



Agricultural Land Classification:

Llanrwst, Conwy, Wales

Prepared for:
Reading Agricultural Consultants

Prepared by:
R W Askew BSC(Hons) MSc MISOilSci CSci
Askew Land & Soil Limited

Date:

24th January 2020

Project Number:
C681

Contract/Proposal No:	C681
Issue:	2
Author:	Rob Askew
Date:	24 th January 2020

Our interpretation of the site characteristics is based on available data made during our desktop study and soil survey. This desktop study and soil survey has assessed the characteristics of the site in relation to the assessment of its Agricultural Land Classification. It should not be relied on for alternative end-uses or for other schemes.

Version Control Record			
Issue	Description of Status	Date	Initials
A	First Draft	20/01/2020	RWA
1	First Issue to Client	23/01/2020	RWA
2	Second issue incorporating Welsh Government ALC validation comments	24/01/2020	RWA

CONTENTS

1 INTRODUCTION..... 1

1.1 Background 1

1.2 Methodology..... 1

2 AGRICULTURAL LAND CLASSIFICATION..... 3

2.1 Introduction 3

2.2 Climate 3

2.3 Site..... 4

2.4 Soil..... 5

2.5 Interactive Limitations 7

2.6 ALC Grading at the Site 8

FIGURES

- Figure 1: Sample Locations
- Figure 2: Agricultural Land Classification

APPENDICES

- Appendix A: Soil Profile Logs
- Appendix B: Soil Pit Description
- Appendix C: Topsoil Particle Size Distribution (PSD)

1 INTRODUCTION

1.1 Background

- 1.1.1 This report was commissioned by Reading Agricultural Consultants to determine the quality of agricultural land at a site proposed for residential development at Llanrwst, Conwy, Wales, LL26 0DT ('the Site'). The assessment is made in accordance with the Agricultural Land Classification (ALC) system for England and Wales (see 'Methodology' below).
- 1.1.2 The approximately 9.5 hectare (ha) Site is located to the north of Llanrwst. The approximate centre of the Site is located at British National Grid (BNG) reference SH 7964 6296. The Site is directly bordered by a residential development to the south and southeast, the A470 to the southwest, and agricultural land to the north and northwest. The location of the Site is shown on **Figure 1**.

1.2 Methodology

- 1.2.1 This report has been prepared by a Chartered Scientist (CSci), who is a Fellow (F.I. Soil Sci) of the British Society of Soil Science (BSSS). The author meets the requirements of the BSSS Professional Competency Scheme for ALC, which is endorsed, amongst others, by the Department for Environment, Food and Rural Affairs (Defra), Natural England, the Science Council, and the Institute of Environmental Assessment and Management (IEMA) (see BSSS Document 2 'Agricultural Land Classification of England and Wales')¹.
- 1.2.2 This assessment is based upon the findings of a study of published information on climate, geology and soil, in combination with the findings of a detailed soil investigation carried out by the former Ministry of Agriculture, Fisheries and Food (MAFF)² in accordance with the national 'Agricultural Land Classification of England and Wales: Revised Guidelines and Criteria for Grading the Quality of Agricultural Land', October, 1988 (henceforth referred to as the 'the ALC Guidelines').
- 1.2.3 The ALC system provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. The ALC system divides agricultural land into five grades (Grade 1 'Excellent' to Grade 5 'Very Poor'), with Grade 3 subdivided into Subgrade 3a 'Good' and Subgrade 3b 'Moderate'. Agricultural land classified as Grade 1, 2 and Subgrade 3a falls in the 'best and most category as set out in at paragraph 3.54 of Planning Policy for Wales (2018) and Technical Advice Note 6. Further

¹ British Society of Soil Science. Professional Competency Scheme Document 2 'Agricultural Land Classification of England and Wales'. Available online @ <https://www.soils.org.uk/sites/default/files/events/flyers/ipss-competency-doc2.pdf> Last viewed 21st January 2020

² The Ministry of Agriculture, Fisheries and Food (MAFF) was incorporated within the Department for Environment, Food and Rural Affairs (Defra) in June 2001

details of the ALC system and national planning policy implications are set out by the Welsh Government in a guidance note which is available online³.

- 1.2.4 A detailed soil survey and ALC was carried out on 8th January 2020. The ALC survey involved examination of the soil's physical properties at 10 auger locations, at a sampling density of approximately one auger bore per ha. The soil profile was examined at each sample location to a maximum depth of approximately 1.2 m by hand with the use of a 5cm diameter Dutch (Edleman) soil auger. Two soil pits, i.e. Soil Pit 1 and Soil Pit 2, were excavated by hand with a spade in order to examine certain soil physical properties, such as stone content and the structural condition of the subsoil, more closely. The locations of the auger bores and soil pits are shown on Figure 1. A record of the soil profiles recorded at each auger bore location is given as **Appendix A**. A description of the soil profile recorded in Soil Pit 1 and Soil Pit 2 is given as **Appendix B**.
- 1.2.5 The auger locations were located using a hand-held Garmin E-Trec Geographic Information System (GIS) to enable the sample locations to be relocated for verification, if necessary. Where auger locations on a 100 m grid pattern fall on headland, tramlines, or within 3 m of a hedgerow or tree, they were relocated on agricultural land close by, i.e. to avoid compacted ground or land affected by tree roots, etc.
- 1.2.6 The soil profile at each sample location was described using the 'Soil Survey Field Handbook: Describing and Sampling Soil Profiles' (Ed. J.M. Hodgson, Cranfield University, 1997). Each soil profile was ascribed an Agricultural Land Classification (ALC) grade following the MAFF ALC Guidelines.
- 1.2.7 A sample of topsoil was collected at auger bore locations 1, 4 and 9 as shown on Figure 1. The samples were sent to an accredited laboratory for particle size distribution (PSD) / soil texture analysis, i.e. the proportions of sand, silt and clay. This is to determine the definitive texture class of the topsoil. A copy of the laboratory Certificate of Analysis reporting the findings of the topsoil PSD analysis is given as **Appendix C**.

³ Welsh Government. Agricultural land classification: frequently asked questions. Available online @ <https://gov.wales/agricultural-land-classification-frequently-asked-questions> Last viewed 21st January 2020.

2 AGRICULTURAL LAND CLASSIFICATION

2.1 Introduction

2.1.1 This section of the report sets out the findings of the Agricultural Land Classification (ALC). It is based on a desktop study of relevant published information on climate, topography, geology, and soil in conjunction with a detailed ALC survey carried out in January 2020.

2.1.2 As described in the ALC Guidelines, the main physical factors influencing agricultural land quality are:

- climate;
- site;
- soil; and
- interactive limitations.

2.1.3 These factors are considered in turn below.

2.2 Climate

2.2.1 Interpolated climate data relevant to the determination of the Agricultural Land Classification (ALC) grade of land at the Site is given in Table 2.1 below. As there is a range in altitude, from approximately 54m AOD in the north, to approximately 9mAOD in the southwest, climate data has been interpolated at four locations at different elevations over the whole site. This data has been used to refine the soil droughtiness calculations, given on the Soil Profile Logs as **Appendix A**, i.e. the calculations have used the climate data which is closest in altitude to the altitude recorded at the auger bore location.

Table 2.1: ALC Climate Data				
Climate Parameter	Data for SH 7973 6238	Data for SH 7960 6251	Data for SH 7971 6267	Data for SH 7977 6289
Average Altitude (m)	21	19	26	43
Average Annual Rainfall (mm)	1209	1191	1185	1189
Accumulated Temperature above 0°C (January – June)	1460	1462	1454	1435
Moisture Deficit (mm) Wheat	84	85	84	81
Moisture Deficit (mm) Potatoes	76	78	76	72
Field Capacity Days (FCD)	242	240	240	241
Grade According to Climate	2	2	2	2

2.2.2 With reference to Figure 1 'Grade according to climate' on page 6 of the ALC Guidelines, there is an overall climatic limitation to the quality of agricultural land at the Site. This means that agricultural land at the Site cannot be classified more than Grade 2 due to an overriding climate limitation, in the absence of any other limiting factor, i.e. site, soil and/or interactive limitations.

2.2.3 Agricultural land at the Site is predicted to be at field capacity (i.e. near saturation point) for 240 – 242 days per year, mainly over the late autumn, winter and early spring. In combination with topsoil texture will cause an 'interactive limitations' to agricultural land quality at the Site, i.e. soil wetness and / or soil droughtiness (see below).

2.3 Site

2.3.1 As show on Figure 1, the approximately 9.5 hectare (ha) Site is located to the north of Llanrwst, Conwy. The approximate centre of the Site is located at British National Grid (BNG) reference SH 7964 6296.

2.3.2 With regard to the ALC Guidelines, agricultural land quality can be limited by one or more of three main site factors as follows:

- gradient;
- micro-relief (i.e. complex change in slope angle over short distances); and
- risk of flooding.

I. Gradient and Micro-Relief

2.3.3 The land at the Site is undulated. The elevation is approximately 54 metres (m) Above Ordnance Datum (AOD) at the highest point in the far north. The elevation decreases to approximately 9m AOD at the lowest point in the southwest.

2.3.4 The angle of the slopes on Site have been measured a hand-held Abney level. Between auger bore (AB) 4 and AB5, as shown on Figure 1, there is a steep, west facing slope with a gradient of 16°. The quality of agricultural land on this steep slope is limited by gradient to Grade 4 (as per Table 1 of the ALC Guidelines, 1988), as shown on the ALC map given as **Figure 2**. Likewise, there is moderately steeply sloping land at, and in the vicinity, of AB7 (see Figure 1). With a gradient of 14°, agricultural land on this steep slope is also limited by gradient to Grade 4, as shown on Figure 2.

2.3.5 Land in the north (i.e. at and around AB1 and AB2, Figure 1) and in the centre (i.e. between AB1 – AB8, Figure 1), is undulated. The land in these areas is strongly sloping, with a gradient of between 8° - 10°. The quality of agricultural land in these parts of the Site is limited by gradient to Subgrade 3b, as shown on Figure 2.

- 2.3.6 Whilst gently to moderately sloping (i.e. gradient of between 2° - 7°), land in the northeast (i.e. between AB3 – AB5), and in the south (i.e. between AB9 – AB10) is not limited by gradient, as the angle of slope does not exceed 7° (re Table 1 of the ALC Guidelines).
- 2.3.7 The quality of agricultural land at the Site is not limited by micro-relief, i.e. complex changes in slope angle and direction over short distances.

II. Risk of Flooding

- 2.3.8 From the Welsh Government's Flood Map for Planning website⁴, the Site is located in Flood Zone A, at little or low risk of fluvial flooding. It is predicted that the quality of agricultural land is not limited by flood risk, re Table 2 'Grade according to flood risk in summer' and Table 3 'Grade according to flood risk in winter' of the ALC Guidelines.

2.4 Soil

I. Geology/Soil Parent Material

- 2.4.1 British Geological Survey (BGS) information available online⁵ has been utilised to identify the Bedrock underlying the Site and any Superficial (Drift) Deposits over the Bedrock. This information helps to determine the parent material from which the soil has formed.
- 2.4.2 The BGS information (1:50,000) indicates that Site is underlain entirely by the Denbigh Grits Formation (Mudstone, Siltstone and Sandstone). The BGS information (1:50,000) shows the bedrock is not covered by any superficial deposits, other than a small area of glacial Till (Devensian, diamicton) in the southwest.

II. Published Information on Soil

- 2.4.3 The Soil Survey of England and Wales (SSEW) soil map of Wales (Sheet 2) at a scale of 1:250,000 and accompanying Bulletin No. 11 'Soils and their Use in Wales' (C.C. Rudeforth et al. Harpenden, 1984) reports that agricultural land at the Site is covered by soils in the Manod association.

2.4.4 As described by the SSEW, the Manod soils are widespread in Wales and although some is level or gently sloping, much of the land is steeper than 11°. They consist mainly of free draining fine loamy soils over Palaeozoic mudstone, siltstone or slate. The main soils are permeable and well drained (Wetness Class I) but because of the climate, the soils remain moist throughout most years.

III. Soil Survey

⁴ Welsh Government. Long term flood risk maps. Available online @ <https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en> Last viewed 21/01/2020.

⁵ British Geological Survey 'Geology of Britain Viewer'. Available online @ <http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html>

- 2.4.5 The soil survey carried out on 8th January 2020 determined the presence of three types of soil over the Site as follows.

Soil Type 1 (c.f. Manod series)

- 2.4.6 The main type of soil profile at the Site (i.e. at AB1, AB2, AB6 and AB7, Figure 1) comprises, shallow, dark greyish brown (Munsell colour 10YR4/2), non-calcareous, slightly stony (6%), medium clay loam topsoil with a moderate, fine subangular blocky structure. At a depth of approximately 15cm, the topsoil merges over an abrupt, smooth horizon boundary to brown (Munsell colour 10YR to 7.5YR4/3), non-calcareous, moderately stony, medium clay loam upper subsoil with a moderate, medium subangular blocky structure. At an approximate depth of 33cm, grey (Munsell colour 10YR5/1) very stony (slaty) mudstone bedrock/parent material is encountered. The profile is well drained (Wetness Class I).

Soil Type 2

- 2.4.7 The second most prevalent type of soil is found at AB3, AB5 and AB9, Figure 1. The profiles are similar to type 1, except they are deeper. The topsoil (0cm - 20cm) comprises brown (Munsell colour 10YR4/3), non-calcareous, very slightly stony (2%), medium clay loam topsoil with a moderate, fine sub-angular blocky structure. The upper subsoil (20cm – 60cm) is a yellowish brown (Munsell colour 10YR5/4), non-calcareous, very slightly stony (4%), medium clay loam with a moderate, medium subangular blocky structure. Below a depth of approximately 60cm to full auger depth (120cm), the lower subsoil is a yellowish brown (Munsell colour 10YR5/6), non-calcareous, very slightly stony (4%), silty clay with a few distinct ochreous mottles (Munsell colour 10YR6/8). None of the soil horizons (layers) constitute a slowly permeable layer, and none have gley colours. The profiles are well drained (Wetness Class I), as per Table 13 of the ALC guidelines.

Soil Type 3

- 2.4.8 This type of soil occurs at the bottom of slopes at AB4 and AB10, Figure 1. The soil receives runoff and ground water from adjacent higher ground and is gleyed and mottled as a result. The topsoil (0cm - 10cm) comprises grey (Munsell colour 10YR5/2), non-calcareous, very slightly stony (2%), medium clay loam topsoil with a moderate, medium sub-angular blocky structure. The upper subsoil (10cm – 40cm) is grey (Munsell colour 5YR5/1), non-calcareous, very slightly stony (1%), medium clay loam with a moderate, coarse angular blocky structure. The upper and lower subsoil is gleyed and has common, distinct ochreous mottle (Munsell colour 10YR 5/6). The profiles do not have any slowly permeable layer but are gleyed within 40cm. Therefore, they are placed in Wetness Class III, as per Table 13 of the ALC Guidelines. The grassland in this area has an abundance of soft rushes (*Juncuss spp.*), which is indicative of wet ground.
- 2.4.9 A log of the nine soil profiles recorded during the auger survey is given as **Appendix A**. Descriptions of the soil profiles recorded on Site at Soil Pit 1 and Soil Pit 2 (see Figure 1) are given as **Appendix B**.
- 2.4.10 A sample of topsoil was collected at auger bore location 1, 4 and 9 (see Figure 1), and the samples were sent to an accredited laboratory for analysis of particle size distribution (PSD),

based on the British Standard Institution particle size grades. The certificate of analysis is provided as **Appendix C**. The findings of the PSD analysis are shown in Table 3.2 below:

Table 2.2: Topsoil Texture (re Table 10, ALC Guidelines)				
Topsoil Sample Location (See Fig. 1)	% sand 0.063-2.0 mm	% silt 0.002- 0.063 mm	% clay <0.002 mm	ALC Soil Texture Class
Auger Bore 1	35	40	25	Medium Clay Loam
Auger Bore 4	22	55	23	Medium Clay Loam
Auger Bore 9	33	43	24	Medium Clay Loam

2.5 Interactive Limitations

- 2.5.1 From the published information and the results of the Site visit, it has been determined that the quality of agricultural land at the Site is limited by soil wetness.

I. Soil Wetness

- 2.5.2 From the ALC Guidelines, a soil wetness limitation exists where 'the soil water regime adversely affects plant growth or imposes restrictions on cultivations or grazing by livestock'. The ALC grade according to soil wetness at the Site is given in Table 2.3 below (based on Table 6 'Grade According to Soil Wetness – Mineral Soils' in the ALC Guidelines):

Table 2.3: ALC Grade According to Soil Wetness		
Wetness Class	Texture of the Top 25 cm	>225 Field Capacity Days
I	Sand, Loamy Sand, Sandy Loam, Sandy Silt Loam	2
	Sandy Clay Loam/Medium Silty Clay Loam /Medium Clay Loam*	3a
	Heavy Clay Loam**	3b
	Sandy Clay/Silty Clay/Clay	3b
II	Sand, Loamy Sand, Sandy Loam, Sandy Silt Loam	3a
	Sandy Clay Loam/Medium Silty Clay Loam /Medium Clay Loam*	3b
	Heavy Clay Loam**	3b
	Sandy Clay/Silty Clay/Clay	3b
III	Sand, Loamy Sand, Sandy Loam, Sandy Silt Loam	3b
	Sandy Clay Loam/Medium Silty Clay Loam /Medium Clay Loam*	3b
	Heavy Clay Loam**	4
	Sandy Clay/Silty Clay/Clay	4

Key

* <27% clay; and ** >27% clay

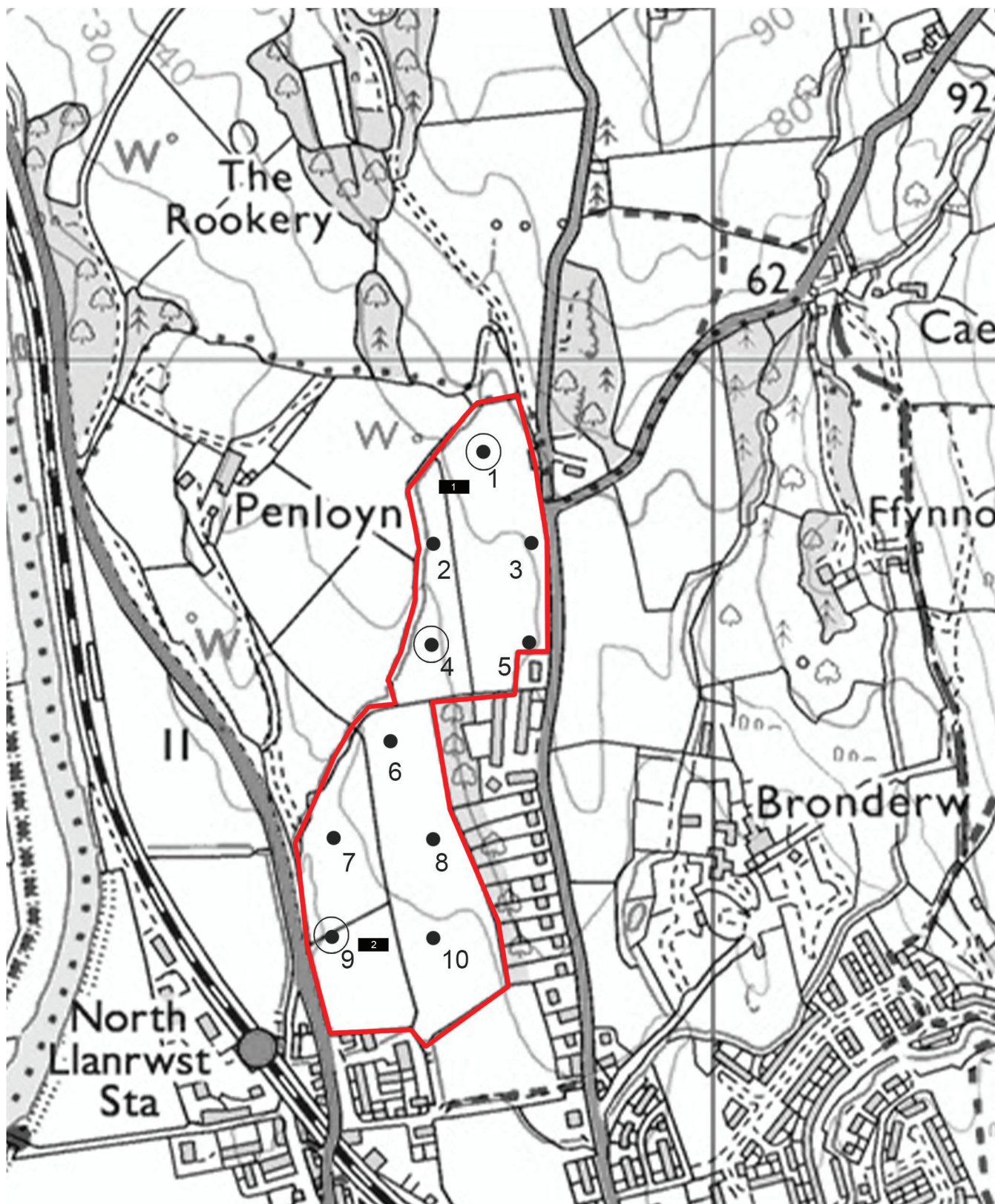
- 2.5.3 In a climate area with 233 field capacity days (FCD), well drained soil profiles in Wetness Class I with medium clay loam topsoil are limited by soil wetness to Subgrade 3a (re Table 6 of the ALC Guidelines). With medium clay loam topsoil, the profile at AB2 which is slightly seasonally waterlogged (Wetness Class II) is limited by soil wetness to Subgrade 3b (re Table 6 of the ALC Guidelines).
- 2.5.4 Where Soil Type 3 is placed in Wetness Class III (see above), soil profiles with medium clay loam topsoil are limited by soil wetness to Subgrade 3b.

2.6 ALC Grading at the Site

- 2.6.1 From the published information above, together with the findings of the detailed ALC survey, it has been determined that the quality of agricultural land at the Site is a combination of Subgrade 3a, Subgrade 3b and Grade 4.
- 2.6.2 The land in Subgrade 3a is located on slight to moderate slopes (<7°). With well drained profiles (Wetness Class I), and medium clay loam topsoil, these profiles are limited to this grade by soil wetness.
- 2.6.3 The land in Subgrade 3b is limited by either gradient (i.e. angle of slope between 7° - 11°), or by soil wetness (i.e. 233 FCD, medium clay loam topsoil, Wetness Class III). Some steeply sloping land is limited by gradient to Grade 4.
- 2.6.4 The area (ha) and proportion (%) of agricultural land in the different ALC grades have been determined from the ALC map given as **Figure 2** and are given in Table 2.5.

Table 2.5: Agricultural Land Classification – Llanrwst, Conwy		
ALC Grade	Total (Ha)	Total (% of Site)
Grade 1 (Excellent)	0	0
Grade 2 (Very Good)	0	0
Subgrade 3a (Good)	3.1	33
Subgrade 3b (Moderate)	5.6	59
Grade 4 (Poor)	0.8	8
Grade 5 (Very Poor)	0	0
Other Land / Non-agricultural	0	0
Total	9.5	100

Figures



Site boundary



Auger location



Topsoil Sample



Soil Pit



Client

Reading Agricultural
Consultants

Project No C681

Dwg. No 01

Scale NTS

Date 07/01/20

Drawn By ELA

Figure 1

Sample Locations

Project Name

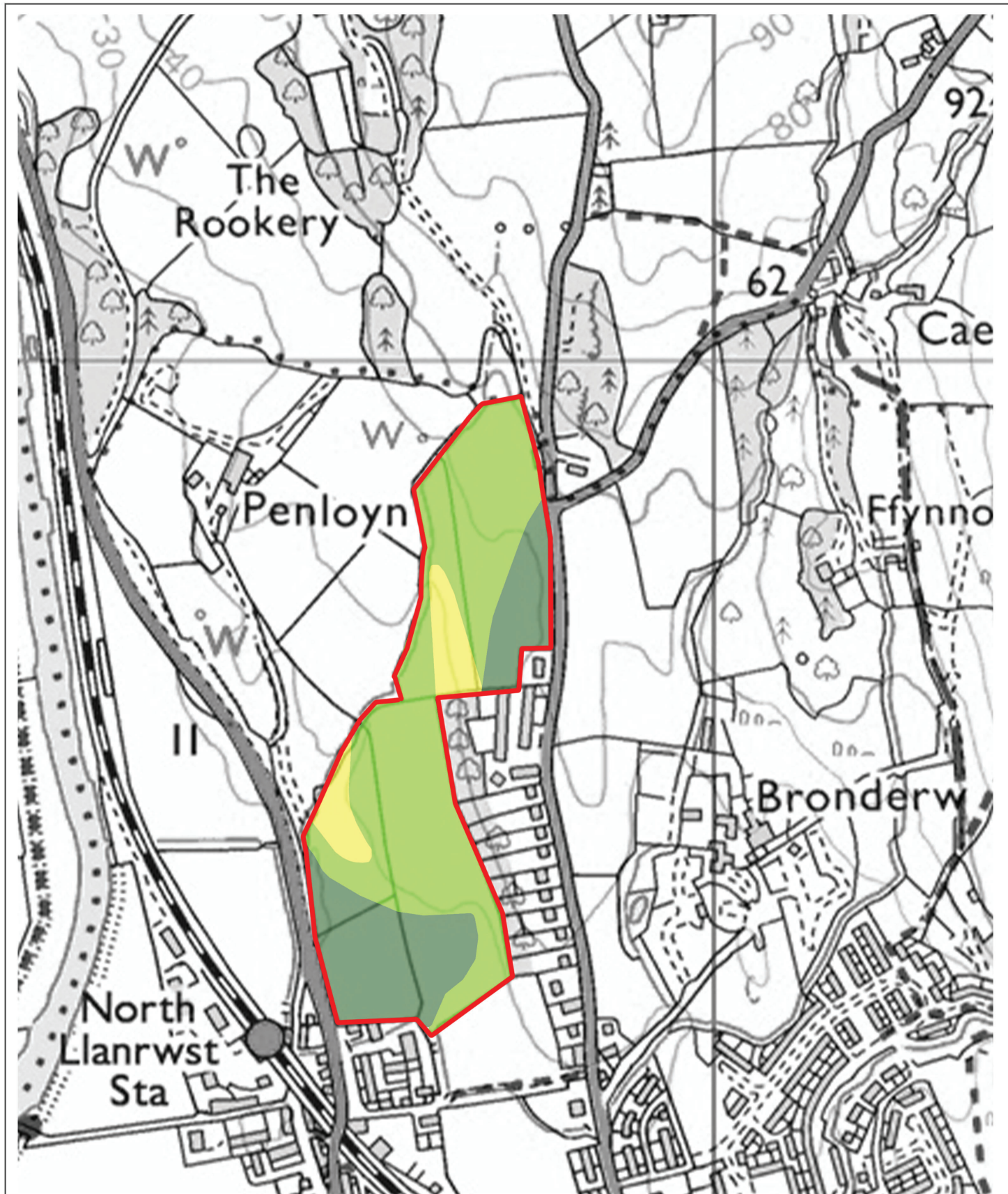
Llanrwst, Conwy, Wales

R W Askew BSc(Hons) MSc MSc CSCi

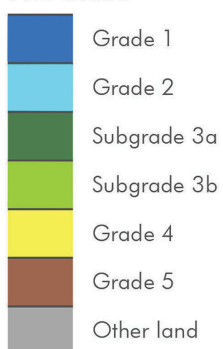
The Old Stables, Upexe, Exeter, EX5 5ND

Tel: 07753 227 224

Email: rw.askew@btinternet.com



ALC Grade



Client

Reading Agricultural Consultants

Project No C681
Dwg. No 02
Scale NTS
Date 07/01/20
Drawn By ELA

Figure 2:

Agricultural Land Classification

Project Name

Llanrwst, Conwy, Wales

R W Askew BSc(Hons) MSc CSci
The Old Stables, Upexe, Exeter, EX5 5ND
Tel: 07753 227 224
Email: rw.askew@btinternet.com

Appendix A: Soil Profile Logs

Project Number	Project Name	Parcel
C681	Llanrwst, Conwy	Site boundary

Date of Survey	Survey Type	Surveyor(s)	Company
08/01/2020	ALC	RA	Askew Land and Soil

Weather	Relief	Land use and vegetation
Cold, dry, cloudy	Undulated	PGR (Permanent Pasture)

Grid Reference	Postcode	Altitude	Area
SH79736238	LL260DT	21	9.5

MAFF prov	MAFF detailed	Flooding
Subgrade 3a	None	Flood Zone 1

AAR	ATO	MDw	MDp	FCD	Climate grade
1209	1460	84	76	242	2

Bedrock	Superficial deposits
Denbigh Grits Formation	Small area of Till in southwest

Soil association(s) 1:250,000	Detailed soil information
Manod	None

Revision Number	Date Revised
2	22/01/2020

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1			Stones - type 2			Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			Profile notes
	NGR	X	Y					Top	Bttn	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength I					Size	Shape	Mbw	MBp	Gd	WC	Iw	Limitation 1	
1	SH 79750	62900	279750	362900	40	8	SW	PGR	0 15 33 33	22 15 18 20	10YR4/2 10YR4/3 10YR4/3 5Y6/1				No No No No	MCL - Cl46 MCL - Cl418 MCL - Cl480	2 0	0	SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones				Not Applic Moderate Poor	NON - N NON - N NON - N	No No No	No -20 -10 3a	WC I 3a	Gradient				3b	Assume roots penetrate into top 20cm of weathered slaty mudstone						
2	SH 79700	62800	279700	362800	32	10	W	PGR	0 22 55 55 60 60	22 33 33 5 5 80	10YR4/3 10YR5/3 10YR6/3 5Y6/1		FF - Fe 10YR5/6 CD - G 10YR5/6		No No Yes No	MCL - Cl46 MCL - Cl418 MCL - Cl418 MCL - Cl480	2 0	0	SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones				Not Applic Moderate Moderate Poor	NON - N NON - N NON - N NON - N	No No Yes No	No 10 24 2	WC II 3b	Gradient				3b	Assume roots penetrate into top 20cm of weathered slaty mudstone						
3	SH 79800	62800	279800	362800	40	3	W	PGR	0 22 58 58	22 36 36 120	10YR4/3 10YR5/4 10YR5/6		FD - Fx 10YR6/8		No No No	MCL - Cl42 MCL - Cl44 MCL - Cl44	1 0	0	SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones				Not Applic Moderate Moderate	NON - N NON - N NON - N	No No No	No 69 41 1	WC I 3a	Wetness				3a							
4	SH 79700	62700	279700	362700	25	2	W	PGR	0 10 42 42	10 32 32 120	10YR5/2 5Y5/1 5Y6/1		CD - G 10YR5/6 CD - G 10YR5/6		No Yes Yes	MCL - Cl42 MCL - Cl42 MCL - Cl42	2 0	0	SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones				Not Applic Moderate Moderate	NON - N NON - N NON - N	No No No	No 66 36 1	WC III 3b	Wetness				3b							
5	SH 79800	62700	279800	362700	37	3	SW	PGR	0 24 56 56	24 32 32 120	10YR4/3 10YR5/4 10YR5/6		FD - Fx 10YR6/8		No No No	MCL - Cl42 MCL - Cl44 MCL - Cl44	1 0	0	SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones				Not Applic Moderate Moderate	NON - N NON - N NON - N	No No No	No 70 42 1	WC I 3a	Wetness				3a							
6	SH 79680	62600	279680	362600	25	8	S	PGR	0 20 44 44	20 20 24 64	10YR4/2 10YR4/3 5Y6/1				No No No	MCL - Cl46 MCL - Cl418 MCL - Cl480	2 0	0	SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones				Not Applic Moderate Poor	NON - N NON - N NON - N	No No No	No -9 3 3a	WC I 3a	Gradient				3b	Assume roots penetrate into top 20cm of weathered slaty mudstone						
7	SH 79600	62500	279600	362500	25	14	SW	PGR	0 10 35 35	10 35 25 55	10YR4/2 10YR4/3 5Y6/1				No No No	MCL - Cl46 MCL - Cl418 MCL - Cl480	2 0	0	SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones				Not Applic Moderate Poor	NON - N NON - N NON - N	No No No	No -23 -15 3b	WC I 3a	Gradient				4	Assume roots penetrate into top 20cm of weathered slaty mudstone						
8	SH 79700	62500	279700	362500	25	8	S	PGR	0 20 50 50	20 30 30 70	10YR4/2 10YR4/3 5Y6/1				No No No	MCL - Cl46 MCL - Cl418 MCL - Cl480	2 0	0	SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones				Not Applic Moderate Poor	NON - N NON - N NON - N	No No No	No -2 11 3a	WC I 3a	Gradient				3b	Assume roots penetrate into top 20cm of weathered slaty mudstone						
9	SH 79600	62400	279600	362400	12	4	W	PGR	0 20 60 60	20 40 40 120	10YR4/3 10YR5/4 10YR5/6		FD - Fx 10YR6/8		No No No	MCL - Cl42 MCL - Cl44 MCL - Cl44	1 0	0	SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones				Not Applic Moderate Moderate	NON - N NON - N NON - N	No No No	No 66 37 1	WC I 3a	Wetness				3a							
10	SH 79700	62400	279700	362400	12	4	W	PGR	0 10 35 35	10 35 25 120	10YR5/2 5Y5/1 5Y6/1		CD - G 10YR5/6 CD - G 10YR5/6		No Yes Yes	MCL - Cl42 MCL - Cl42 MCL - Cl42	2 0	0	SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones SI - Soft 'weathered' igneous or metamorphic rocks or stones				Not Applic Moderate Moderate	NON - N NON - N NON - N	No No No	No 66 36 1	WC III 3b	Wetness				3b							
END																																							

Mottle form

FF - Few Faint
 FD - Few Distinct
 FP - Few Prominent
 CF - Common Faint
 CD - Common Distinct
 CP - Common Prominent
 MF - Many Faint
 MD - Many Distinct
 MP - Many Prominent
 VF - Very many Faint
 VD - Very many Distinct
 VP - Very many Prominent

Texture

C - Clay
 CHK - Chalk
 CS - Coarse Sand
 CSL - Coarse sandy loam
 CSZL - Coarse sandy silt loam
 FP - Fibrous and semifibrous peats
 FS - Fine Sand
 FSL - Fine sandy loam
 FSZL - Fine sandy silt loam
 HCL - Clay loam (heavy)
 HP - Humified peats
 HZCL - Silty clay loam (heavy)
 IMP - Impenetrable to roots
 LCS - Loamy Coarse Sand
 LFS - Loamy fine sand
 LMS - Loamy medium sand
 LP - Loamy peats
 MCL - Clay loam (medium)
 MS - Medium Sand
 MSL - Medium sandy loam
 MSZL - Medium sandy silt loam
 MZ - Marine Light Silts
 MZCL - Silty clay loam (medium)
 OC - Organic clays
 OL - Organic loams
 OS - Organic sands
 PL - Peaty loams
 PS - Peaty sands
 SC - Sandy clay
 SCL - Sandy clay loam
 SP - Sandy peats
 ZC - Silty clay
 ZL - Silt loam

Stone Type

CH - Chalk or chalk stones
 FSST - Soft fine grained sandstones
 GH - Gravel with non-porous (hard) stones
 GS - Gravel with porous stones (mainly soft stone types listed above)
 HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)
 MSST - Soft, medium or coarse grained sandstones
 SI - Soft 'weathered' igneous or metamorphic rocks or stones
 SLST - Soft oolitic or dolomitic limestones
 ZR - Soft, argillaceous or silty rocks or stones

Ped. Shape

SG - Single grain
 GRA - Granular
 SAB - Subangular Blocky
 AB - Angular Blocky
 PRIS - Prismatic
 PLAT - Platy
 MASS - Massive
 NA - N/A

Subsoil Structure Condition

Not Applicable
 Good
 Moderate
 Poor

Soil or Ped. Strength

Loose
 Very friable
 Friable
 Firm
 Very firm
 Extremely firm
 Extremely hard
 N/A

Calcareousness

NON - Non-calcareous (<0.5% CaCO₃)
 VSC - Very slightly calcareous (0.5 - 1% CaCO₃)
 SC - Slightly calcareous (1 - 5% CaCO₃)
 MC - Moderately calcareous (5 - 10% CaCO₃)
 VC - Very calcareous (>10% CaCO₃)

Ped. Size

VF - Very Fine
 F - Fine
 M - Medium
 C - Coarse
 VC - Very Coarse
 NA - N/A

Degree of Ped. Development

W - Weak
 M - Moderate
 S - Strong
 NA - Not applicable

Wetness Class

WC I
 WC II
 WC III
 WC IV
 WC V
 WC VI

ALC Grades

1
 2
 3a
 3b
 4
 5
 Non-Ag

Gley

None
 Gley
 N/A

Appendix B:

Soil Pit Descriptions

Grid Ref.			Altitude	Nearest point	Topography				Flora			Weather and conditions			
Square	East	North			Gradient	Aspect	Slope form	Surface	Cultivation type	Vegetation types		Temp	Sky	Wind	Precipitation
SH	7975	6290	40	AB1	16°	South	Concave	Level	Not ploughed	Permanent grassland		Cold	Cloudy	Slight	Dry

Horizon	Depth		Matrix			Gleying			Mottles			Stone content					Calc.	Mn C	Ped/soil structure				Horizon boundary		Biopores	SPL
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S	Type			Dev.	Size	Structure	Strength	Distinct	Form		
A	0	15	MCL	Dark Greyish Brown	10YR4/2	No						6	0		6	Slate	None	None	Mod	Fine	Sub-angular Blocky	Firm	Abrupt	Smooth	>0.5	No
B	15	33	MCL	Brown	10YR4/3	No						18	0		18	Slate	None	None	Mod	Medium	Sub-angular Blocky	Firm	Clear	Wavy	>0.5	No
C	33	53	MCL	Grey	5Y6/1	No						80	0		80	Slate	None	None	Poor	Coarse	Angular Blocky	Firm	n/a	n/a	>0.5	No

Pit	WC	Grade	Limitation(s)	Notes
2	I	3a	Wetness/workability	

Grid Ref.			Altitude	Nearest point	Topography				Flora			Weather and conditions			
Square	East	North			Gradient	Aspect	Slope form	Surface	Cultivation type	Vegetation types		Temp	Sky	Wind	Precipitation
SH	7960	6240	12	AB9	4°	West	Straight	Level	Not ploughed	Permanent grassland		Cold	Cloudy	Slight	Dry

Horizon	Depth		Matrix			Gleying			Mottles			Stone content					Calc.	Mn C	Ped/soil structure				Horizon boundary		Biopores	SPL
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S	Type			Dev.	Size	Structure	Strength	Distinct	Form		
A	0	20	MCL	Brown	10YR4/3	No						6	0		6	Slate	None	None	Mod	Fine	Sub-angular Blocky	Firm	Abrupt	Smooth	>0.5	No
B	20	60	MCL	Yellowish Brown	10YR5/4	No						18	0		18	Slate	None	None	Mod	Medium	Sub-angular Blocky	Firm	Clear	Wavy	>0.5	No
C	60	120	Slaty/MCL	Yellowish Brown	10YR5/6	No			FD	Brownish Yellow	10YR6/8	80	0		80	Slate	None	None	Poor	Medium	Angular Blocky	Firm	n/a	n/a	>0.5	No

Appendix C:

Topsoil Particle Size Distribution (PSD)



ANALYTICAL REPORT

Report Number	83103-20	N717	ROB ASKEW	Client	C681 LLANWRST
Date Received	13-JAN-2020				NORTH WALES
Date Reported	17-JAN-2020				
Project	SOIL				
Reference	C681				
Order Number					

Laboratory Reference		SOIL466560	SOIL466561	SOIL466562						
Sample Reference		AB1	AB4	AB9						
Determinand	Unit	SOIL	SOIL	SOIL						
Sand 2.00-0.063mm	% w/w	35	22	33						
Silt 0.063-0.002mm	% w/w	40	55	43						
Clay <0.002mm	% w/w	25	23	24						
Textural Class **		MCL	MCL	MCL						

Notes	
Analysis Notes	<p>The sample submitted was of adequate size to complete all analysis requested.</p> <p>The results as reported relate only to the item(s) submitted for testing.</p> <p>The results are presented on a dry matter basis unless otherwise stipulated.</p>
Document Control	This test report shall not be reproduced, except in full, without the written approval of the laboratory.

Reported by	<p>** Please see the attached document for the definition of textural classes.</p> <p><i>Myles Nicholson</i></p> <p>Natural Resource Management, a trading division of Cawood Scientific Ltd.</p> <p>Coopers Bridge, Braziers Lane, Bracknell, Berkshire, RG42 6NS</p> <p>Tel: 01344 886338</p> <p>Fax: 01344 890972</p> <p>email: enquiries@nrm.uk.com</p>
-------------	--

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.