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Richborough Limited

Agricultural Land Classification and Soil Resources

at

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1 Introduction

- 1.1 Reading Agricultural Consultants Limited (RAC) is instructed by Richborough Limited to investigate the Agricultural Land Classification (ALC) and soil resources of land at Wonastow Road, Monmouth, 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 land¹.
- 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 conditions 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.
- 1.6 Natural Resources Wales with the Welsh Government 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 mostly of Subgrade 3a quality with Grade 2 in the west and south.

¹ **MAFF (1988).** *Agricultural Land Classification of England and Wales. Revised guidelines and criteria for grading the quality of agricultural land.* [Agricultural Land Classification of England and Wales: Revised criteria for grading the quality of agricultural land - ALC011 \(naturalengland.org.uk\)](#)

² **Welsh Government (2024).** *Planning Policy Wales, Edition 12*, February 2024 [Planning Policy Wales - Edition 12 \(gov.wales\)](#)

³ **Welsh Government (2023).** *DataMapWales.* <https://datamap.gov.wales/maps/new#/>

- 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 10.7ha of mostly agricultural grassland used for grazing sheep. The east of the site is non-agricultural and currently comprises scrub open to the road. The site is bounded to the south-east by Wonastow Road, to the north-east by residential properties off Ternata Drive and Acer Way, and to the north and west by other agricultural land.
- 2.2 The topography is largely level at around 25m above Ordnance Datum (AOD). Drainage is mainly through the soil profile.
- 2.3 DataMapWales³ shows no significant flood risk at the site.

Agro-climatic conditions

- 2.4 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 25m AOD and are given in Table 1. The climate at the site is warm and wet with moderate to moderately large moisture deficits. The number of Field Capacity Days (FCD) is large and is unfavourable for providing opportunities for agricultural field work. There is however no overriding climatic limitation to the ALC.

Table 1: Local agro-climatic conditions

Parameter	Measurement
Grid Ref	SO 49100 11900
Altitude	25m AOD
Average Annual Rainfall	871mm
Accumulated Temperatures >0°C	1,506 day°
Field Capacity Days	191 days
Average Moisture Deficit, wheat	102mm
Average Moisture Deficit, potatoes	93mm

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>

Soil parent material and soil type

- 2.5 The principal bedrock geology mapped by the British Geological Survey⁵ is the Raglan Mudstone Formation, comprising red mudstones and silty mudstones with calcretes and sandstones. Superficial river terrace deposits overlie the bedrock in the south of the site. Most of the centre and east is overlain by alluvium which can include clay, silt, sand and gravel.
- 2.6 The Soil Survey of England and Wales soil association mapping⁶ (1:250,000 scale) shows the site to be on the boundary of two associations: the Lugwardine association to the east and the Bromyard association to the west.
- 2.7 The Lugwardine soils are characterised by deep, stoneless, reddish, fine silty soils which can be subject to winter and spring floods (although there is no mapped flood risk at the site), as well as waterlogging by high groundwater. The Wetness Class (WC) is therefore localised and ranges from I to V.
- 2.8 The Bromyard association also includes reddish, fine silty soils, but which overlie shales and soft siltstones at moderate depths. Where subject to a large number of FCD, the soil profiles can become seasonally waterlogged (WC III) but may also be better drained (WC I or II)⁷.

⁵ **British Geological Survey (2024).** *Geology Viewer* <https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/>

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.

3 Agricultural land quality

Soil survey methods

- 3.1 Nine soil profiles were examined using an Edelman (Dutch) auger at an observation density of one per hectare 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 RAC/10329/1. 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;
 - stone content;
 - 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 guidelines¹. Soil profiles have been described according to Hodgson⁸ which is the recognised source for describing soil profiles and characteristics according to the revised ALC guidelines.

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

- 3.6 The main limitation to agricultural land quality is wetness and workability, which is heavily influenced by the climatic conditions of the site. The site is classified as mostly Subgrade 3a quality.
- 3.7 The topsoil is dark reddish grey, dark brown or brown (5YR4/2, 7.5YR3/2 or 7.5YR4/2 in the Munsell soil colour charts⁹), stoneless, medium (silty) clay loam or heavy silty clay loam, with one instance of silty clay in the south-west. The south of the site was waterlogged at the surface at the time of survey due to compaction in the topsoil: this could be ameliorated. Elsewhere the topsoil was friable. The structure is fine subangular blocky.
- 3.8 The subsoil is primarily heavy silty clay loam which is weak red, dark reddish grey or reddish brown (2.5YR4/2, 5YR4/2 or 5YR4/3). Across the north and south of the site the subsoil is mottled and gleyed but in the centre there is no mottling. The upper subsoil is stoneless and has a moderate to weak, fine subangular blocky structure. In most instances the subsoil was moist and had a very soft consistency which resulted in the soil compressing beneath the auger.
- 3.9 Where a lower subsoil horizon was observed, it comprises weak red (2.5YR4/2), heavy silty clay loam or silty clay which is also stoneless, soft and compressible.
- 3.10 The soil profiles are in WC I or II depending on the presence or absence of gleying in the subsoil and are mainly assessed as Subgrade 3a quality. An isolated central profile of Grade 2 has been amalgamated into the Subgrade 3a map unit. One profile in the south-west was waterlogged by groundwater and with silty clay topsoil is Subgrade 3b quality.
- 3.11 The areas of each ALC grade at the site are given in Table 2 and their distribution is shown in Figure RAC/10329/2. Photographs taken at the site are given in Appendix 3.

Table 2: Agricultural land classification

Grade	Description	Hectares	%
Subgrade 3a	Good quality	8.2	77
Subgrade 3b	Moderate quality	0.8	8
Non-agricultural		1.6	15
Total		10.6	100

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

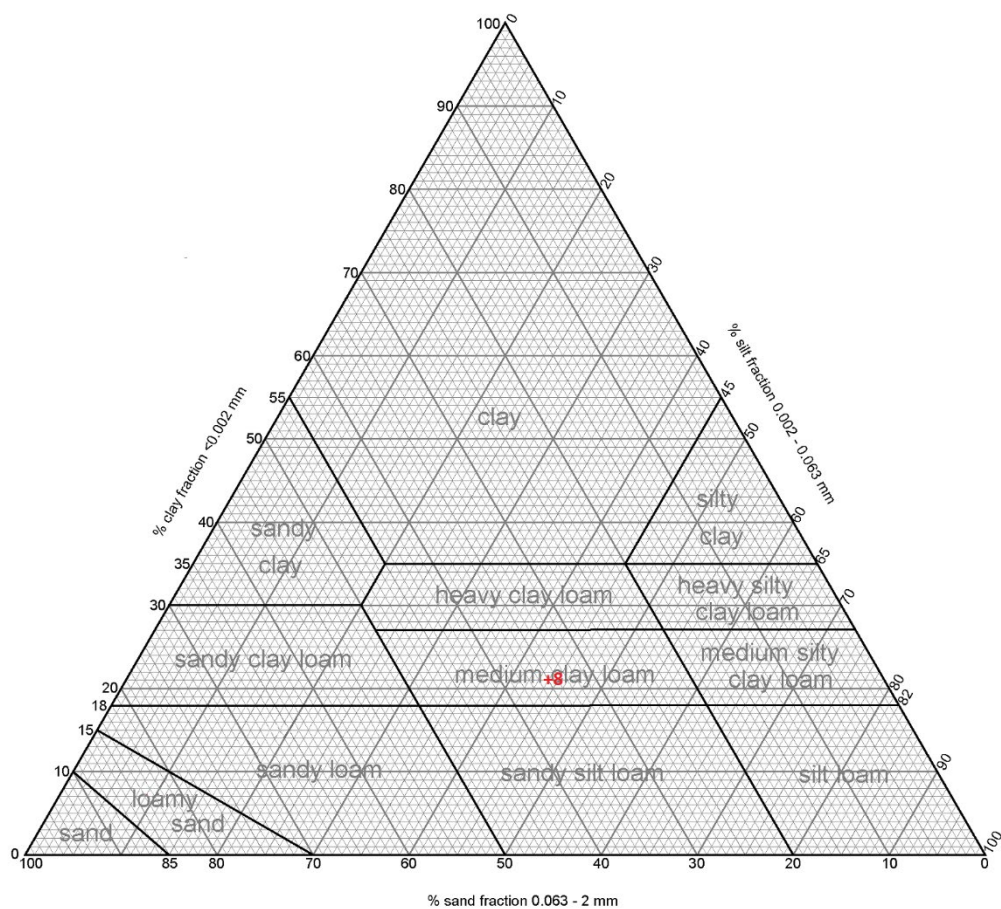
Appendix 1: Laboratory Data

Determinand	Site 8	Units
Sand 2.00-0.063 mm	35	% w/w
Silt 0.063-0.002 mm	44	% w/w
Clay <0.002 mm	21	% w/w
Organic Matter	3.5	% w/w
Texture	Medium Clay Loam	

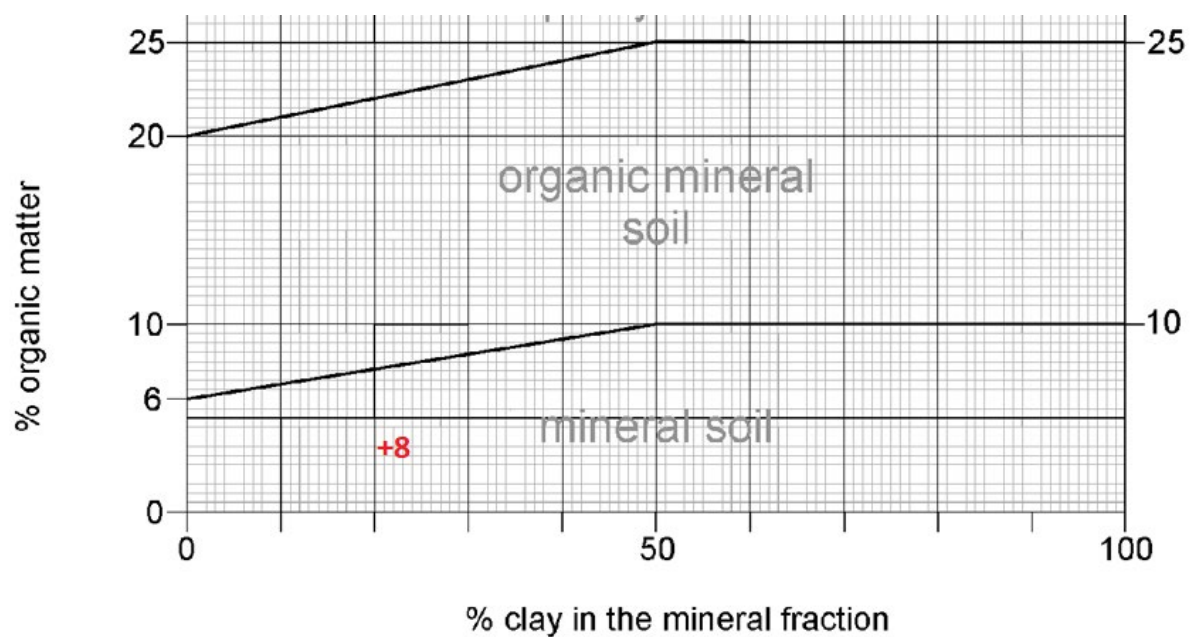
Determinand	Site 8	Units
Soil pH	5.9	
Phosphorus (P)	37.4	mg/l (av)
Potassium (K)	52.8	mg/l (av)
Magnesium (Mg)	171	mg/l (av)

Determinand	Site 8	Units
Phosphorus (P)	3	ADAS Index
Potassium (K)	0	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 / workability limitations are determined 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					Climate Data			Wetness Class Guidelines										Climate	
%	TA _v	EAv			MDwheat	102											1506 D°		
hard	1	0.5			MDpotato	93											Limitation		
chalk	10	7			FCD	191											Grade 1		
hard		flint & pebble			AAR	871	Maximum depth of auger penetration is <u>underlined</u>												
Site No.	Depth cm		Texture	CaCO ₃	Colour	Mottle colour	abund- ance	stone% hard	stone% chalk	Struct- ure	APwheat mm	AP potato mm	Gley	SPL	WC	Wetness grade WE	Final Grade	Limiting Factor(s)	
1	T	0	35	hZCL	7.5YR4/2			0	0		67	67	n	n	/	3a	3a	WE	
		35	60	hZCL	5YR4/3	Fe	few	0	0		36	43	n	n					
		60	120	hZCL	2.5YR4/2	Fe	com	0	0		60	17	y	n					
										Total	162	126							
										MB	60	33							
Droughtiness grade (DR)											1	1							
2	T	0	30	mZCL	7.5YR3/2			0	0	-	57	57	n	n	//	3a	3a	WE	
		30	60	ZC	2.5YR4/2	Fe	com	0	0		38	45	y	n					
		60	120	ZC	2.5YR4/2	Fe	com	0	0		48	15	y	n					
										Total	143	117							
										MB	41	24							
Droughtiness grade (DR)											1	1							
3	T	0	28	ZC	5YR4/2			0	0	-	48	48	n	n	//	3b	3b	WE	
		28	120	ZC	2.5YR4/2	Fe	com	0	0		89	63	y	n					
										Total	137	111			Waterlogged - GW				
										MB	35	18							
	Droughtiness grade (DR)											1	1						
4	T	0	25	mZCL	7.5YR3/2			0	0	-	48	48	n	n	//	3a	3a	WE	
		25	40	hZCL	5YR4/2	Fe	com	0	0		26	26	y	n					
		40	120	ZC	5YR4/2	Fe	com	0	0		71	45	y	n					
										Total	144	118			Subsoil soft and compressible				
										MB	42	25							
Droughtiness grade (DR)											1	1							

Waterlogged - GW

Subsoil soft and compressible

5	T	0	26	mCL	5YR4/2			0	0	-	47	47	n	n	/	2	2	WE
		26	54	hCL	5YR4/3			0	0		42	45	n	n				
		<u>54</u>	120	hCL	5YR4/3			0	0		66	26	n	n				
										Total	155	117						
										MB	53	24						
Droughtiness grade (DR)											1	1						
6	T	0	25	mCL	7.5YR4/2			0	0	-	45	45	n	n	//	3a	3a	WE
		25	45	hZCL	5YR4/2	Fe	com	0	0		34	34	y	n				
		<u>45</u>	120	hZCL	5YR4/2	Fe	com	0	0		79	43	y	n				
										Total	158	122						
										MB	56	29						
Droughtiness grade (DR)											1	1						
7	T	0	22	hZCL	5YR4/2			0	0	-	42	42	n	n	/	3a	3a	WE
		22	40	hZCL	5YR4/3	Fe	few	0	0		31	31	n	n				
		<u>40</u>	120	hZCL	5YR4/3	Fe	few	0	0		87	51	n	n				
										Total	159	123						
										MB	57	30						
Droughtiness grade (DR)											1	1						
8	T	0	30	mCL	5YR4/2			0	0	-	54	54	n	n	//	3a	3a	WE
		30	60	hZCL	2.5YR4/2	Fe	com	1	0		44	51	y	n				
		<u>60</u>	120	hZCL	2.5YR4/2	Fe	com	1	0		59	17	y	n				
										Total	157	121						
										MB	55	28						
Droughtiness grade (DR)											1	1						
9	T	0	30	mCL	7.5YR4/2			0	0	-	54	54	n	n	//	3a	3a	WE
		30	42	hZCL	5YR4/2	Fe	com	1	0		20	20	y	n				
		<u>42</u>	120	hZCL	5YR4/2	Fe	com	1	0		83	47	y	n				
										Total	157	121						
										MB	55	28						
Droughtiness grade (DR)											1	1						

Subsoil soft and compressible

Subsoil soft and compressible

Subsoil soft and compressible

Appendix 3:

Soil Pit Photographs



Pit 1



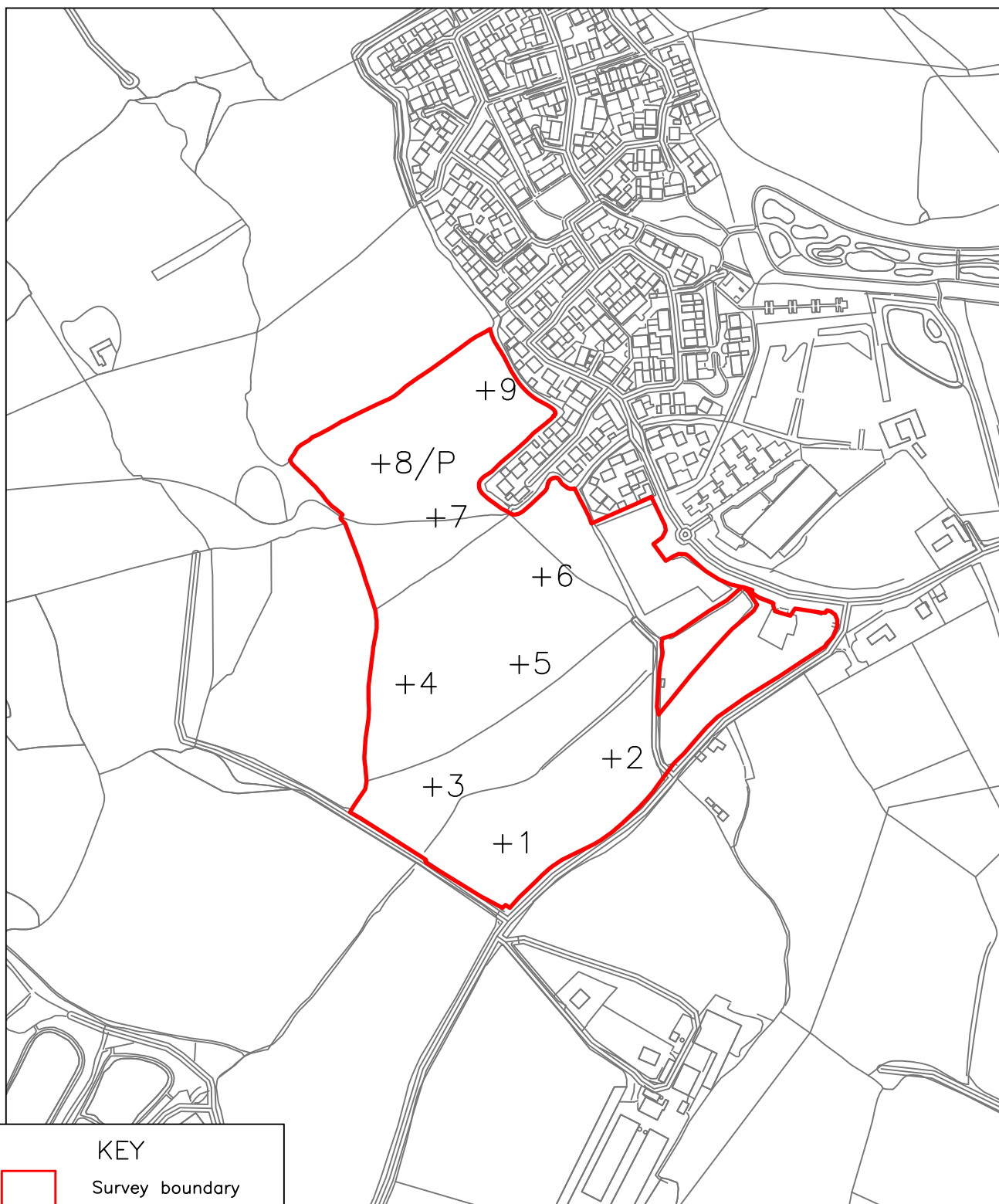
Pit overview



Pit topsoil



Pit subsoil

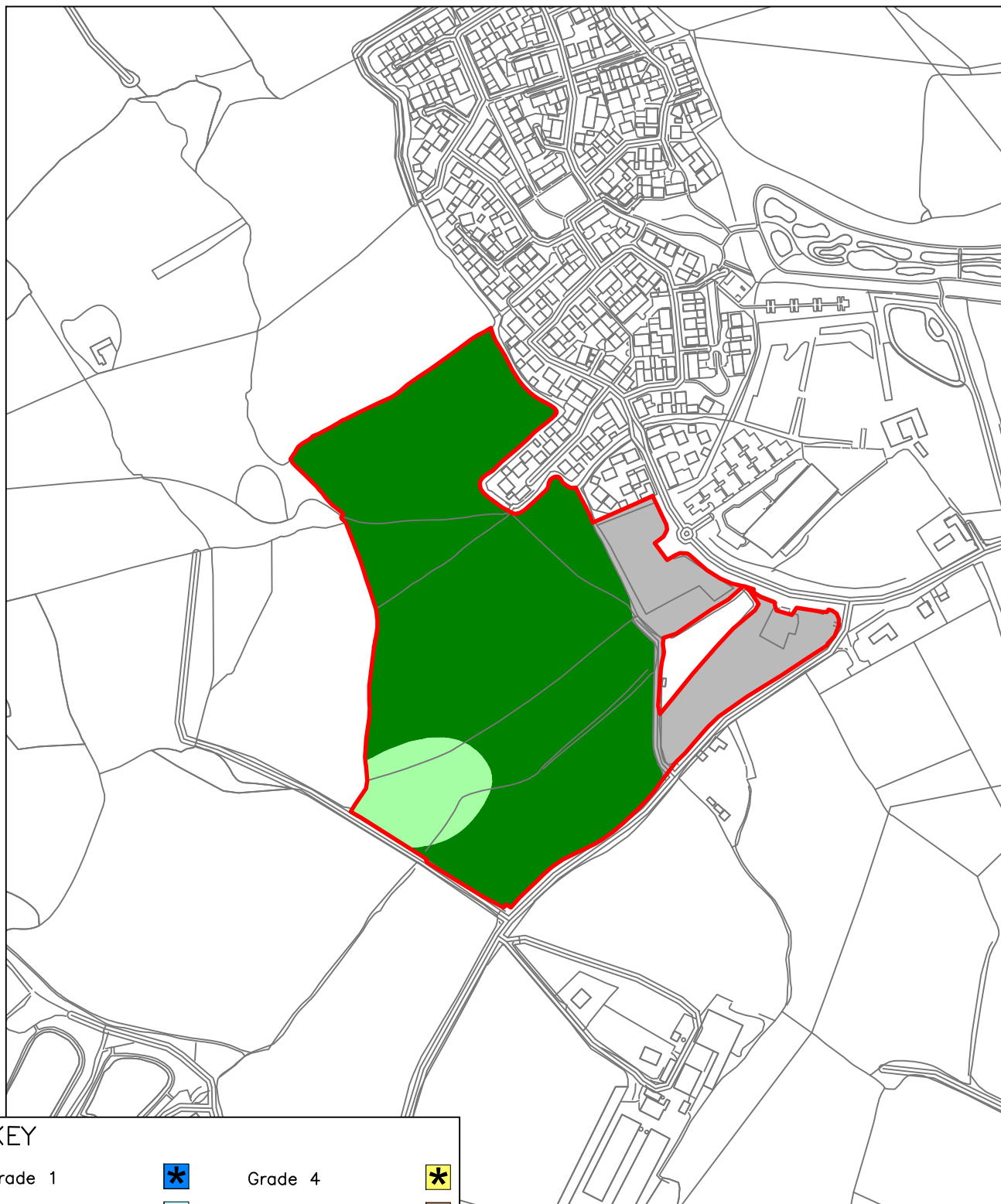


1:5,000
0 100m 200m

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	Scales 1:5,000@A4	Date 04/2024				
			Rev.	Comment	Date	





KEY

Grade 1		Grade 4	
Grade 2		Grade 5	
Subgrade 3a		Non-agricultural	
Subgrade 3b		Not present	

1:5,000

0 100m 200m

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