AGRICULTURAL QUALITY
OF LAND OFF FFORDD GLANFFYNNON
LLANRUG

Report 2376/1

29th August 2024

Land Research ASSOCIATES
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AGRICULTURAL QUALITY

OF LAND OFF FFORDD GLANFFYNNON, LLANRUG

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Report 2376/1
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SUMMARY

An agricultural land quality survey has been undertaken of 0.68 ha of land off Ffordd Glanffynnon, Llanrug in July 2024.

The land has stony loamy soils, some with drainage restrictions. Agricultural land quality is limited to Subgrade 3b and Grade 4 by stoniness and wetness limitations.

1.0 Introduction

1.1 This report provides information on the agricultural quality of 0.68 ha of land off Ffordd Glanffynnon, Llanrug, Caenarfon. The report is based on a survey of the land in July 2024.

SITE ENVIRONMENT

1.2 The survey area comprises three very small fields. The land is bordered to the west by Ffordd Glanffynnon, to the north by a residential property, to the north-east by wet woodland habitat and on other sides by adjoining agricultural land. The land is gently undulating, at an average elevation of approximately 120 m AOD.

1.3 The land is under permanent pasture, grazed by sheep at the time of survey.

PUBLISHED INFORMATION

1.4 British Geological Survey 1:50,000 scale information records the underlying geology as glacio-fluvial sand and gravel over Fachwen Formation siltstone and limestone.

1.5 The National Soil Map (published at 1:250,000 scale) records the land as Wick 1 Association, mainly comprising coarse loams, formed in sand and gravel deposits[1].

1.6 The Welsh Government Predictive Agricultural Land Classification map[2] shows the land in the north-east as Subgrade 3b and other areas as Subgrade 3a. The far north of the site is shown as Urban but this is an inaccuracy due to the low resolution / detail of this mapping.

[1] Ragg, J.M., *et al.,* (1984). *Soils and their Use in Midland and Western England,* Soil Survey of England and Wales Bulletin No. 12, Harpenden.

[2] New map | DataMapWales (gov.wales)

2.0 Soils

2.1 A soils and agricultural land quality survey was carried out in July 2024 in accordance with MAFF (1988) Agricultural Land Classification guidelines[3]. It was based on observations at alternate intersects of a 25 m grid, giving a density of eight observations per hectare. One observation (point 5 of Map 1) was on a field boundary and was relocated. During the survey, soils were examined by hand augerings and pits to a maximum depth of 0.62 m (stopped by extreme stoniness). A log of the sampling points and a map (Map 1) showing their location is in an appendix to this report.

2.2 The soils were found to be moderately to very stony fine loams. The topsoils are organo-mineral in nature (see appended laboratory testing) but this is due to the land being in permanent grass and is not regarded as a factor in land grading. At all observation points ground investigation was stopped on very stony layers. Pit excavations showed this material to consist of hard boulders.

2.3 On higher ground in the centre of the site soils were found to be freely-draining, with a brightly coloured horizon immediately below the topsoil. Elsewhere the subsoils are permeable but show evidence of waterlogging (greyish colours with ochreous mottles). On the lowest ground in the east the land is heavily rush-infested, indicating poor to very poor drainage.

2.4 Example soil profiles described from pit excavations at points 3 and 4 are attached to this report as an appendix.

ASSESSMENT OF DRAINAGE

2.5 The subsoils in the centre of the site are judged to be freely to moderately freely draining (Soil Wetness Class I or II). Elsewhere the land displays *gleying* (greyish and pale colours with ochreous mottles) at variable depth. This land is judged moderately freely to imperfectly-draining (Soil Wetness Class II to III). The rush infested land on the eastern margins is judged very poorly-draining (Soil Wetness Class V) under the local climate.

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

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 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[4].

3.3 The relevant site data for an average elevation of 120 m and a central point at grid reference SH 537,630 is given below.

- Average annual rainfall: 1192 mm
- January-June accumulated temperature >0°C 1353 day°
- Field capacity period 234 days
- Summer moisture deficits for: wheat: 66 mm
potatoes: 58 mm

3.4 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 ALC issued in 1988 by MAFF[5]. The wet slightly cool climate at this locality limits land quality to a maximum of Subgrade 3a.

SURVEY RESULTS

3.5 The agricultural quality of the land is primarily determined by stoniness and wetness limitations. Other factors have been assessed but do not affect the land grade. Land of Grades 3 and 4 has been identified.

Subgrade 3b

3.6 The topsoils at this site mainly have abundant large hard stones. This presents a risk of increased machinery wear were the land to be cultivated.

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

3.7 Some parts of the site have slightly lower topsoil stone content but have some drainage restrictions. Wetness means opportunities for crop sowings are likely to be limited to summer and autumn under the local climate.

Grade 4

3.8 The rush-infested land in the east is likely to be too wet for cultivated agriculture and is limited to use for grassland only.

3.9 Pit excavation 4 was found to have very stony topsoils of more restricted quality (nominally Grade 5 according to the Guidelines). However, it is not known whether this stoniness is representative of a wider area and this land is judged most appropriately assigned to Grade 4: land suited to improved pasture but not sustained arable use. In reality soil complexity and plot size constraints mean improved pasture is the effective capability of the whole site but these considerations are considered outside of the scope of ALC grading.

Grade areas

3.10 The land grades are shown on Map 2 and the areas occupied shown below.

Table 1: Areas occupied by the different land grades (ha)

Grade/subgrade	*Area (ha)*	*% of the land*
Subgrade 3b	0.58	85
Grade 4	0.10	15
Total	0.68	100

APPENDIX

DETAILS OF OBSERVATIONS

MAPS

LABORATORY TESTING

SITE PHOTOGRAPHS

Land off Ffordd Glanffynnon, Llanrugg: Soils and ALC 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	0-19	mstMCL/SCL	5-10 >60 mm	19-30	vstMCL/SCL	xxx	30+	Stopped on stones		4	III	3b	W
2	0-26	vstMCL	10-15 >60 mm	26-35	mstSCL (Bs?)	o	35-45 45+	mstMCL Stopped on stones	o	2	I/II	3b	St
3	0-23	vstMCL	15-20 10-15 >60 mm	23-30	vst gritty MCL (Bs?)	o	30-60	gritty MCL	o	1	I	3b	St
4	0-35	vstMCL	40	35-65	vstMZCL	xxx	65+	Stopped on stones		1	III	5	St
5	0-21	mstMCL	10-15 5-10 >60 mm	21-34	MCL (Bs)	o	34-54 54-62 62+	vstMCL vstMCL Stopped on stones	o xxx	1	II	3b	W

Soil log key

Gley indicators[1]

o	unmottled
x	1-2% ochreous mottles and brownish matrix (or a few to common root mottles (topsoils))[3]
xx	>2% ochreous mottles and brownish matrix and/or dull structure faces (slightly gleyed horizon)
xxx	>2% ochreous mottles and greyish or pale matrix (gleyed horizon) or reddish matrix and >2% greyish, brownish or ochreous mottles and pale ped faces mottles or fmn concentrations (gleyed horizon)
xxxx	dominantly blueish/greenish matrix, often with some reddish mottles (gleyed horizon)

Texture[2]

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

Limitations:

W - wetness/workability
D - droughtiness
De - depth
F - flooding
St – stoniness
G - gradient
T – topography/microrelief
C - Climate

Suffixes & prefixes:

o - organic

(vsl, sl, m, v, x)**st** – (very slightly, slightly, moderately, very, extremely) **stony**[6]

(vsl, sl, m, v, x)**ca**
(very slightly, slightly, moderately, very, extremely) **calcareous**[7]

Slowly permeable layers[4]

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

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

Wetness Class[5]

I (freely drained) to VI (very poorly drained)

Other abbreviations

fmn - ferri-manganiferous concentrations
dist - disturbed soil layer; chky - chalky
R – bedrock (CH – chalk, SST – sandstone LST – limestone, MST – Mudstone)
r-reddish, gn – greenish

[1]Gley indicators in accordance with Hodgson, J.M., 1997. Soil Survey Field Handbook (third edition). Soil survey technical monograph No. 5
[2]Texture in accordance with particle size classes in Hodgson (1997)
[3] Occasionally recorded in the texture box
[4]Permeability is estimated for auger borings and must be confirmed by full pit observations in accordance with the definitions in: Revised Guidelines for grading the quality of Agricultural Land (Maff 1988)
[5]Soil Wetness Classes are defined in Hodgson (1997)
[6]stoniness classes as defined in Hodgson (1997)
[7]calcareous classes as defined in Hodgson (1997)

Grades shown as intergrade e.g. **3a**/3b are close to the grade boundary. The estimate of which side of the boundary the grading falls is the shown first (in bold here)
grades in brackets eg. (3a) raised by one grade due to calcareous topsoil

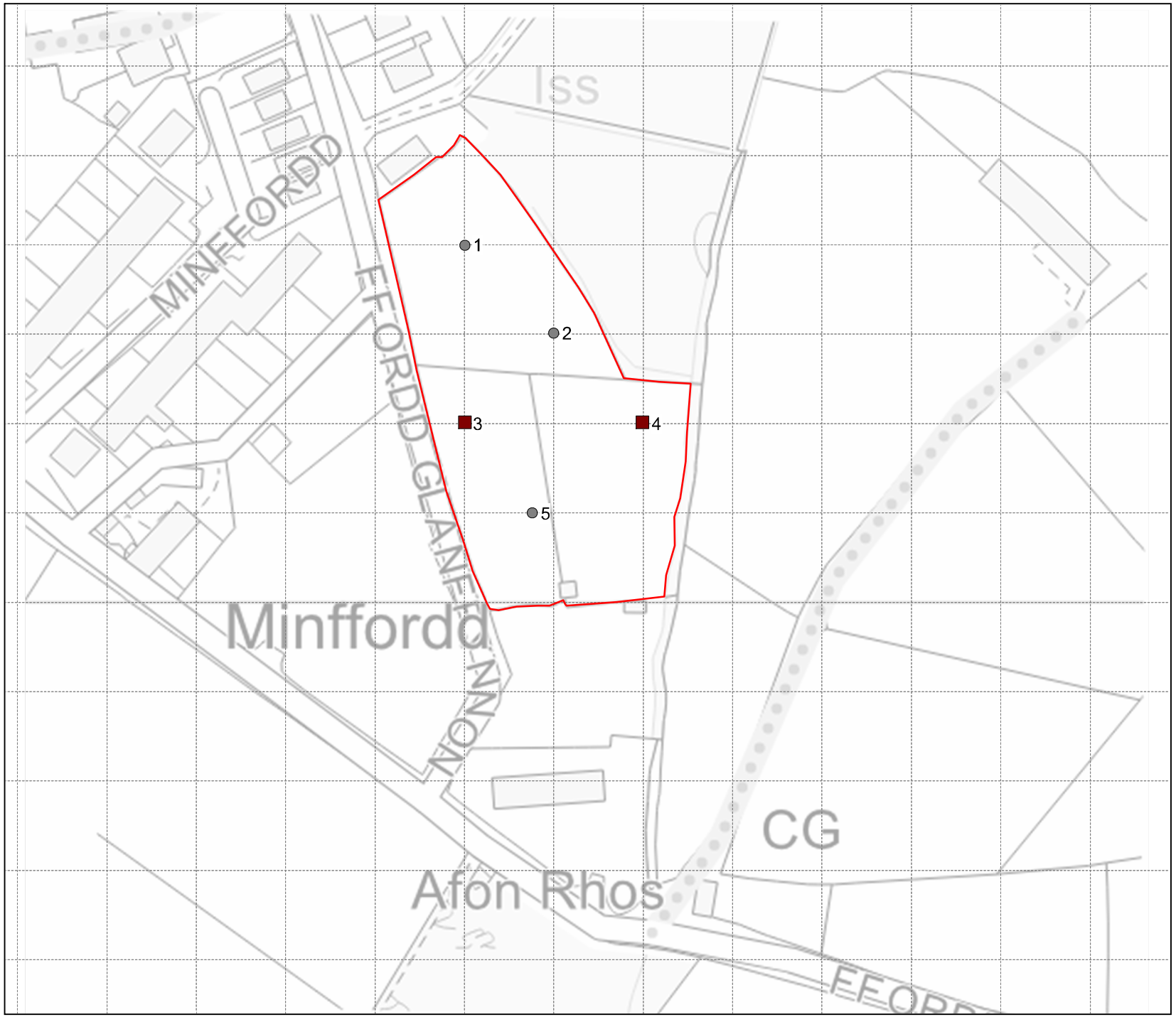
SOIL PIT DESCRIPTIONS

Observation 3

0-23 cm	Very dark greyish brown (10YR 3/2) medium clay loam; 30-40% hard stones (15-20% >20 mm, 10-15% >60 mm); strongly developed medium granular structure; friable; abundant fine fibrous roots; clear smooth boundary to:
23-30 cm	Strong brown (7.5YR 5/8) gritty medium clay loam/sandy clay loam; very stony; moderately developed medium sub-angular blocky structure; friable; abundant fine fibrous roots; gradual smooth boundary to:
30-60 cm	Brown (7.5YR 5/3) gritty medium clay loam/sandy clay loam; very stony; moderately developed fine sub-angular blocky structure; friable; common fine fibrous roots;
60 cm +	Impenetrable with hand tools.

Observation 4

0-35 cm	Very dark greyish brown (10YR 3/2) medium clay loam/silty clay loam; 40% hard large stones (>60 mm); strongly developed medium granular structure; friable; abundant fine fibrous roots; clear smooth boundary to:
35-65 cm	Grey (10YR 6/1) medium silty clay loam with 2-3% prominent strong brown (7.5YR 5/8) very fine mottles; very stony; moderately developed coarse sub-angular blocky structure; friable; common fine fibrous roots;
65 cm +	Impenetrable with hand tools.



KEY

- Auger observations
- Pits
- Site boundary

Site:

Llanrug

Map title:

MAP 1
Observations

Land Research ASSOCIATES
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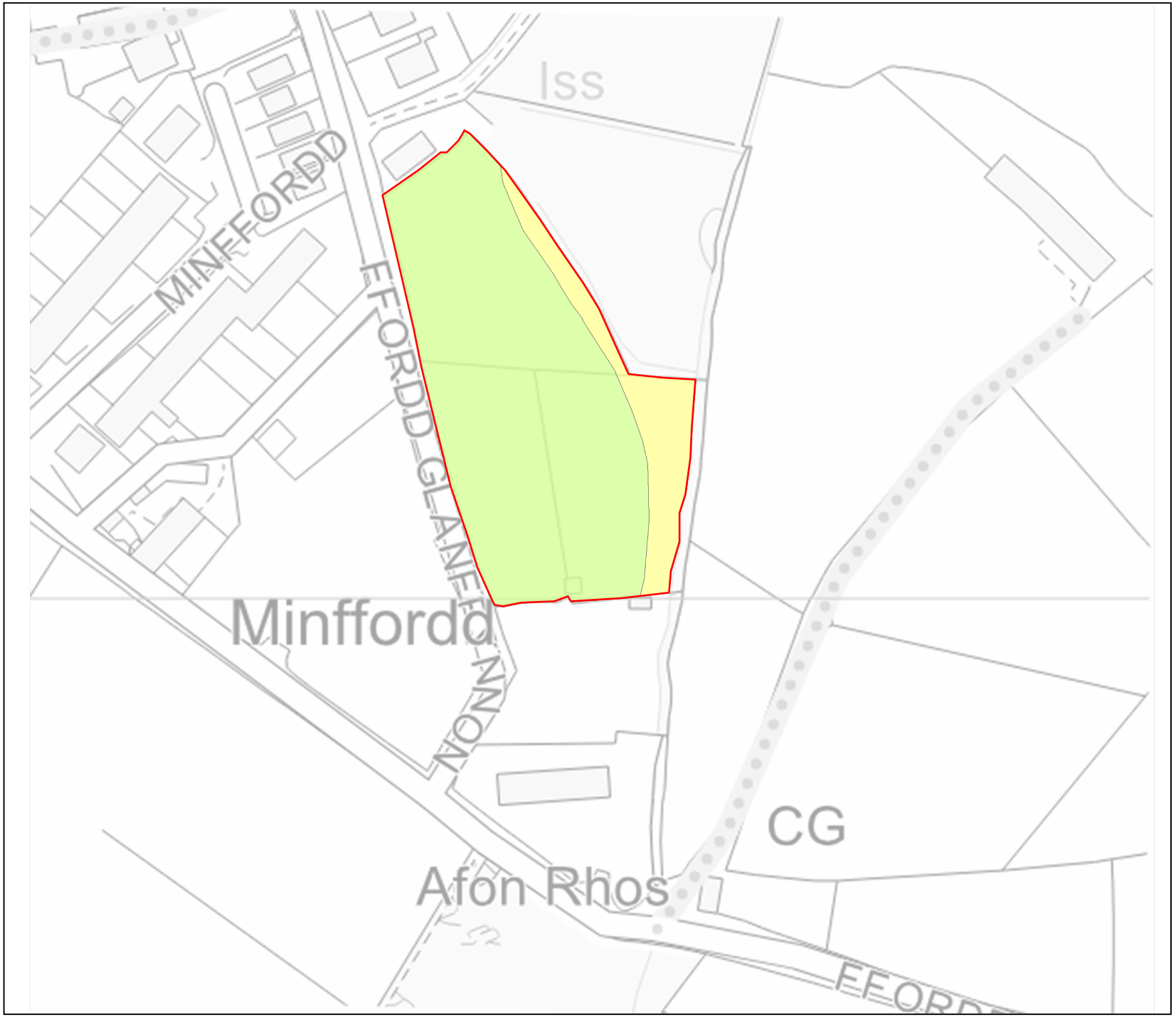
Chesterfield
S41 0TZ
www.lra.co.uk

Date: 29/08/2024

Scale: 1:1,500



KEY

- Subgrade 3b
- Grade 4
- Site boundary

Site:

Llanrug

Map title:

MAP 2
Agricultural Land
Classification

Land Research ASSOCIATES
Tapton Innovation Centre
Brimington Road
Chesterfield
S41 0TZ
www.lra.co.uk

Date: 29/08/2024

Scale: 1:1,500

ANALYTICAL REPORT

Report Number	**46505-24**	**H579**	**MR MIKE PALMER**
Date Received	**06-AUG-2024**		**LAND RESEARCH ASSOCIATES**
Date Reported	**27-AUG-2024**		**TAPTON PARK INNOVATION**
Project	**SOIL**		**CENTRE**
Reference	**LLANRUG**		**BRIMINGTON ROAD**
Order Number			**CHESTERFIELD S41 0TZ**

Laboratory Reference		**SOIL706838**
Sample Reference		**3**
Determinand	**Unit**	**SOIL**
Sand 2.00-0.063mm	% w/w	29
Silt 0.063-0.002mm	% w/w	45
Clay <0.002mm	% w/w	26
Textural Class **		O-MCL

Notes

Analysis Notes

The sample submitted was of adequate size to complete all analysis requested.
The results as reported relate only to the item(s) submitted for testing.
The results are presented on a dry matter basis unless otherwise stipulated.

Document Control

** Please see the attached document for the definition of textural classes.

Reported by

Myles Nicholson

Natural Resource Management, a trading division of Cawood Scientific Ltd.
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ADAS (UK) Textural Class Abbreviations

The texture classes are denoted by the following abbreviations:

Class	Code
Sand	S
Loamy sand	LS
Sandy loam	SL
Sandy Silt loam	SZL
Silt loam	ZL
Sandy clay loam	SCL
Clay loam	CL
Silt clay loam	ZCL
Clay	C
Silty clay	ZC
Sandy clay	SC

For the *sand, loamy sand, sandy loam* and *sandy silt loam* classes the predominant size of sand fraction may be indicated by the use of prefixes, thus:

- vf Very Fine (more than 2/3's of sand less than 0.106 mm)
- f Fine (more than 2/3's of sand less than 0.212 mm)
- c Coarse (more than 1/3 of sand greater than 0.6 mm)
- m Medium (less than 2/3's fine sand and less than 1/3 coarse sand).

The subdivisions of *clay loam* and *silty clay loam classes* according to clay content are indicated as follows:

- M medium (less than 27% clay)
- H heavy (27-35% clay)

Organic soils i.e. those with an organic matter greater than 10% will be preceded with a letter O.

Peaty soils i.e. those with an organic matter greater than 20% will be preceded with a letter P.

Site photographs 31/07/2024

Pit 3 (see Map 1)

Pit 4 (see Map 1)

Stony material from GI excavations near observation

Rush infested area in north