



November 2021

Hallam Land Management Limited

Agricultural Land Classification and Soil Resources

at

Land West of Pagham Road, Pagham

**Beechwood Court,
Long Toll, Woodcote,
RG8 0RR**



Table of Contents

1 INTRODUCTION.....1

2 SITE AND CLIMATIC CONDITIONS2

3 AGRICULTURAL LAND QUALITY3

APPENDIX 1: LABORATORY DATA.....6

APPENDIX 2: SOIL PROFILE SUMMARIES AND DROUGHTINESS CALCULATIONS.....8

APPENDIX 3: PHOTOGRAPHS.....10

FIGURE RAC9373-1: OBSERVATIONS12

FIGURE RAC9373-2: AGRICULTURAL LAND CLASSIFICATION.....13

1 Introduction

- 1.1 Reading Agricultural Consultants Ltd (RAC) is instructed by Hallam Land Management Limited to investigate the Agricultural Land Classification (ALC) and soil resources of land west of Pagham Road, Pagham, West Sussex 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, and summarised in Natural England's Technical Information Note 049².
- 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 in the ALC system is defined as best and most versatile (BMV) agricultural land.
- 1.6 As explained in Natural England's TIN049, the whole of England and Wales was mapped from reconnaissance field surveys in the late 1960s and early 1970s, to provide general strategic guidance on agricultural land quality for planners. This Provisional Series of maps was published on an Ordnance Survey base at a scale of One Inch to One Mile (1:63,360). The Provisional ALC

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

² **Natural England (2012).** *Technical Information Note 049 - Agricultural Land Classification: protecting the best and most versatile agricultural land,* Second Edition.

map shows the site as Grade 2 in the east and Grade 3 in the west. However, TIN049 explains that:

"These maps are not sufficiently accurate for use in assessment of individual fields or development sites, and should not be used other than as general guidance. They show only five grades: their preparation preceded the subdivision of Grade 3 and the refinement of criteria, which occurred after 1976. They have not been updated and are out of print. A 1:250 000 scale map series based on the same information is available. These are more appropriate for the strategic use originally intended ..."

- 1.7 TIN049 goes on to explain that a definitive ALC grading should be obtained by undertaking a detailed survey according to the published guidelines, at an observation density of one boring per hectare. This survey follows the detailed methodology set out in the MAFF guidelines.

2 Site and climatic conditions

General features, land form and drainage

- 2.1 The site extends to 4.9ha of arable agricultural land most recently having grown calabrese, some of which was still remaining at the time of survey. The site is well contained by existing infrastructure: Pagham Road marks the eastern boundary; the Mill Farm Park Home Estate is to the south and west; and two residential properties, a wooded area and an established hedge line bordering neighbouring agricultural land to the north.
- 2.2 The land is level to very gently undulating at around 5m above Ordnance Datum (AOD). Drainage of the land is facilitated by a ditch along the northern edge which directs water to Pagham Rife.

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 5m AOD, and are given in Table 1. The site is warm and moderately moist. Moisture deficits are large to very large. The number of Field Capacity Days is about average for lowland England (150) and slightly favourable for providing opportunities for agricultural field work. There is no overriding climatic limitation to agricultural land quality.

Table 1: Local agro-climatic conditions

Parameter	Value
Average Annual Rainfall	736mm
Accumulated Temperatures >0°C	1,546 day°
Field Capacity Days	149 days
Average Moisture Deficit, wheat	121mm
Average Moisture Deficit, potatoes	118mm

Soil parent material and soil type

- 2.4 The underlying geology mapped by the British Geological Survey³ is the London Clay Formation, consisting of blue-grey or grey-brown, slightly calcareous, silty clay with some layers of sandy clay.
- 2.5 Superficial river terrace deposits of sand and gravel overlie most of the site. The west is mapped as having raised beach deposits which include shingle, sand, silt and clay.
- 2.6 The Soil Survey of England and Wales soil association mapping⁴ (1:250,000 scale) shows the Park Gate association across most of the site. Park Gate soils are mainly silty clay loam throughout and are moderately permeable but affected by high winter water tables. Profiles are seasonally waterlogged and may vary from Wetness Class (WC) II to IV.
- 2.7 The Newchurch 1 association is mapped in the west of the site and includes calcareous clayey and fine silty soils. The drainage regime is variable depending upon groundwater levels and drainage systems and may also be of WC II to IV⁵.

3 Agricultural land quality

Soil survey methods

- 3.1 Five soil profiles were examined using an Edelman (Dutch) auger at an observation density of approximately one per hectare in accordance with the established recommendations for ALC surveys². One soil pit was also excavated to examine subsoil structures and stone content. The locations of observations are indicated on Figure RAC9373-1. At each observation point the following characteristics were assessed for each soil horizon up to a maximum of 120cm or any impenetrable layer:

³ **British Geological Survey (2021).** *Geology of Britain viewer*, <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

⁴ **Soil Survey of England and Wales (1984).** *Soils of South East England* (1:250,000), Sheet 6

⁵ **Jarvis et al (1984).** *Soils and Their Use in South East England*. Soil Survey of England and Wales Bulletin 15, Harpenden.

- soil texture;
- 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 Field Capacity Days 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 agricultural land quality has been carried out according to the MAFF revised ALC guidelines (1988)¹. Soil profiles have been described according to Hodgson (1997)⁶ which is the recognised source for describing soil profiles and characteristics according to the revised ALC guidelines.
- 3.6 Agricultural land quality across the site is mainly limited by soil wetness. The site is classified as a mix of Subgrades 3a and 3b.
- 3.7 The topsoil is medium clay loam or medium silty clay loam of 33cm average depth. Most of the topsoil is dark greyish brown (10YR4/2 in the Munsell soil colour charts⁷), slightly stony and non-calcareous. Few roots are in the topsoil but worms and worm channels were frequently

⁶ **Hodgson, J. M. (Ed.) (1997).** *Soil survey field handbook*. Soil Survey Technical Monograph No. 5, Silsoe.

⁷ **Munsell Color (2009).** *Munsell Soil Color Book*. Grand Rapids, MI, USA

observed in the excavated pit. The topsoil is moderately well developed with a medium subangular blocky structure.

- 3.8 There is a gradual boundary to the upper subsoil which is brown (10YR5/3), heavy silty clay loam or clay. There are generally no stones in the upper subsoil which is also non-calcareous. All of the upper subsoil observed is gleyed. The structure varies across the site. In the centre and west, the upper subsoil is mostly firm and moderately or weakly developed with a coarse or very coarse angular blocky structure which is slowly permeable. In the east, the upper subsoil was found to be moist and compressible, but not firm, and is considered to be moderately permeable.
- 3.9 In the south and west a lower subsoil horizon is distinguishable, comprising brown (10YR5/3) clay in the pit location and dark greyish brown to brown (10YR4/2 to 10YR4/3), sandy clay loam in the west, which is mottled. The soil was moist but friable at the time of survey and moderately permeable. The stone content in the west is estimated to be around 20% by volume.
- 3.10 Profiles in the east of the site are assessed as WC III and are limited by wetness to Subgrade 3a. Profiles in the centre and west are assessed as WC IV and are limited by wetness to Subgrade 3b.
- 3.11 The ALC distribution within the site is shown in Figure RAC9373-2 and the areas of each grade are given in Table 2.

Table 2: ALC areas

Grade	Description	Area (ha)	% of agricultural land
Subgrade 3a	Good quality	1.9	39
Subgrade 3b	Moderate quality	3.0	61
	Total Agricultural	4.9	100

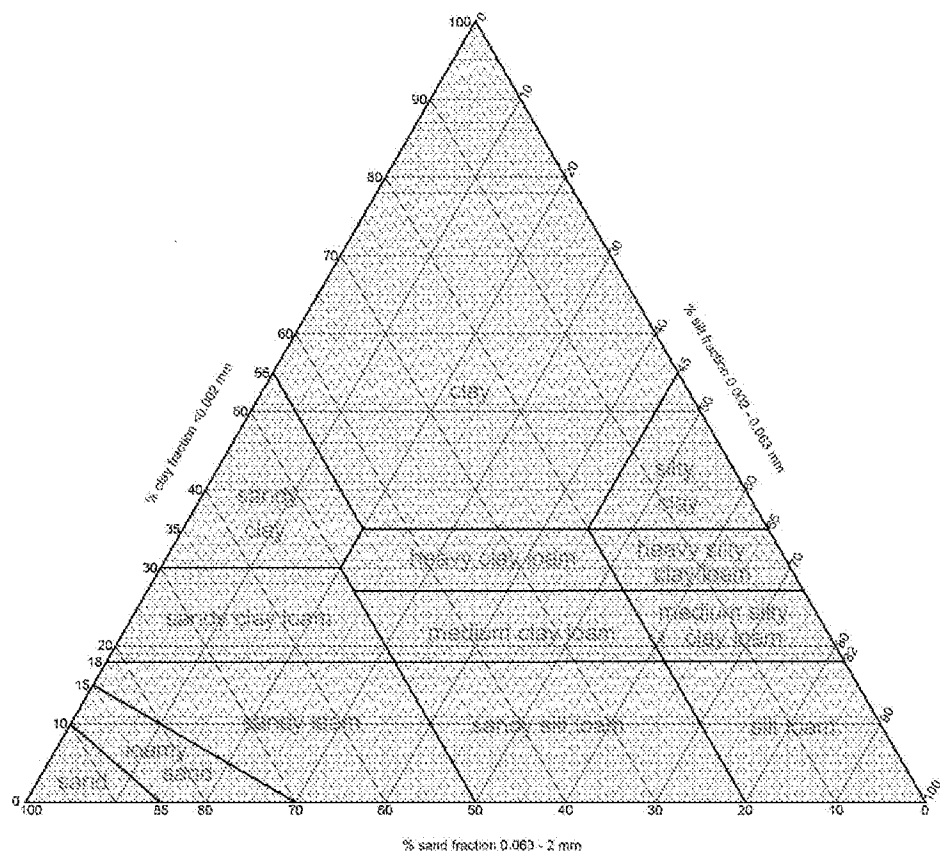
Appendix 1: Laboratory Data

Determinand	Site 2	Units
Sand 2.00-0.063 mm	20	% w/w
Silt 0.063-0.002 mm	59	% w/w
Clay <0.002 mm	21	% w/w
Organic Matter	2.4	% w/w
Texture	Medium Clay Loam/Medium Silty Clay Loam	

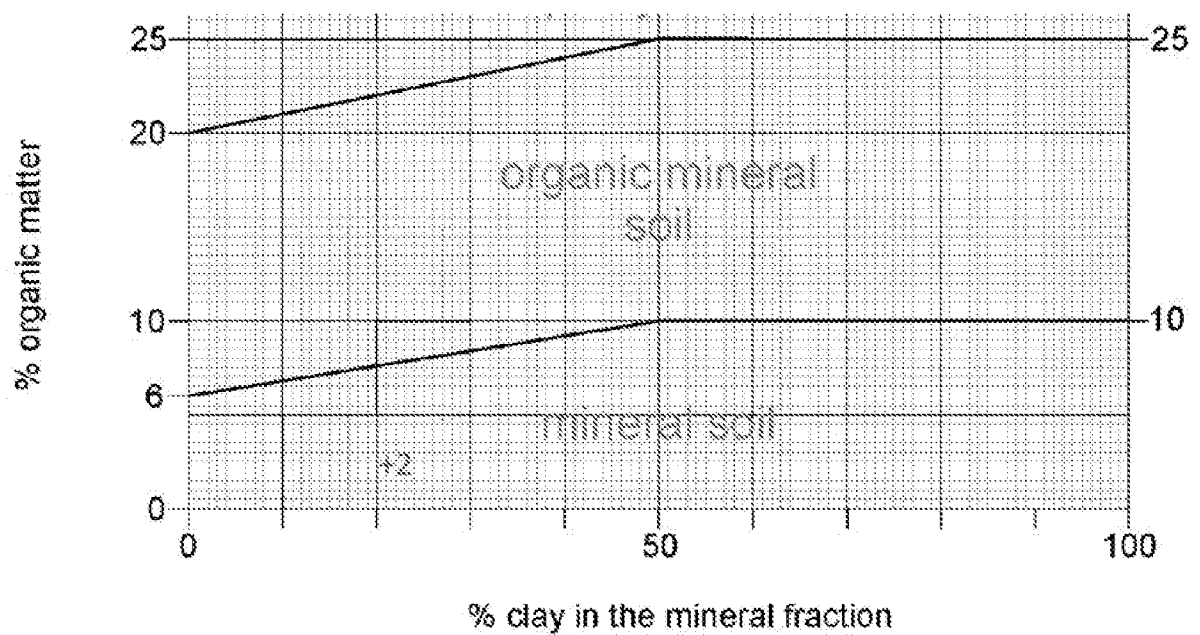
Determinand	Site 2	Units
Soil pH	6.8	
Phosphorus (P)	45.6	mg/l (av)
Potassium (K)	150	mg/l (av)
Magnesium (Mg)	114	mg/l (av)

Determinand	Site 2	Units
Phosphorus (P)	4	ADAS Index
Potassium (K)	2-	ADAS Index
Magnesium (Mg)	3	ADAS Index

Soil Texture by Particle Size Analysis



Organic Matter Class



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

Climate Data	
MDwheat	121
MDpotato	118
FCD	149

Wetness Class Guidelines	II	III	IV	V
SPL within 80cm, gleying within 40cm	>68cm	40-68cm	<40cm	
SPL within 80cm, gleying at 40-70cm	>52cm	<52cm		
No SPL but gleying within 40cm	coarse subsoil		/ other cases	//

736

1546

Maximum depth of auger penetration is underlined

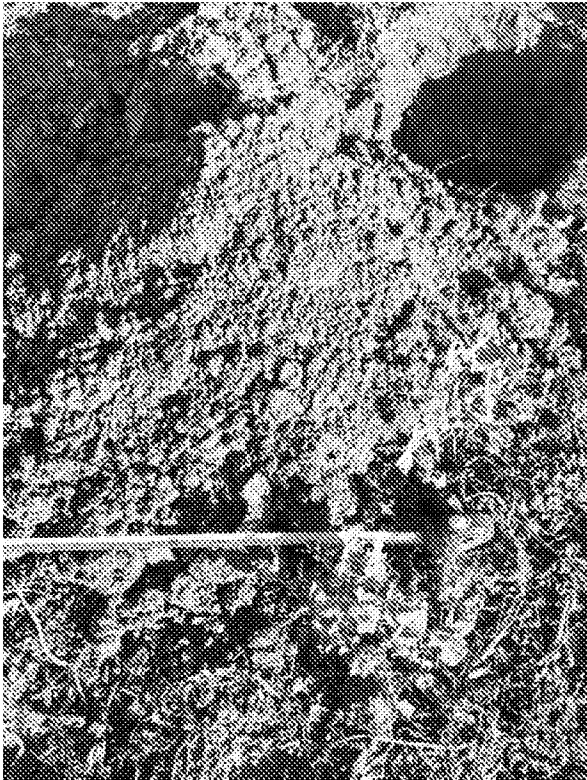
Site No.	Depth cm	Texture	CaCO ₃	Colour	Mottle colour	abund-ance	stone% hard	stone% .	Struct-ure	APwheat mm	AP potato mm	Gley	SPL	WC	Wetness grade WE	Final Grade	Limiting Factor(s)
1	T 0	32	mZCL	10YR4/2			2		-	60	60	n	n	III	3a	3a	WE
	32	120	hZCL	10YR5/3	Fe	com	1		ny/poor	100	64	y	(y)				
									Total	159	124						
									MB	38	6						
									Droughtiness grade (DR)	1	2						
2	T 0	30	mZCL/mCL	10YR4/2			2		-	61	61	n	n	IV	3b	3b	WE
	Pit 30	48	C	10YR5/3	FeMn	com	0		poor	43	48	y	y				
	48	55	C	10YR5/3	FeMn	com	0			43	48	y	n				
	55	120	C	10YR5/3	FeMn	com	0			27	0	y	n				
									Total	132	109						
									MB	11	-9						
									Droughtiness grade (DR)	2	2						
3	T 0	38	mCL	10YR4/2			6		-	63	63	n	n	IV	3b	3b	WE
	38	65	C	10YR5/3	FeMn	com	0		poor	26	35	y	y				
	65	80	SCL	10YR4/2-4/3	Fe	com	20			12	6	n	n				
	80	120	SCL	10YR4/2-4/3	Fe	com	20			33	0	n	n				

														Total	134	104				
														MB	13	-14				
														Droughtiness grade (DR)	2	3a				
4	T	0	32	mZCL	10YR5/2			2	-	60	60	n	n	/V	3b	3b	WE			
		32	60	C	10YR5/3	FeMn	com	0	poor	30	36	y	y							
		60	120	C	10YR5/3	FeMn	com	0	poor	42	13	y	y							
										Total	132	109								
										MB	11	-9								
										Droughtiness grade (DR)	2	2								
5	T	0	32	mZCL	10YR4/2			2	-	60	60	n	n	///	3a	3a	WE			
		32	48	hZCL	10YR5/3	Fe	com	0		24	24	y	n							
		48	60	hZCL	10YR5/3	Fe	com	0		17	24	y	n							
		60	120	C	10YR5/3	Fe	com	1	poor	42	13	y	y							
										Total	142	120								
										MB	21	2								
										Droughtiness grade (DR)	2	2								

Appendix 3: Photographs



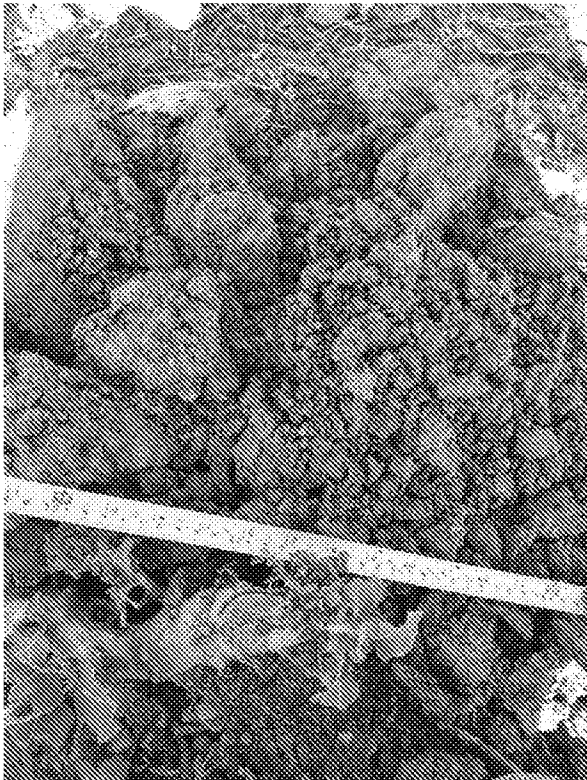
Pit 1



Pit topsoil



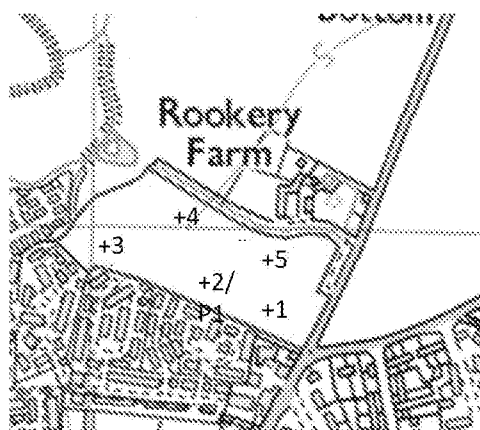
Pit upper subsoil



Pit lower subsoil



Slowly permeable clay at Observation 3



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

Plan reproduced from Ordnance Survey map with the permission of the Controller of Her Majesty's Stationery Office. Crown Copyright Reserved. Ordnance Survey Copyright License Number: 100005684



Scale 1:10,000@A4 Nov/2021

Figure RAC9373-1: Observations

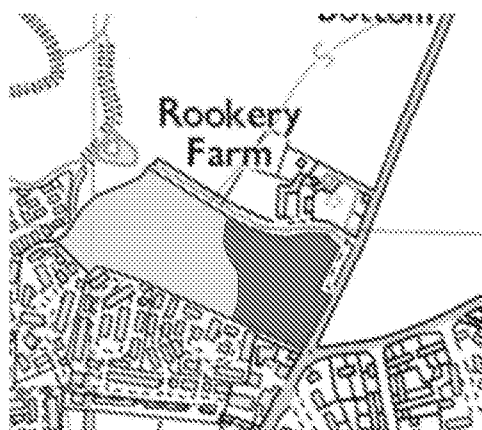
Site: Land West of Pagham Road

Client: Hallam Land Management Limited



READING
AGRICULTURAL
CONSULTANTS

© Copyright Reading Agricultural Consultants, 2021. Beechwood Court, Long Toll, Woodcote, Reading, RG6 0RR. Tel. 01491 694233. www.reading-ajl.com



- | | | |
|---|--------------------------------|---|
|  Grade 1 - excellent quality | } Best and most versatile land |  Subgrade 3b - moderate quality |
|  Grade 2 - very good quality | |  Grade 4 - poor quality |
|  Subgrade 3a - good quality | |  Grade 5 - very poor quality |
|  Not Present | |  Non-agricultural |

Plan reproduced from Ordnance Survey map with the permission of the Controller of Her Majesty's Stationery Office. Crown Copyright Reserved.
Ordnance Survey Copyright License Number: 100005684



Scale 1:10,000@A4 Nov/2021

Figure RAC9373-2: Agricultural Land Classification

Site: Land West of Pagham Road

Client: Hallam Land Management Limited



READING
AGRICULTURAL
CONSULTANTS

Copyright Reading Agricultural Consultants, 2021. Beechwood Court, Long Toll, Woodcote, Reading, RG6 0RR. Tel. 01491 694233. www.reading-ajl.com