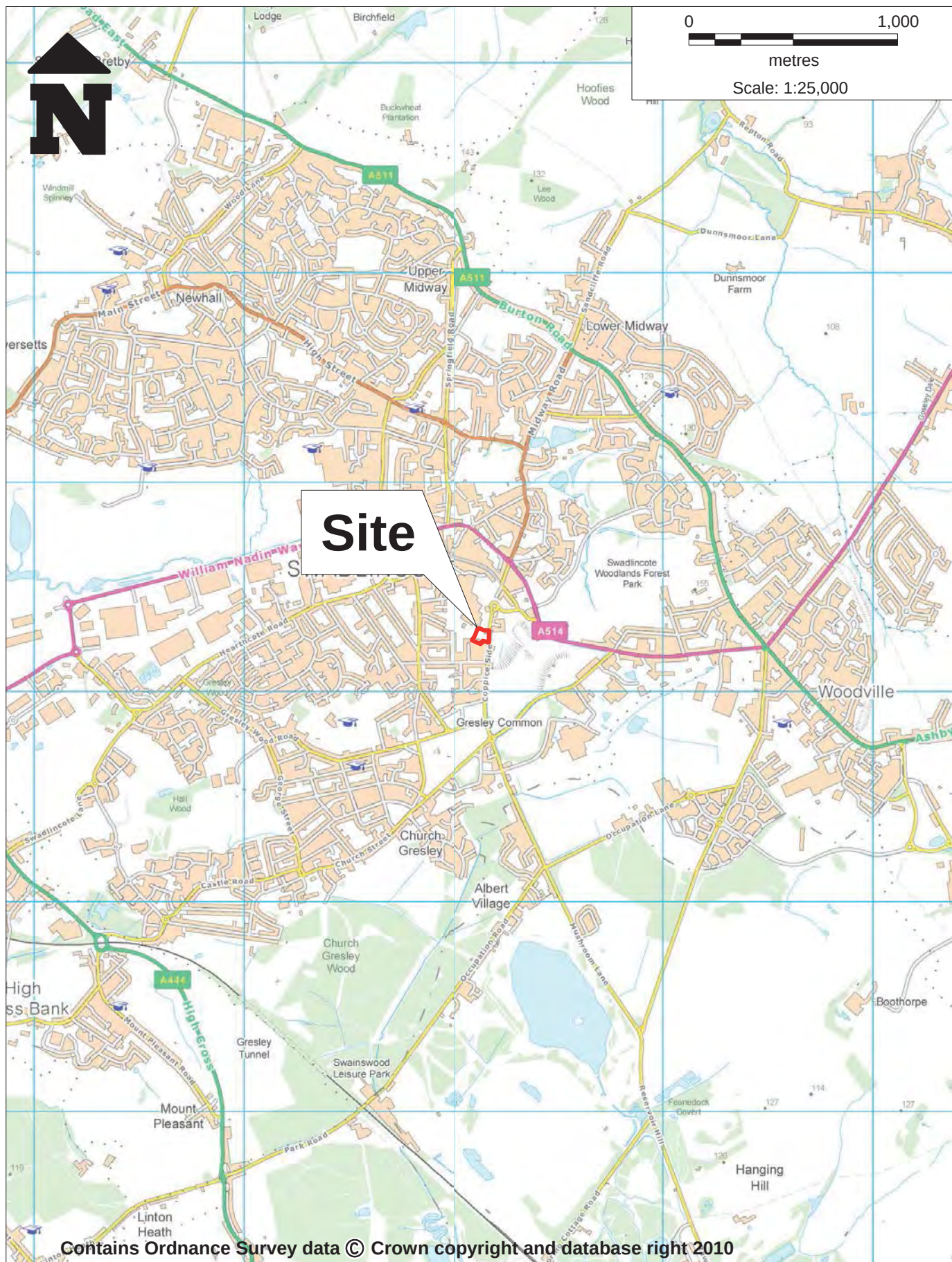
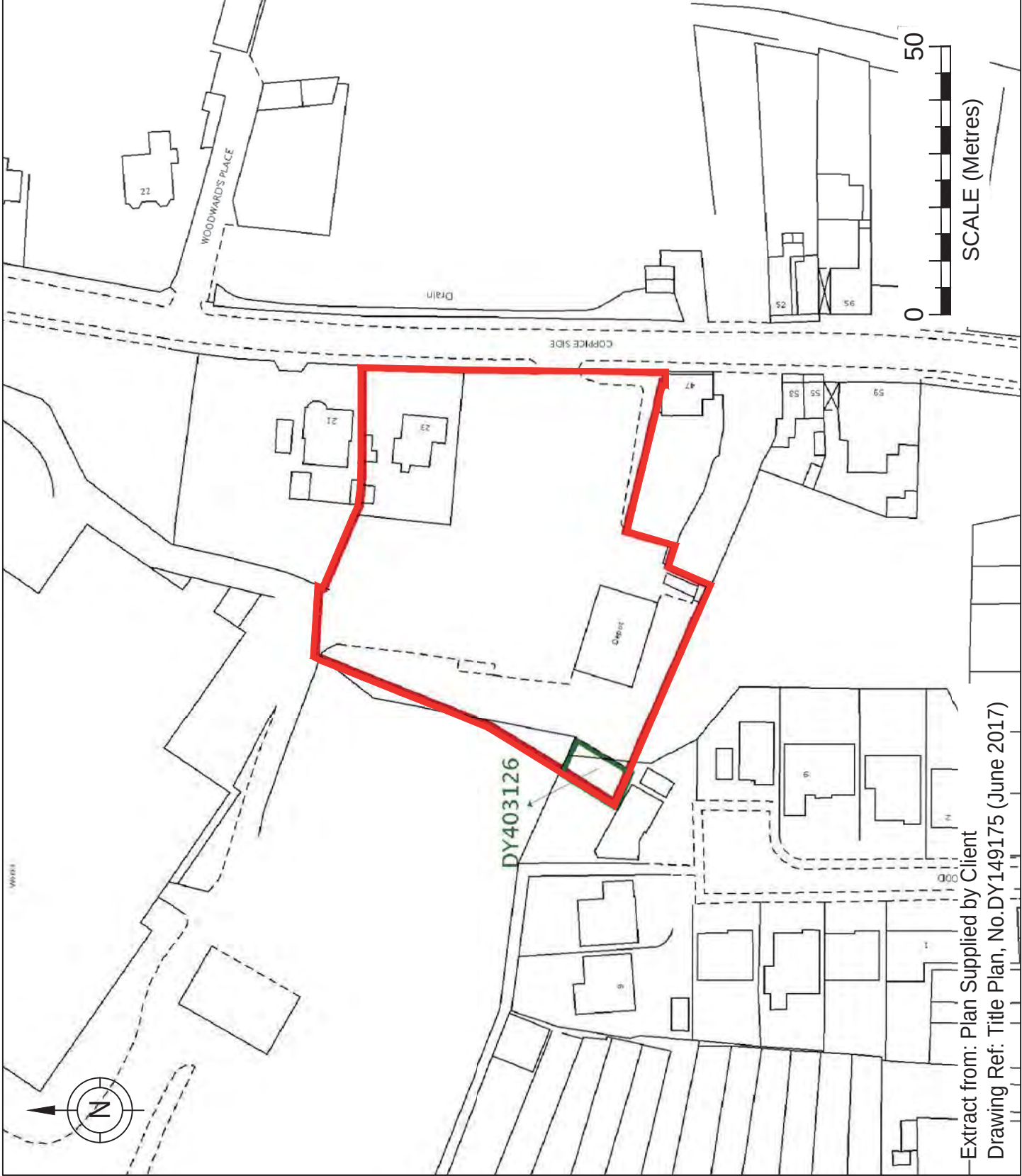


Figure 1: Site Location Plan, Land at Coppice Side, Swadlincote

Drawn: July 2017 Scale: 1:25,000 @ A4 (see scale bar)



KEY



Site Boundary

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



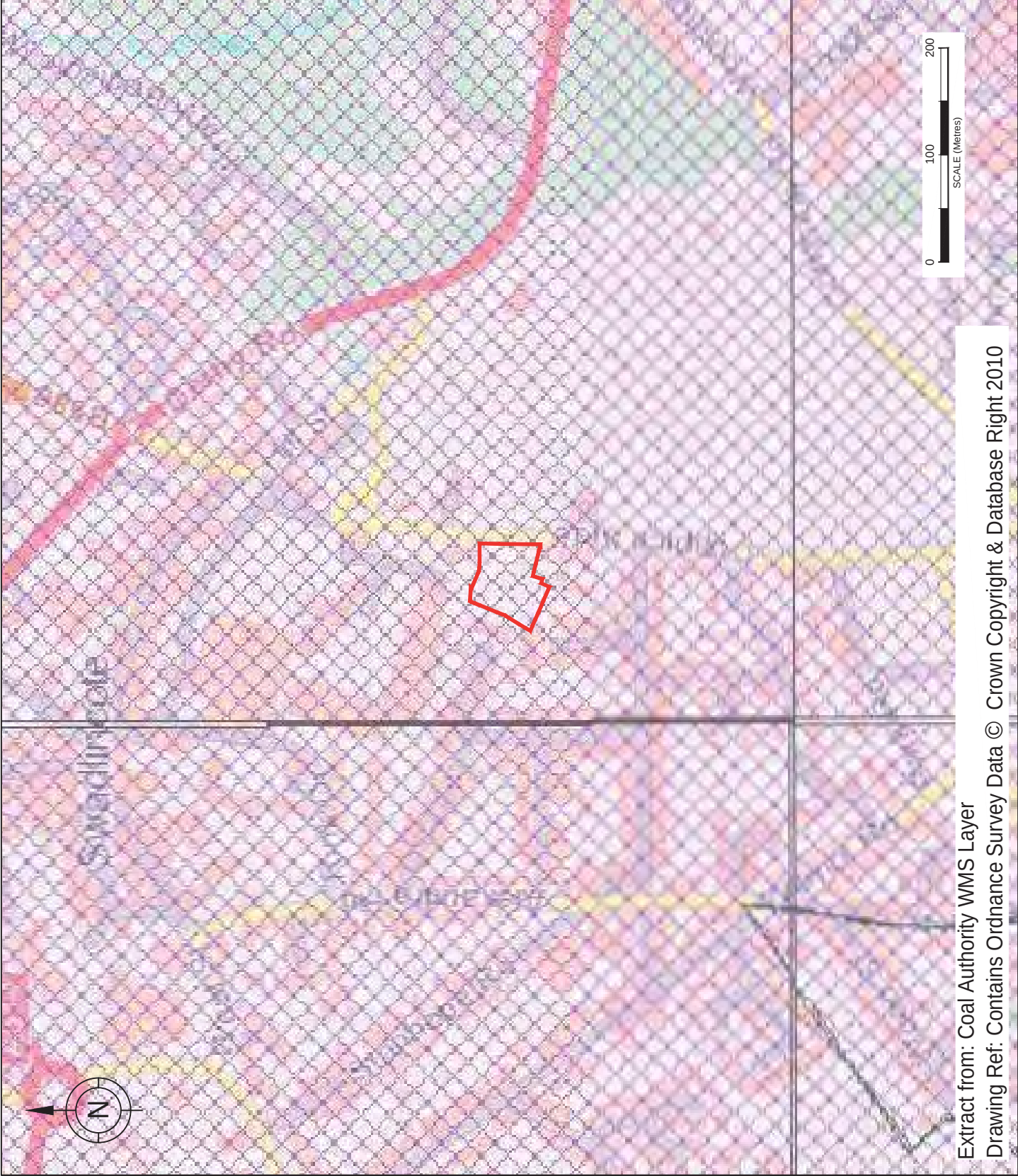
Client: HB Villages Developments Ltd

Site: Land at Coppice Side, Swadlincote

Title: Site Boundary Plan

Top No:	Scale (See Scale Bar):	Figure:	Revision:
LKC 17 1266	1:1000 @ A4	2	
Drawn By:	Checked By:	Drawn:	
AC	HM	Jul 2017	

Extract from: Plan Supplied by Client
Drawing Ref: Title Plan, No.DY149175 (June 2017)



KEY



Site Boundary



Probable Shallow
Coal Mine Workings

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



Client:	HB Villages Developments Ltd
Site:	Land at Coppice Side, Swadlincote
Title:	Development High Risk Area

Extract from: Coal Authority WMS Layer
Drawing Ref: Contains Ordnance Survey Data © Crown Copyright & Database Right 2010

Doc No:	LKC 17 1266	Scale (Site Scale Bar):	1:5000 @ A4	Figure:	3	Revision:	
Drawn By:	AC	Checked By:	HM	Drawn:	Jul 2017		

APPENDIX A

BGS DIGITAL GEOLOGICAL MAPPING

Geology 1:50,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	WMGR	Infilled Ground	Artificial Deposit	Cenozoic - Cenozoic
	MGR	Made Ground (Undivided)	Artificial Deposit	Holocene - Holocene
	WGR	Worked Ground (Undivided)	Void	Holocene - Holocene

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay, Silt, Sand and Gravel	Flandrian - Flandrian
	ODT	Oadby Member	Diamicton	Anglian - Anglian

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	KDM	Kidderminster Formation	Sandstone and Conglomerate, Interbedded	Early Triassic - Early Triassic
	BMS	Bromsgrove Sandstone Formation	Sandstone	Anisian - Early Triassic
	BMS	Bromsgrove Sandstone Formation	Mudstone	Anisian - Early Triassic
	KDM	Kidderminster Formation	Mudstone	Early Triassic - Early Triassic
	MOI	Moiria Formation	Breccia	Anisian - Late Permian
	PUCM	Pennine Upper Coal Measures Formation	Mudstone, Siltstone and Sandstone	Westphalian D - Bolsovian
	PUCM	Pennine Upper Coal Measures Formation	Sandstone	Westphalian D - Bolsovian
	PMCM	Pennine Middle Coal Measures Formation	Mudstone, Siltstone and Sandstone	Bolsovian - Duckmantian
	PMCM	Pennine Middle Coal Measures Formation	Sandstone	Bolsovian - Duckmantian
	PLCM	Pennine Lower Coal Measures Formation	Mudstone, Siltstone and Sandstone	Langsetian - Langsetian
	PLCM	Pennine Lower Coal Measures Formation	Sandstone	Langsetian - Langsetian
	WGF	Wingfield Flags	Sandstone	Langsetian - Langsetian



Geology 1:50,000 Maps

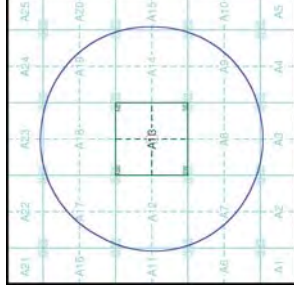
This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps.

The various geological layers - artificial and landslip 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
Map Sheet No:	141
Map Name:	Loughborough
Map Date:	2009
Bedrock Geology:	Available
Superficial Geology:	Available
Artificial Geology:	Available
Faults:	Not Supplied
Landslip:	Available
Rock Segments:	Not Supplied

Geology 1:50,000 Maps - Slice A



Order Details:

Order Number:	132907764_1_1
Customer Reference:	LKC 17 1266
National Grid Reference:	430130, 319260
Slice:	A
Site Area (Ha):	0.39
Search Buffer (m):	1000

Site Details:

Copple Side, Swadlincote, DE11 9AA



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

V15.0 20-Jul-2017

Artificial Ground and Landslip

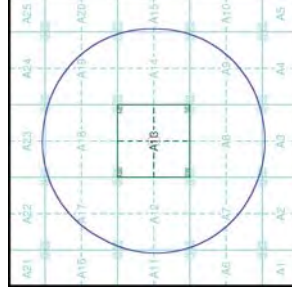
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions 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.
- In-filled 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 founded strata, where the ground has collapsed due to subsidence.

Artificial Ground and Landslip Map - Slice A

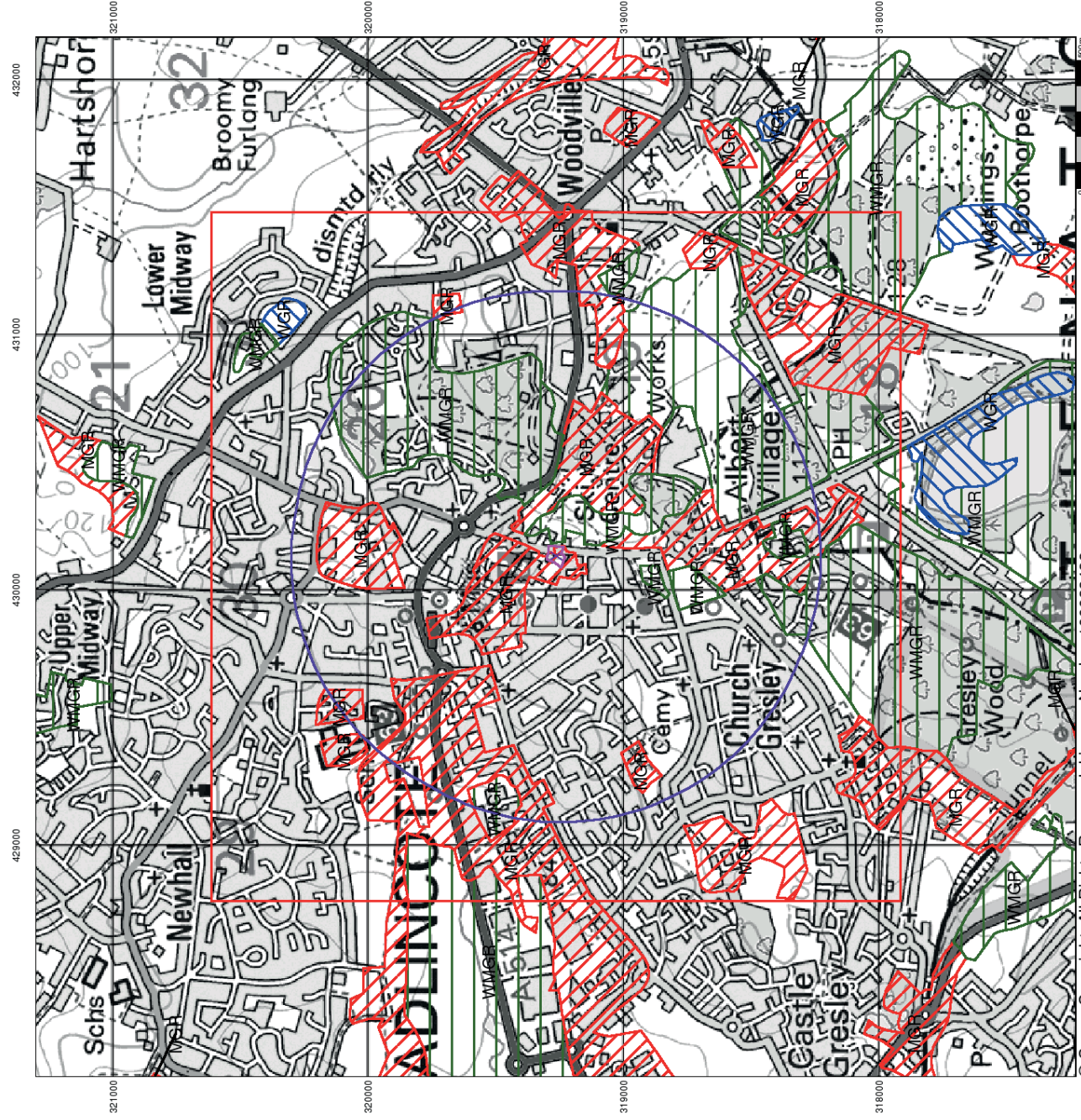


Order Details:

Order Number: 132907764_1.1
Customer Reference: LKC 17 1266
National Grid Reference: 430130, 319260
Slice: A
Site Area (Ha): 0.39
Search Buffer (m): 1000

Site Details:

Copple Side, Swadlinote, DE11 9AA



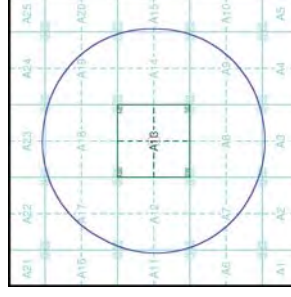
Superficial Geology

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 onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A

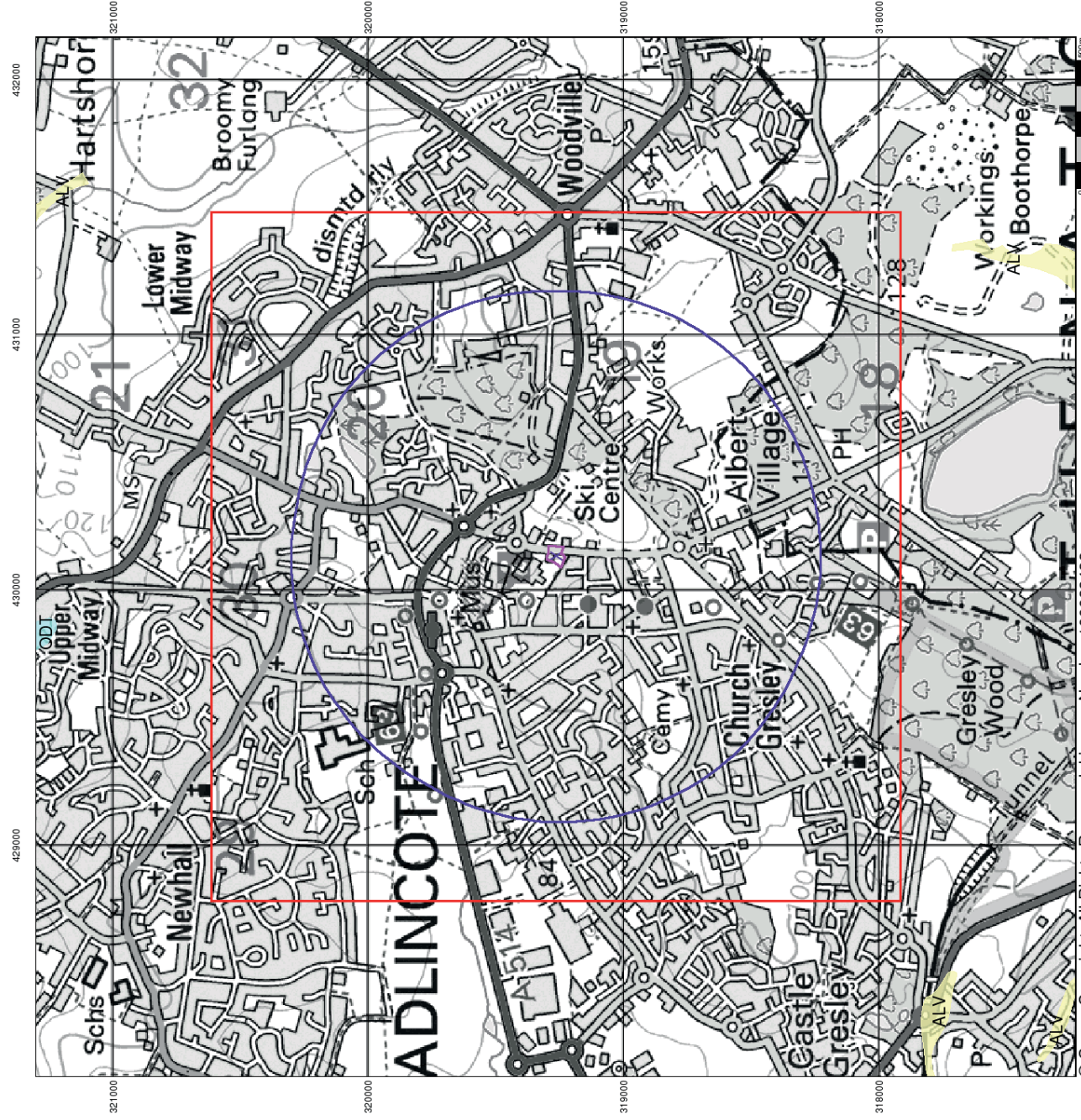


Order Details:

Order Number: 132907764_1.1
Customer: LKC 17 1266
National Grid Reference: 430130, 319260
Slice: A
Site Area (Ha): 0.39
Search Buffer (m): 1000

Site Details:

Copple Side, Swadlincote, DE11 9AA



Bedrock and Faults

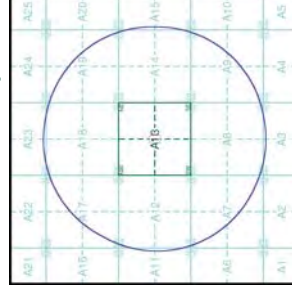
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

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 - Slice A

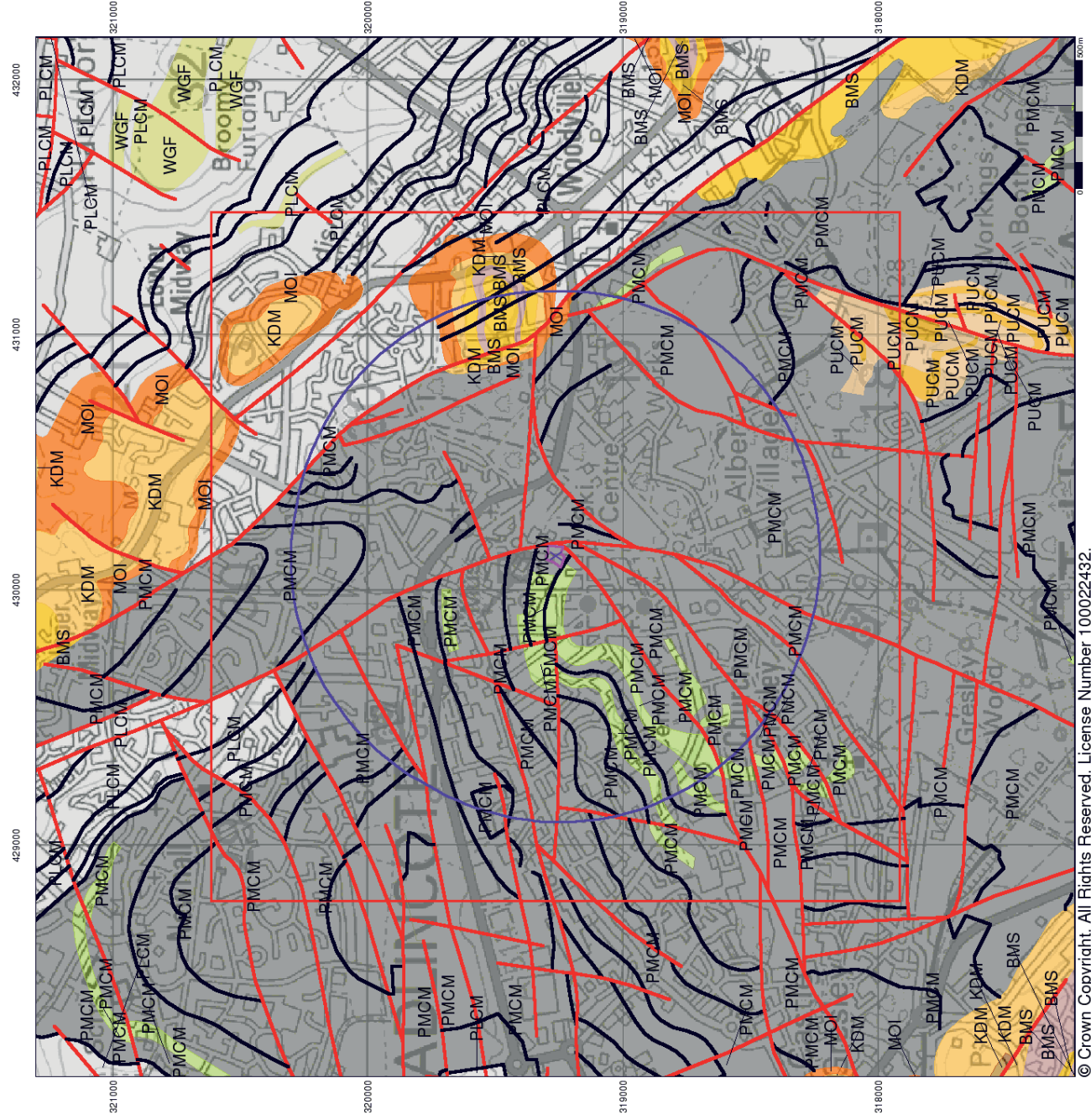


Order Details:

Order Number: 132907764_1.1
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 National Grid Reference: 430130, 319260
 Slice: A
 Site Area (Ha): 0.39
 Search Buffer (m): 1000

Site Details:

Copple Side, Swadlincote, DE11 9AA





APPENDIX B

COAL AUTHORITY NON-RESIDENTIAL MINING REPORT