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Mostyn Estates Limited

Agricultural Land Classification and Soil Resources

at

Land off Conway Road, Llandudno

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

**01491 684 233
www.reading-ag.com**

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1 Introduction

- 1.1 Reading Agricultural Consultants Ltd (RAC) is instructed by Mostyn Estates Limited to investigate the Agricultural Land Classification (ALC) and soil resources of land off Conway Road, Llandudno, 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 of

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 (2024)**. Planning Policy Wales, Edition 12, February 2024
<https://www.gov.wales/sites/default/files/publications/2024-07/planning-policy-wales-edition-12.pdf>

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

Grade 2 quality in the north and mostly Subgrade 3b in the south but also with a small area of Subgrade 3a at the southern edge.

- 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 3.5ha of agricultural grassland with established hedgerows and tree belts at the northern and eastern boundaries. The site is fully constrained by existing infrastructure: Conway Road (B5115) is to the west and Wormhout Way (A470) to the east, with the convergence of the two at a roundabout to the north. Llanrhos Lawn Cemetery is to the south.
- 2.2 The topography is characterised by a north-facing slope between altitudes of around 20m and 30m above Ordnance Datum (AOD). Drainage is facilitated by the slope and is also through the soil profile.
- 2.3 DataMapWales³ shows no significant risk of flooding 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 mild 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.

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	SH 79300 80600
Altitude	25m AOD
Average Annual Rainfall	780mm
Accumulated Temperatures >0°C	1,448 day°
Field Capacity Days	183 days
Average Moisture Deficit, wheat	102mm
Average Moisture Deficit, potatoes	92mm

Soil parent material and soil type

- 2.5 The bedrock geology mapped by the British Geological Survey⁵ is the Nod Glas Formation in the north, comprising black, coal-like mudstone, and Conwy Mudstones Formation in the south, comprising grey mudstones and siltstones with thin, flaggy sandstones.
- 2.6 Superficial deposits of diamicton overlie the bedrock across the whole site and can include a range of poorly sorted material ranging in size from clay to boulders.
- 2.7 The Soil Survey of England and Wales soil association mapping⁶ (1:250,000 scale) shows most of the site as the Cegin association, bordering on East Keswick 3 association soils to the south-east.
- 2.8 The Cegin soils have loamy and clayey textures with slowly permeable, coarsely structured and often compact subsoils. Where the FCD regime is shorter than 200 days, as at the site, the soils are typically in Wetness Class (WC) IV.
- 2.9 The contrasting East Keswick 3 association is characterised by brown earths in deep, well drained, slightly stony loamy drift. Some component soils have limestone within 80cm depth. All of the main soils are well drained (WC I)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 Four 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 surveys⁴. One observation pit was also excavated to examine subsoil structures. The locations of observations are shown on Figure RAC/10492a/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. The auger profiles are described in Appendix 2 and the pit in Appendix 3, along with photographs of the site.
- 3.6 The main limitation to agricultural land quality is wetness which limits the ALC to Grade 2. There is one soil type present at the site.
- 3.7 The topsoil is dark brown (7.5YR3/3 or 10YR3/3 in the Munsell soil colour charts⁹) medium clay loam which is 38-40cm deep. The topsoil is slightly stony, non-calcareous and has a weakly developed, fine subangular blocky structure. Many fibrous roots and common earthworms were observed throughout the topsoil.
- 3.8 The upper subsoil horizons are brown (7.5YR4/3, 7.5YR4/4 or 10YR5/3) heavy clay loam or occasionally medium clay loam and are also slightly stony and non-calcareous. Beneath the topsoil, the upper subsoil has a weak medium subangular blocky structure and is friable. The auger observations were obstructed by stone at an average depth of 55cm, however from the pit it is noted that the subsoil continues to depth, transitioning to reddish brown (5YR4/4) heavy clay loam lower subsoil. The lower subsoil structure is weakly developed with coarse angular blocky peds, becoming prismatic with depth, although it maintains >0.5% biopores greater than 0.5mm diameter. There is no slowly permeable layer within 80cm and the profiles are classed as WC I. The limitation is due to the topsoil texture under a FCD regime of 183 days which results in a workability limitation to Grade 2.
- 3.9 The classification of the site is given in Table 2 and shown in Figure RAC/10492a/2.

Table 2: Agricultural Land Classification

Grade	Description	Hectares	%
Grade 2	Very good quality	3.5	100
	Total	3.5	100

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

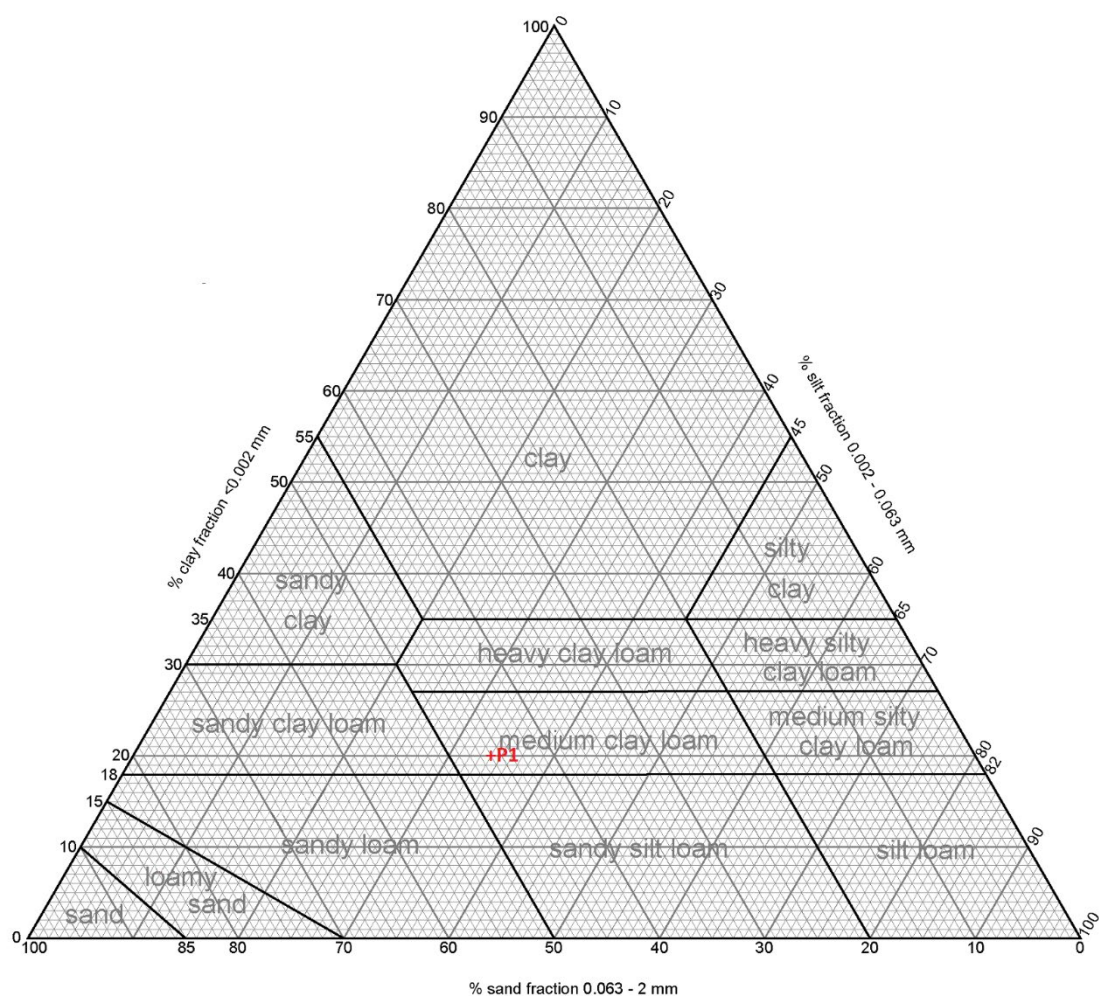
Appendix 1: Laboratory Data

Determinand	Pit 1	Units
Sand 2.00-0.063 mm	46	% w/w
Silt 0.063-0.002 mm	34	% w/w
Clay <0.002 mm	20	% w/w
Organic Matter	5.4	% w/w
Texture	Medium Clay Loam	

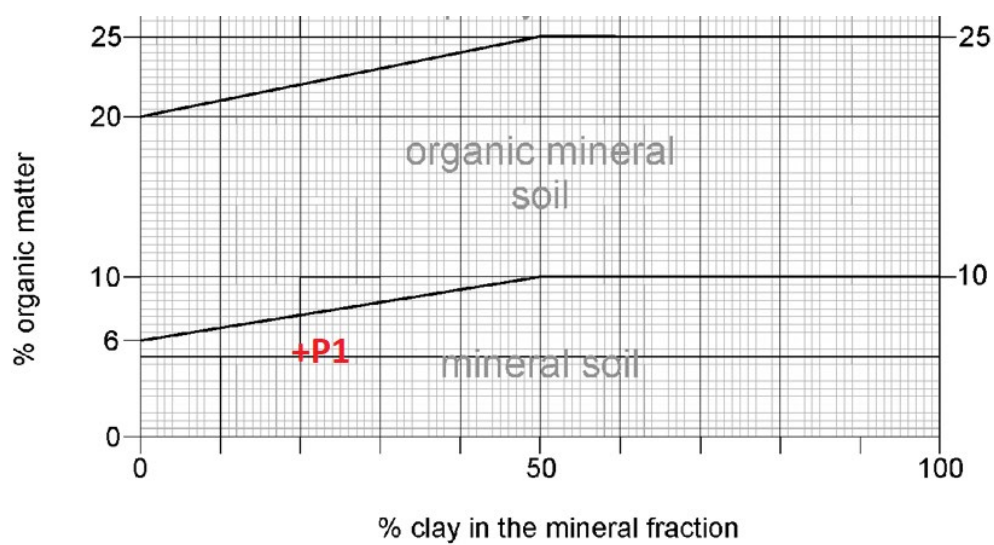
Determinand	Pit 1	Units
Soil pH	6.3	
Phosphorus (P)	18.4	mg/l (av)
Potassium (K)	29.0	mg/l (av)
Magnesium (Mg)	217	mg/l (av)

Determinand	Pit 1	Units
Phosphorus (P)	2	ADAS Index
Potassium (K)	0	ADAS Index
Magnesium (Mg)	4	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		
%	TA _v	EA _v
hard	1	0.5
.		

hard flint & pebble

Climate Data	
MDwheat	102
MDpotato	92
FCD	183

Wetness Class Guidelines	II	III	IV	V
SPL within 80cm, gleying within 40cm	>77cm	49-77cm	<49cm	
SPL within 80cm, gleying at 40-70cm	>65cm	<65cm		
No SPL but gleying within 40cm	coarse subsoil	/	other cases	//

Maximum depth of auger penetration is underlined

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	38	mCL		10YR3/3			8		-	63	63	n	n	/	2	2	WE			
		38	40	hCL		7.5YR4/3	Mn	few	3			3	3	n	n							
		40	<u>70</u>	hCL		10YR5/3	Och	com	3			35	47	y	n							
		70	120	hCL					5			50	0	n	n							
		Total											151	113								
		MB											49	21								
		Droughtiness grade (DR)											1	1								
2	T	0	38	mCL		7.5YR3/3			8			63	63	n	n	/	2	2	WE			
		38	40	mCL		7.5YR4/3			3			3	3	n	n							
		40	<u>60</u>	mCL		7.5YR4/4			3			25	31	n	n							
		60	120	hCL					5			60	16	n	n							
		Total											151	113								
		MB											49	21								
		Droughtiness grade (DR)											1	1								
3	T	0	<u>40</u>	mCL		7.5YR3/3			8			66	66	n	n	/	2	2	WE			
		40	55	hCL					10			19	22	n	n							
		55	80	hCL					10			23	22	n	n							
		80	120	hCL								40	0	n	n							
		Total											148	109								
		MB											46	17								
		Droughtiness grade (DR)											1	1								

						Droughtiness grade (DR)	1	1							
4	T	0	40	mCL	7.5YR3/3	8	66	66	n	n	/	2	2	WE	
		40	50	hCL	10YR5/3	3	16	16	n	n					
		50	120	hCL		10	64	29	n	n					
	Total						145	111							
MB							43	19							
						Droughtiness grade (DR)	1	1							

Appendix 3:

Site Photographs and Pit Description



Site

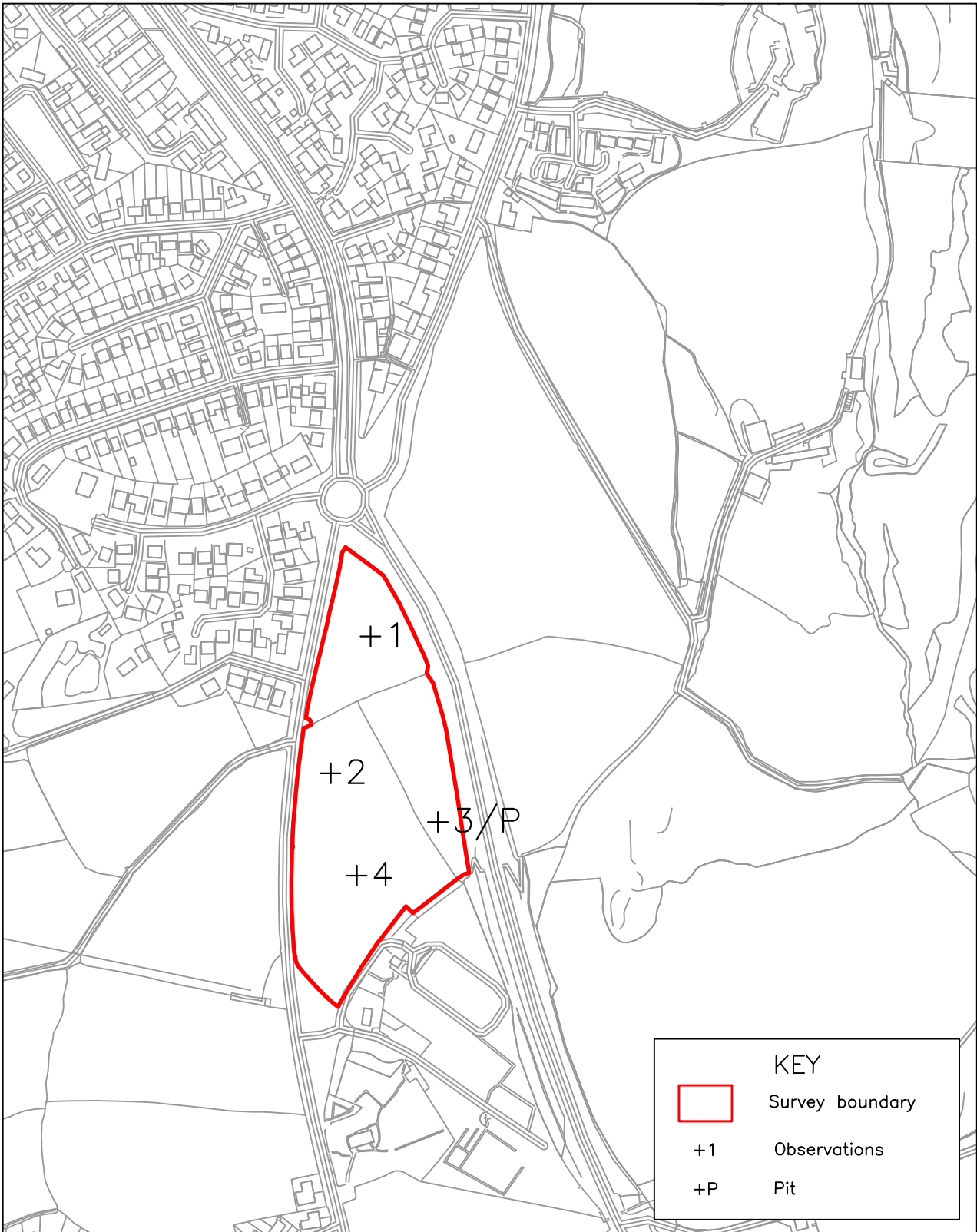


Pit 1

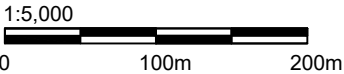
Pit 1 – Grid ref SH79389 80600, grass, pit dug to 80cm

0-38 cm	Medium clay loam, 7.5YR3/3, weakly developed, fine subangular blocky structure, many fibrous roots, common earthworms, stone content 8% >2cm 5%, >6cm 3% hard rounded stones
38-40 cm	Heavy clay loam, 7.5YR4/4, weakly developed, medium subangular blocky, porosity >0.5% greater than 0.5mm diameter, friable
40-55 cm	Heavy clay loam, 7.5YR4/4, weakly developed, medium subangular blocky, common ochreous mottles, porosity >0.5% greater than 0.5mm diameter, friable
55-70 cm	Heavy clay loam, 7.5YR4/4 (ped face 5YR5/2), weakly developed, coarse angular blocky, porosity >0.5% greater than 0.5mm diameter, common ochreous mottles, firm
70-80 cm	Heavy clay loam, 5YR4/4, weakly developed, medium prismatic, porosity >0.5% greater than 0.5mm diameter, common ochreous mottles, firm

Slowly permeable layer > 80cm, WC I, Grade 2

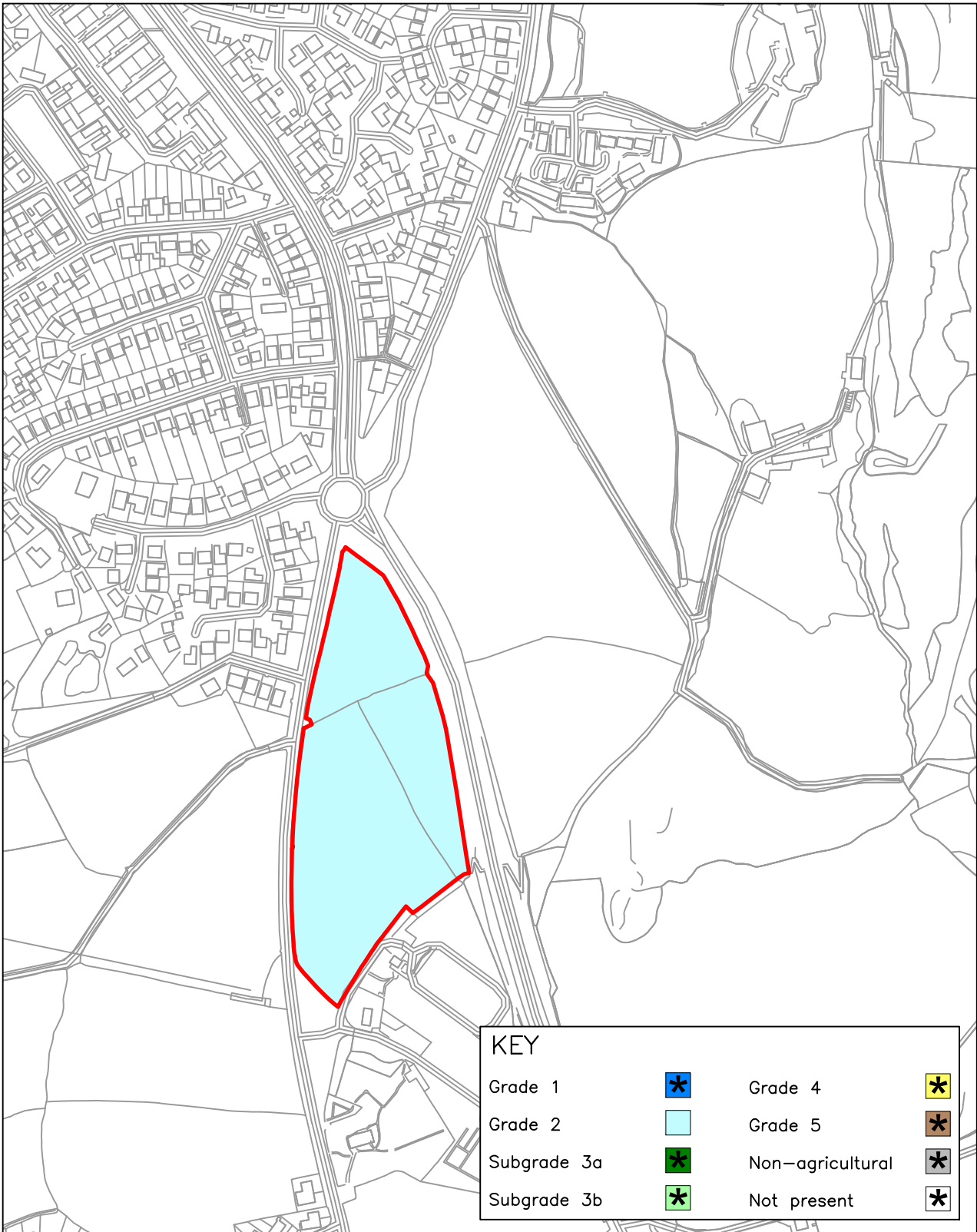


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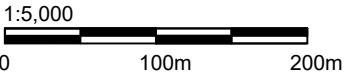
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KEY			
Grade 1		Grade 4	
Grade 2		Grade 5	
Subgrade 3a		Non-agricultural	
Subgrade 3b		Not present	

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