SOILS AND AGRICULTURAL QUALITY OF LAND OFF SOUTH NEWINGTON ROAD BLOXHAM

Report 1313/1

20th April, 2017

Land Research ASSOCIATES

SOILS AND AGRICULTURAL QUALITY

OF LAND OFF SOUTH NEWINGTON ROAD, BLOXHAM

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Report 1313/1
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SUMMARY

A soil and agricultural land quality survey has been undertaken of 5.9 ha of land off South Newington Road in Bloxham. The land comprises two small grass fields, plus buildings and hard standings in the south.

The land has mixed soils over clay or ironstone. The former give land of subgrade 3b agricultural quality (limited by wetness), and the latter land of subgrade 3a and 2 (limited by wetness and droughtiness). A small disturbed area is limited by soil depth to grade 4.

Were the site to be developed, the topsoils of the soils over ironstone are a better resource for reuse in gardens and landscaping and should be used preferentially.

1.0 Introduction

1.1 This report provides information on the soils and agricultural quality of 5.9 ha of land off South Newington Road in Bloxham, Oxfordshire. The report is based on a survey of the land in April 2017.

SITE ENVIRONMENT

1.2 The land investigated comprises two fields, bordered to the north by residential development, to the north-east by a recreation ground, to the south-east by South Newington Road and on other sides by adjoining agricultural land.

1.3 The site is gently undulating, at an elevation of approximately 115 m AOD.

AGRICULTURAL USE

1.4 At the time of survey the land was under grass (ungrazed).

1.5 The land is not registered under any agri-environment schemes.

PUBLISHED INFORMATION

1.6 1:50,000 scale BGS information records the east of the site to be underlain by ferruginous limestone and ironstone of the Jurassic Marlestone Rock Formation, with the west underlain by Jurassic mudstone of the Whitby Mudstone Formation.

1.7 The National Soil Map (published 1:250,000 scale), shows the site as Denchworth Association, comprising slowly permeable clayey soils formed in Jurassic mudstone[1].

1.8 Provisional ALC mapping (1: 250,000 scale) shows the land as grade 2 and grade 4 in the north. No more detailed survey has been published.

[1] Jarvis, M.G *et al*., 1984. *Soils and their Use in South East England.* Soil Survey of England and Wales Bulletin No. 15, Harpenden.

2.0 Soils

2.1 The National Planning Practice Guidance states that the planning system should protect and enhance valued soils and prevent the adverse effects of unacceptable levels of pollution. This is because soil is an essential finite resource that provides important ecosystem services, for example as a growing medium for food, timber and other crops, as a store for carbon and water, as a reservoir of biodiversity and as a buffer against pollution.

2.2 A detailed soil resource and agricultural quality survey was carried out in April 2017. It was based on observations at intersects of a 100 m grid, giving a sampling density of one observation per hectare. Where soils were found to vary significantly, sample density was increased to intersects of a 50 m grid (4 observations per hectare). During the survey, soils were examined by a combination of pits and augerings to a maximum depth of 1.2 m. A log of the sampling points and a map (Map 1) showing their location is in an appendix to this report.

2.3 Soils at the site were found to vary in depth, texture and drainage depending on the nature of the underlying geology. The distribution of soil types is shown by Map 2 in an appendix to this report and they are described below.

SOILS OVER CLAY

2.4 The soils in the west of the site are formed over Jurassic clay/mudstone and comprise clay topsoil over grey mottled poorly-structured clay subsoil (indicating seasonal waterlogging to shallow depth caused by slow permeablility).

2.5 An example profile is described below from observation 6 (Map 1).

0-25 cm	Pale grey (7.5YR 4/1) clay with common distinct fine reddish brown (5YR 4/4) mottles; stoneless; moderately developed medium sub-angular blocky structure; firm; clear smooth boundary to:
25-43 cm	Grey (7.5YR 5/1) clay with distinct fine reddish brown (5YR 4/4) mottles; stoneless; weakly developed very coarse angular blocky structure; very firm; gradual smooth boundary to:
43-120 cm	Grey (7.5YR 6/1) clay with many prominent fine and medium reddish yellow (5YR 6/8) mottles; stoneless; structureless (massive); very firm.

2.6 These soils are imperfectly to poorly-draining (Soil Wetness Class III to IV) and have a low capacity to absorb excess winter rainfall.

SOILS OVER IRONSTONE

2.7 In the east of the site the soils are of variable depth to broken ironstone.

Topsoils and subsoils are heavy clay loam in texture, increasing in stoniness with depth and sometimes mottled and poorly-structured where there is a greater depth of soil over rock. On the boundary between geological types the soils are deeper and ironstone was not encountered.

2.8 An example profile is described below from observation 13 (Map 1).

0-26 cm	Dark yellowish brown (10YR 3/4) heavy clay loam; slightly stony (small hard ironstone); well developed fine sub-angular blocky structure; friable; gradual smooth boundary to:
26-51 cm	Yellowish brown (10YR 5/6) heavy clay loam; very stony (40-50% platy medium and large hard ironstone); moderately developed medium and fine sub-angular blocky structure; friable; gradual smooth boundary to:
51-68 cm	Brown (10YR 5/3) heavy clay loam with common distinct fine yellowish brown (10YR 5/8) mottles; moderately stony; weakly developed coarse sub-angular blocky structure; friable; gradual wavy boundary to:
68+ cm	Hard ironstone.

2.9 These soils are freely -draining (Soil Wetness Class I or II) and have a high capacity to absorb excess winter rainfall.

DISTURBED SOILS

2.10 In a small area in the north of the site, the land has been disturbed historically and the soils contain many bricks and large stones. These soils are not described further.

3.0 Agricultural land quality

3.1 To assist in assessing land quality, the Ministry of Agriculture, Fisheries and Food (MAFF) developed a method for classifying agricultural land by grade according to the extent to which physical or chemical characteristics impose long-term limitations on agricultural use for food production. The MAFF Agricultural Land Classification (ALC) system classifies land into five grades numbered 1 to 5, with grade 3 divided into two subgrades (3a and 3b). The system was devised and introduced in the 1960s and revised in 1988.

3.2 The agricultural climate is an important factor in assessing the agricultural quality of land and has been calculated using the Climatological Data for Agricultural Land Classification[2]. The relevant site data for an average elevation of 115 m is given below.

• Average annual rainfall:	688 mm
• January-June accumulated temperature >0°C	1371 day°
• Field capacity period (when the soils are fully replete with water)	155 days mid Nov-mid Apr
• Summer moisture deficits for:	wheat: 100 mm potatoes: 90 mm

3.3 The survey described in the previous section was used in conjunction with the agro-climatic data above to classify the site using the revised guidelines for Agricultural Land Classification issued in 1988 by the Ministry of Agriculture, Fisheries and Food[3]. There are no climatic limitations at this locality.

SURVEY RESULTS

3.4 The agricultural quality of the land is determined by wetness and droughtiness. Land of grades 2, 3 and 4 has been identified.

Grade 2

3.5 This land (on the boundary between soil and geological types) is limited by slight wetness caused by the relatively high clay content of the topsoil. This means that flexibility of some mechanised field operations is likely to be

[2]Meteorological Office, (1989).*Climatological Data for Agricultural Land Classification*.
[3]MAFF, (1988).*Agricultural Land Classification for England and Wales: Guidelines and Criteria for Grading the Quality of Agricultural Land*.

reduced, particularly in winter and early spring. However, the limitations are minor and a wide range of arable crops could be grown.

Subgrade 3a

3.6 The soils over ironstone have a restricted soil moisture reserve due to shallow rooting depth, leading to moderate average yields of arable crops.

3.7 On the boundary between geological types are transitional soils with permeable upper layers over slowly permeable clay. The light drainage impedance combined with the high topsoil clay content causes occasional surface wetness which is likely to restrict winter field operations and limit flexibility of spring cropping.

Subgrade 3b

3.8 In the west of the site the slowly permeable underlying clay is at shallow depth and combined with the high clay content of the topsoil causes a greater wetness limitation. Under the local climate this wetness is likely to prevent land access for machinery operations in winter and spring, meaning arable cropping is mainly limited to autumn-sowings.

Grade 4

3.9 The disturbed soils in the north have rocky material incorporated and could not realistically be used for cultivated agriculture. Use is effectively restricted to improved pasture/silage grass.

Non Agricultural

3.1 This land comprises cattle sheds and an access track in the south

Grade areas

3.2 The boundaries between the different grades of land are shown on Map 3 and the areas occupied by each are shown below.

Table 1: Areas occupied by the different land grades

Grade/subgrade	*Area (ha)*	*% of the land*
Grade 2	0.5	8
Subgrade 3a	1.6	27
Subgrade 3b	3.4	58
Grade 4	0.3	5
Non Agricultural	0.2	2
Total	5.9	100

4.0 Soil resources and their use

4.1. As part of the Government's 'Safeguarding our Soils' Strategy, Defra published a code of practice on the sustainable use of soils on construction sites, which can be helpful in design of developments and setting planning conditions. An Environment Agency strategy Soil a Precious Resource: Our strategy for protecting, managing and restoring soil (Environment Agency, 2007) has complementary aims.

Topsoil

4.2. The topsoils of the ironstone soils (see Map 2) are a moderate quality resource for reuse in gardens and landscaping and should be used preferentially. They are susceptible to compaction damage when wet given their relatively high clay content, and handling operations would be best restricted to the period between May and October when the soils are more likely to be drier.

4.3. The soils over clay have heavy topsoils of low quality for reuse given their poor handling properties.

Subsoil

4.4. The subsoils susceptible to compaction during construction activities which could result in increased surface water runoff and risk of localised flooding, as well as restricted rooting depth and increased droughtiness for landscaping schemes. If compacted during construction, subsoils should be loosened before any topsoil is spread on them.

Soil Handling

4.5. Areas not being built over (e.g. environmental buffers and landscape areas) should not be trafficked by construction vehicles as thiswill render the soils impermeable, preventing percolation of rainfall beyond the base of the topsoil, which will quickly become saturated.

4.6. Stripped topsoil should be stored in separate resource bunds no more than 3 m high and kept grassed and free from construction traffic until required for re-use. The Construction Code of Practice for Sustainable Use of Soils on Construction Sites (Defra, 2009) provides guidance on good practice in soil handling.

APPENDIX

MAPS AND DETAILS OF OBSERVATIONS

Land at Bloxham: ALC and soil resources survey – Details of observations at each sampling point

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness	Agricultural quality	
No	Depth (cm)	Texture	Stones >20 mm (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class	Grade	Main limitation
1	0-24	C	0	24-34	C	xx	34-80+	C	xxx	1	IV	3b	W
2	0-25	C	<5	25-90+	C	xxx				2	IV	3b	W
3	0-32	HCL	<5	32-42	HCL	xx	42-77 77+	C R	xxx	2	III	3b	W
4	0-27	HCL	<5	27-43	HCL	x(x)	43-70+	C	xxx	2	III	3b	W
5	0-26	HCL	5-10	26+	STOPPED ON STONES (DISTURBED)					0	?	4	De
6	0-25	C	0	25-43	C	xxx	43-120	C	xxx	1	IV	3b	W
7	0-32	HCL	0	32-42	HCL/C	xxx	42-90+	C	xxx	1	III/IV	3b	W
8	0-31	HCL	<5	31-52	HCL	o	52-64 64-90+	HCL C	xx xxx	1	II	3a	W
9	0-32	HCL	<5	32-78	HCL	x	78-110+	HCL(r)	xx(x)	1	I/II	2	W
10	0-24	HCL	<5	24-46	HCL	xx	46-70+	C	xxx	2	III	3b	W
11	0-27	HCL	<5	27-73	HCL(r)	o	73-100+	C	xx	0	I/II	2/3a	W
12	0-27	HCL	<5	27-35	HCL	xx	35+	R		0	I	3a/3b	D
13	0-26	HCL	<5	26-68	HCL	x	68+	R		1	I	3a	D
14	0-31	HCL	<5	31-65	HCL	xx	65+	R		1	II	3a	W/D

Key to table

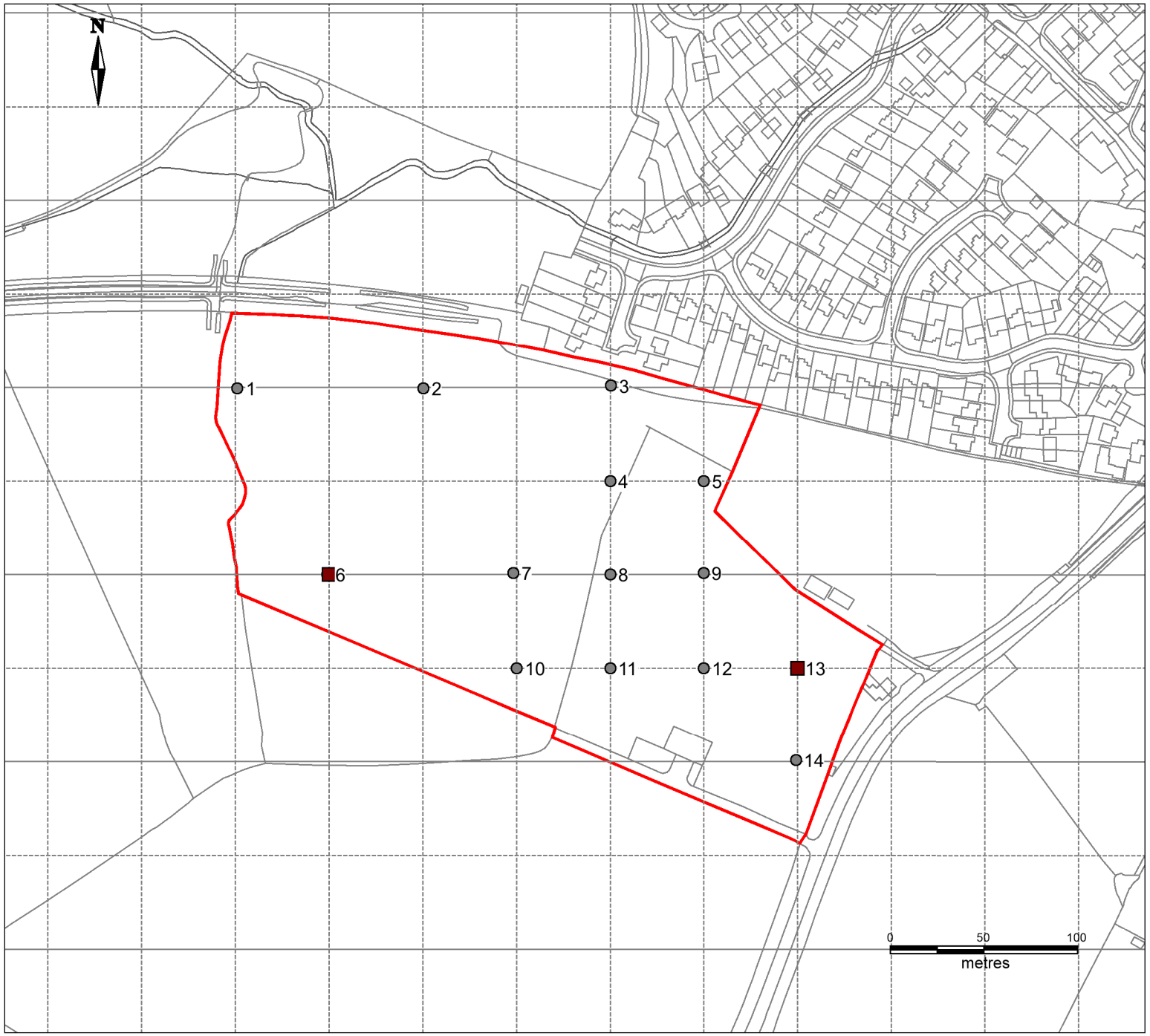
Mottle intensity:
- o unmottled
- x few to common rusty root mottles (topsoils) or a few ochreous mottles (subsoils)
- xx common to many ochreous mottles and/or dull structure faces
- xxx common to many greyish or pale mottles (gleyed horizon)
- xxxx dominantly grey, often with some ochreous mottles (gleyed horizon)

a depth underlined (e.g. 50) indicates the top of a slowly permeable layer
(a wavy underline indicates the top of a layer borderline to slowly permeable)

Texture:
- C - clay
- ZC - silty clay
- SC - sandy clay
- CL - clay loam (H-heavy, M-medium)
- ZCL - silty clay loam (H-heavy, M-medium)
- SCL - sandy clay loam
- SZL - sandy silt loam (F-fine, M-medium,C-coarse)
- SL - sandy loam (F-fine, M-medium, C-coarse)
- LS - loamy sand (F-fine, M-medium, C-coarse)
- S - sand (F-fine, M-medium, C-coarse)
- P - peat (H-humified, SF-semi-fibrous, F-fibrous)
- LP - loamy peat; PL - peaty loam
- R - bedrock

Limitations:
- W - wetness/workability
- D - droughtiness
- De - depth
- St – stoniness
- Sl – slope
- F - flooding
- T – topography/microrelief

Texture suffixes & prefixes:
- ca – calcareous: x-extremely, v-very, sl-slightly
- (ca) marginally calcareous
- mn - ferrimanganiferous concentrations
- gn – greenish, yb – yellowish brown, rb – reddish brown
- r – reddish; (v)st – (very) stony; sdst–sandstone;lst - limestone
- dist - disturbed soil layer; mdst - mudstone



KEY

- Survey observations
- Soil description pits
- Survey area

Client: GLADMAN

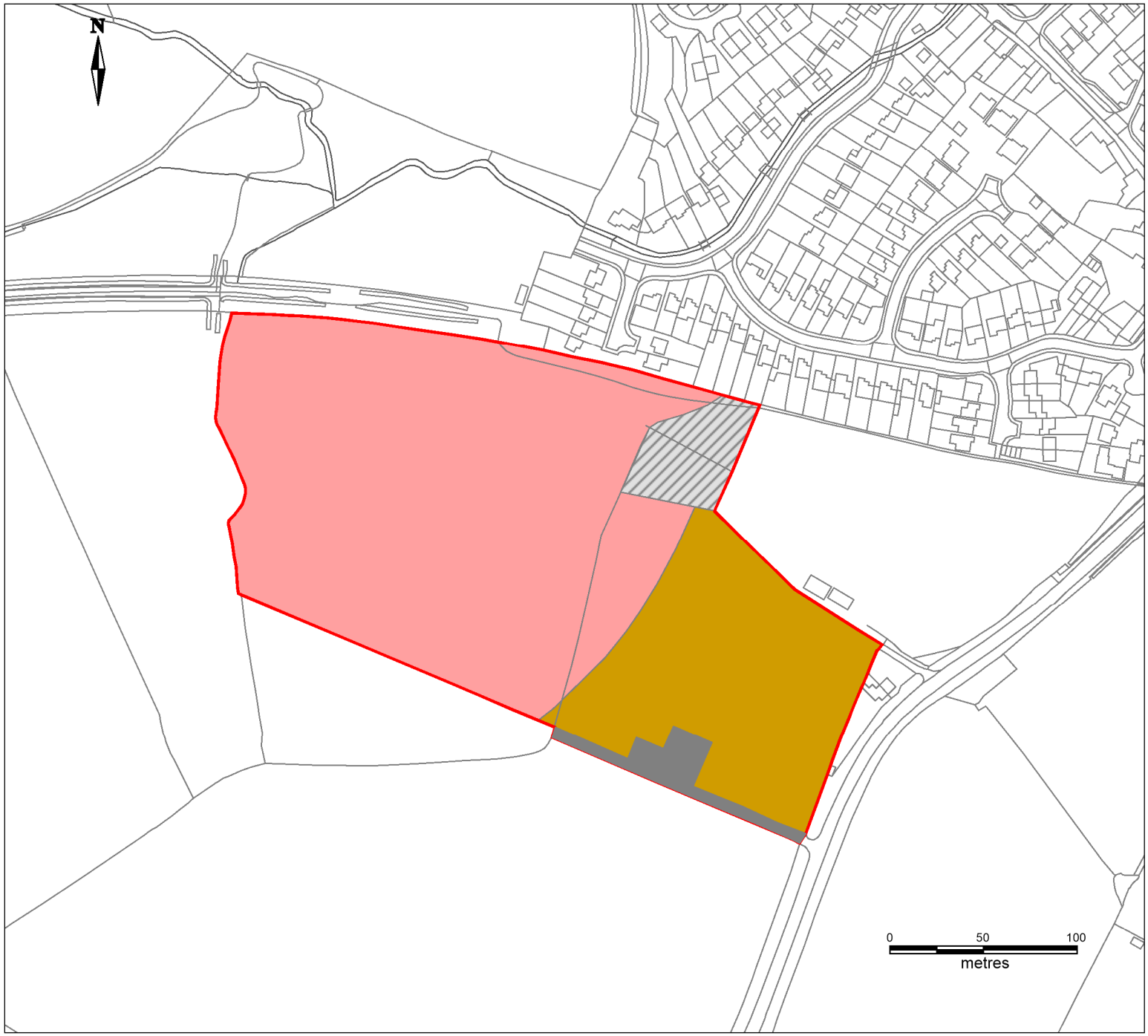
Site: **Bloxham**

Map title: **Map 1 Observations**

Land Research Associates
Lockington Hall
Lockington
Derby DE74 2RH
01509 670570

Scale: 1:3,000

Date: 19/04/2017



KEY

- Soils over clay
- Soils over ironstone
- Disturbed soils
- Survey area

Client: GLADMAN

Site: **Bloxham**

Map title:

Map 2
Soil Types

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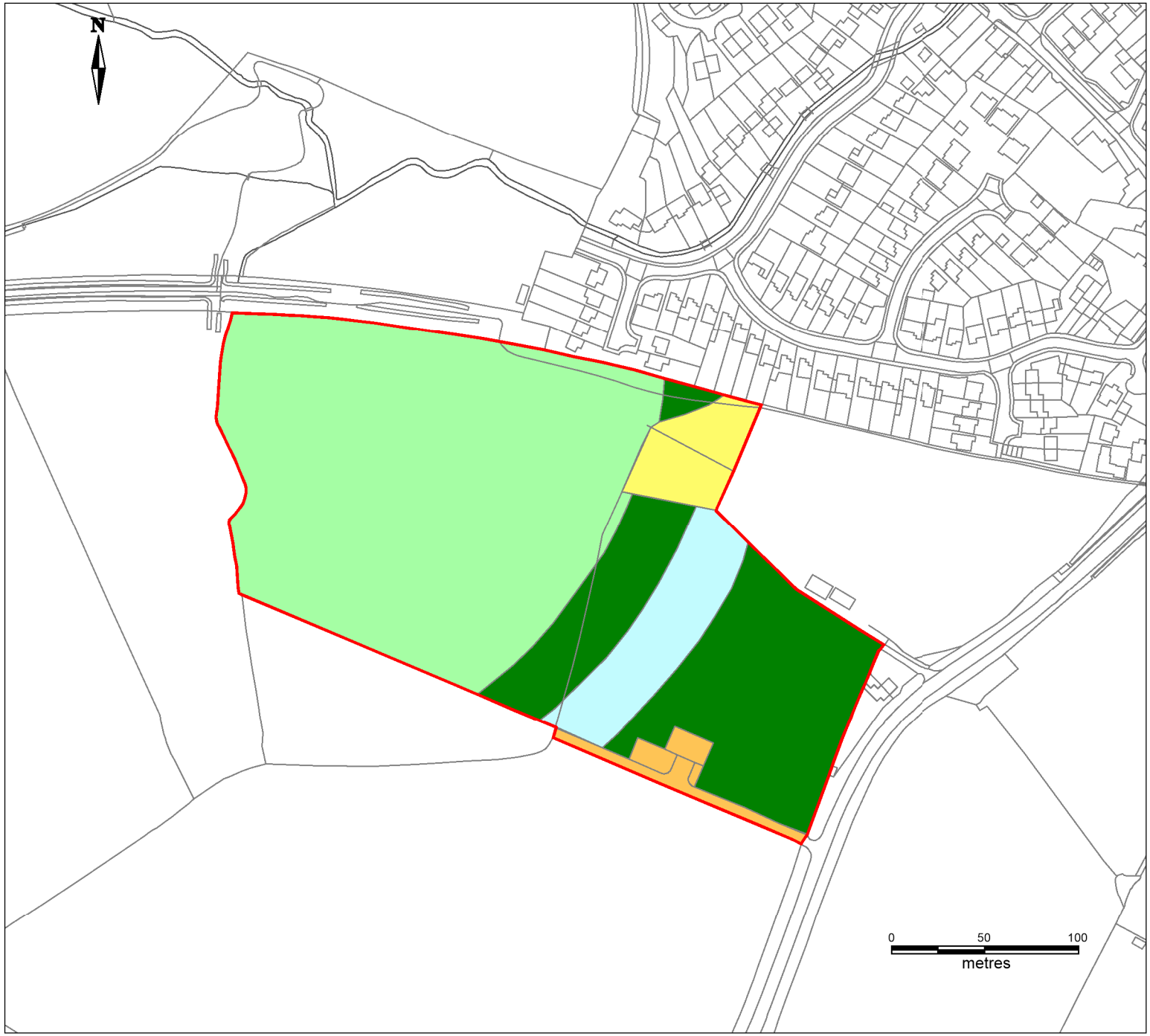
01509 670570

Scale: 1:3,000

Date: 19/04/2017



KEY

- Grade 2
- Subgrade 3a
- Subgrade 3b
- Grade 4
- Non Agricultural
- Survey area

Client: GLADMAN

Site: **Bloxham**

Map title:

Map 3
Agricultural Land Classification

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Scale: 1:3,000

Date: 19/04/2017