



July 2021

Monmouthshire Housing Association Ltd

Agricultural Land Classification and Soil Resources

at

Land West of Churchfields, Devauden, Monmouthshire

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1 Introduction

- 1.1 Reading Agricultural Consultants Ltd (RAC) is instructed by Monmouthshire Housing Association Ltd to investigate the Agricultural Land Classification (ALC) and soil resources of land west of Churchfields, Devauden, Monmouthshire, by means of a detailed survey of soil and site characteristics.
- 1.2 Guidance for assessing the quality of agricultural land in England and Wales is set out in the Ministry of Agriculture, Fisheries and Food (MAFF) revised guidelines and criteria for grading the quality of agricultural land (1988)¹.
- 1.3 Agricultural land in England and Wales is graded between 1 and 5, depending on the extent to which physical or chemical characteristics impose long-term limitations on agricultural use. The principal physical factors influencing grading are climate, site and soil which, together with interactions between them, form the basis for classifying land into one of the five grades.
- 1.4 Grade 1 land is excellent quality agricultural land with very minor or no limitations to agricultural use. Grade 2 is very good quality agricultural land, with minor limitations which affect crop yield, cultivations or harvesting. Grade 3 land has moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield, and is subdivided into Subgrade 3a (good quality land) and Subgrade 3b (moderate quality land). Grade 4 land is poor quality agricultural land with severe limitations which significantly restrict the range of crops and/or level of yields. Grade 5 is very poor quality land, with very severe limitations which restrict use to permanent pasture or rough grazing.
- 1.5 Land which is classified as Grades 1, 2 and 3a is defined in paragraph 3.58 of Planning Policy Wales² as the best and most versatile (BMV) agricultural land, which should be conserved as a finite resource for the future. Paragraph 3.59 goes on to state that considerable weight should be given to protecting BMV land from development because of its special importance, and that it should only be developed if there is an overriding need for the development and either previously developed land or land in lower agricultural grades is unavailable, or available lower grade land has a recognised environmental value which outweighs the agricultural

¹ **MAFF (1988)**. *Agricultural Land Classification of England and Wales. Revised guidelines and criteria for grading the quality of agricultural land*. MAFF Publications.

² **Welsh Government (2021)**. Planning Policy Wales, Edition 11, February 2021
https://gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf

considerations. If BMV land does need to be developed, and there is a choice between sites of different grades, development should be directed to land of the lowest grade.

- 1.6 Natural Resources Wales has published a Predictive ALC Map for Wales³. The map is designed on a 50m grid. Criteria including climate, slope, soil wetness, droughtiness and stone contents have been considered and used to determine the most likely limitation to agricultural land quality within each grid square. The map predicts this site to be of Subgrade 3a quality.
- 1.7 However, as explained by the Welsh Government's Frequently Asked Questions on ALC⁴, the only way to accurately determine the agricultural grade of land is by a detailed field survey in accordance with the current ALC guidelines. This survey follows the established methodology and guidelines for carrying out ALC surveys.

2 Site and climatic conditions

General features, land form and drainage

- 2.1 The site extends to approximately 2.5ha of grassland to the north-west of Devauden, and is used for grazing ponies. The site is bounded to the east by residential properties off Churchfields, and in all other directions by other agricultural land.
- 2.2 The topography is very gently sloping from around 235m above Ordnance Datum (AOD) in the east to around 230m AOD in the west. The slope forms a valley side. Drainage of the site is via the slope toward the valley to the west.

Agro-climatic conditions

- 2.3 Agro-climatic data for the site have been interpolated from the Meteorological Office's standard 5km grid point data set at a representative altitude of 235m AOD and are given in Table 1. The site is cold and very wet with moderately small to small moisture deficits. The number of Field Capacity Days (FCD) is large and is unfavourable for providing opportunities for agricultural field work. There is an overriding climatic limitation to Subgrade 3a.

³ **Natural Resources Wales (2019).** *Predictive Agricultural Land Classification (ALC) Map for Wales.*
<http://lle.gov.wales/map/alc2>

⁴ **Welsh Government (2020).** *Agricultural Land Classification, Frequently Asked Questions.*
<https://gov.wales/sites/default/files/publications/2020-06/agricultural-land-classification-frequently-asked-questions.pdf>

Table 1: Local agro-climatic conditions

Parameter	Measurement
Grid Ref	ST 4815899059
Altitude	235m AOD
Average Annual Rainfall	1,038mm
Accumulated Temperatures >0°C	1,272 day°
Field Capacity Days	214 days
Average Moisture Deficit, wheat	60mm
Average Moisture Deficit, potatoes	39mm

Soil parent material and soil type

- 2.4 The principal underlying geology mapped by the British Geological Survey⁵ is the Brownstones Formation which includes red, brown and purple fluvial sandstones with interbedded red mudstone. There are no mapped superficial deposits.
- 2.5 The Soil Survey of England and Wales soil association mapping⁶ (1:250,000 scale) shows the site to be on the border of two associations: Oglethorpe and Eardiston 1.
- 2.6 The Oglethorpe association generally includes reddish brown coarse loamy topsoils and subsoils with volumes of sandstone increasing with depth. Profiles are well drained, of Wetness Class (WC) I.
- 2.7 The similar Eardiston 1 soils are characterised by reddish coarse loamy soils over sandstone which may be shallow in places. Profiles are often well drained, of WC I⁷.

3 Agricultural land quality

Soil survey methods

- 3.1 Three soil profiles were examined using an Edelman (Dutch) auger at an observation density of one per hectare across the grassland in accordance with the established recommendations for ALC surveys. One observation pit was also excavated to examine subsoil structures. The locations of observations are shown on Figure RAC9233-1. At each observation point the following characteristics were assessed for each soil horizon up to a maximum of 120cm or any impenetrable layer:
- soil texture;

⁵ **British Geological Survey (2021).** *Geology of Britain viewer*, <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

⁶ **Soil Survey of England and Wales (1984).** *Soils of Wales* (1:250,000), Sheet 2

⁷ **Rudelforth et al (1984).** *Soils and Their Use in Wales*. Soil Survey of England and Wales Bulletin 11, Harpenden.

- significant stoniness;
- colour (including localised mottling);
- consistency;
- structural condition;
- free carbonate; and
- depth.

- 3.2 One topsoil sample was submitted for laboratory determination of particle size distribution, pH, organic matter content and nutrient contents (P, K, Mg). Results are presented in Appendix 1.
- 3.3 Soil Wetness Class (WC) was determined from the matrix colour, presence or absence of, and depth to, greyish and ochreous gley mottling, and slowly permeable subsoil layers at least 15cm thick, in relation to the number of FCD at the location.
- 3.4 Soil droughtiness was investigated by the calculation of moisture balance equations (given in Appendix 2). Crop-adjusted Available Profile Water (AP) is estimated from texture, stoniness and depth, and then compared to a calculated moisture deficit (MD) for the standard crops, wheat and potatoes. The MD is a function of potential evapotranspiration and rainfall. Grading of the land can be affected if the AP is insufficient to balance the MD and droughtiness occurs.

Agricultural land classification and site limitations

- 3.5 Assessment of land quality has been carried out according to the revised ALC guidelines (1988)¹. Soil profiles have been described according to Hodgson (1997)⁸ which is the recognised source for describing soil profiles and characteristics according to the revised ALC guidelines.
- 3.6 The agricultural land quality at this site is most affected by the overriding climatic limitation. The whole site is restricted by climate to Subgrade 3a.
- 3.7 The topsoil is sandy loam to sandy clay loam of 30cm to 34cm depth. The colour is dark reddish brown or reddish brown (2.5YR3/3, 2.5YR4/3 or 5YR3/3 in the Munsell soil colour charts⁹) and the stone content is low at around 5-8% by volume in total, including some stones larger than 6cm. The topsoil is friable and has a moderately developed fine subangular blocky structure. Roots and pores are well distributed. There is a straight boundary with the upper subsoil.

⁸ **Hodgson, J. M. (Ed.) (1997).** *Soil survey field handbook*. Soil Survey Technical Monograph No. 5, Silsoe.

⁹ **Munsell Color (2009).** *Munsell Soil Color Book*. Grand Rapids, MI, USA

- 3.8 The upper subsoil was observed in two locations and found to comprise reddish brown (5YR4/4) sandy loam or dark reddish brown (5YR3/3) medium sand which is slightly stony (10-12% by volume). Some faint mottling is present in the upper subsoil in the west of the site at the lowest-lying observation point but the weakly developed fine subangular blocky structure is well drained. The soil profiles were observed to depths of 60cm and 65cm with further observation prevented due to the soils being too dry to extract with either auger or spade.
- 3.9 For the purpose of calculating a droughtiness limitation, the observed characteristics are assumed to continue to depth. The profiles are assessed as WC I. The soil sample analysed shows the texture to be on the borderline of sandy loam and sandy clay loam and therefore the profile is inherently on the borderline of Grade 1 and 2. However, the main limitation is climate which restricts the whole site to Subgrade 3a, as shown in Figure RAC9233-2.
- 3.10 Photographs taken at the site are given in Appendix 3.

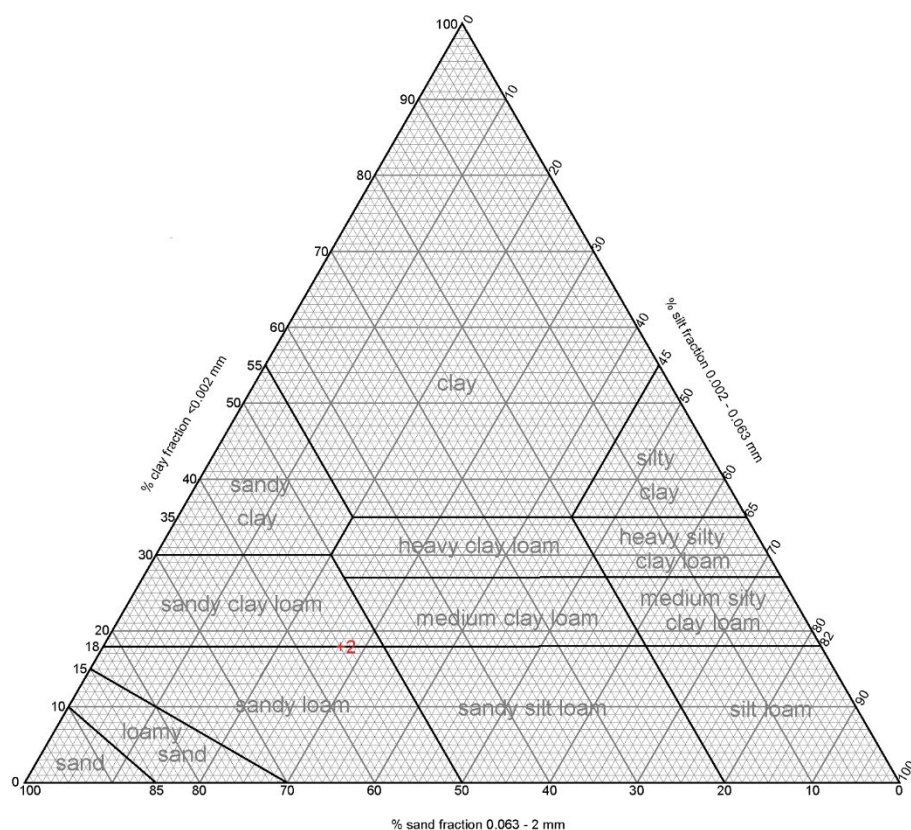
Appendix 1: Laboratory Data

Determinand	Site 2	Units
Sand 2.00-0.063 mm	55	% w/w
Silt 0.063-0.002 mm	27	% w/w
Clay <0.002 mm	18	% w/w
Organic Matter	2.5	% w/w
Texture	Sandy Clay Loam/Sandy Loam	

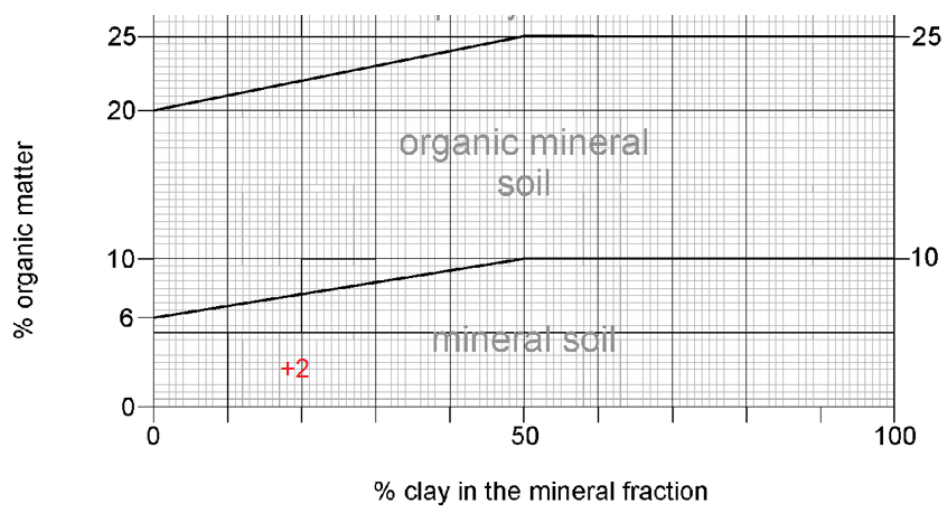
Determinand	Site 2	Units
Soil pH	5.5	
Phosphorus (P)	3.8	mg/l (av)
Potassium (K)	46.8	mg/l (av)
Magnesium (Mg)	58.8	mg/l (av)

Determinand	Site 2	Units
Phosphorus (P)	0	ADAS Index
Potassium (K)	0	ADAS Index
Magnesium (Mg)	2	ADAS Index

Soil Texture by Particle Size Analysis



Organic Matter Class



¹ Less than 50% sand in the mineral fraction

² 50% sand or more in the mineral fraction

Appendix 2: Soil Profile Summaries and Droughtiness Calculations

Wetness calculations are made according to the methodology given in Appendix 3 of the ALC guidelines, MAFF 1988

Droughtiness calculations are made according to the methodology given in Appendix 4 of the ALC guidelines, MAFF 1988.

Grades are shown for drought, wetness and any other soil or site factors which are relevant. The overall Grade is set by the most limiting factor and shown on the right.

Stone types		
%	TAv	EAv
hard	1	0.5
.		

hard flint & pebble

Climate Data	
MDwheat	60
MDpotato	39
FCD	214

Wetness Class Guidelines	II	III	IV	V
SPL within 80cm, gleying within 40cm		>58cm	<58cm	
SPL within 80cm, gleying at 40-70cm	>78cm	<78cm		
No SPL but gleying within 40cm	coarse subsoil	II	other cases	III

Maximum depth of auger penetration is underlined

1038

1272

Site No.		Depth cm	Texture	CaCO ₃	Colour	Mottle colour	abundance	stone% hard	stone% .	Structure	APwheat mm	AP potato mm	Gley	SPL	WC	Wetness grade WE	Final Grade	Limiting Factor(s)
1	T	0	34	mSL	2.5YR3/3			5		-	55	55	n	n	/	1	3a	OC
		34	65	mS	5YR3/3			10			17	20	n	n				
		<u>65</u>	120	mS	5YR3/3			10			25	3	n	n				
										Total	97	78						
										MB	37	39						
										Droughtiness grade (DR)	1	1						
Dry																		
2	Pit	0	30	mSL/SCL	2.5YR4/3			8		-	47	47	n	n	/	1	3a	OC
		30	60	mSL	5YR4/4	Fe	com	12			36	40	n	n				
		<u>60</u>	80	mSL	5YR4/4	Fe	com	12			20	13	n	n				
		80	120	mS				10			18	0	n	n				
										Total	121	100						
										MB	61	61						
										Droughtiness grade (DR)	1	1						
Dry																		
3	T	0	18	mSL	5YR3/3			5		-	29	29	n	n	/	1	3a	OC
		<u>18</u>	30	mSL	5YR3/3			5			17	17	n	n				
		30	65	mSL	5YR5/3			10			42	47	n	n				
		65	120	mS				10			25	3	n	n				
										Total	113	97						
										MB	53	58						
										Droughtiness grade (DR)	1	1						
Very dry Assume SS as 1																		

Appendix 3: Site Photographs



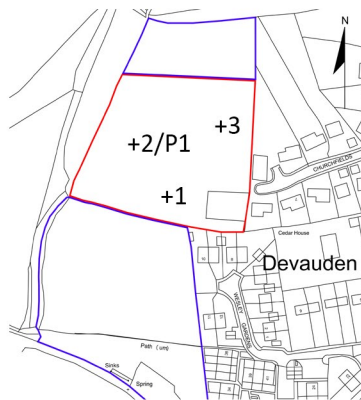
Pit 1



Pit 1 topsoil



Pit 1 subsoil



- Survey Area
- +1 Auger Observation
- .P1 Pit Observation



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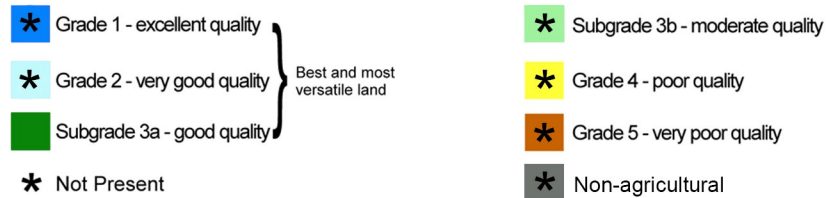
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Figure	RAC9233-1: Observations
Site:	Land West of Churchfields, Devauden
Client:	Monmouthshire Housing Association



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Scale 1:5,000@A4 July/2021

Figure RAC9233-2: Agricultural Land Classification

Site: Land West of Churchfields, Devauden

Client: Monmouthshire Housing Association



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