Agricultural Land Classification and Topsoil Nutrient Assessment:

Agroforestry Site,
Dartington Hall, Devon

Prepared for:
The Dartington Hall Trust

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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 (ALC) and topsoil nutrient assessment. It should not be relied on for alternative end-uses or for other schemes. This report has been prepared solely for the benefit of The Dartington Hall Trust. No warranty is provided to any third party and no responsibility or liability will be accepted for any loss or damage in the event that this report is relied upon by a third party or is used in circumstances for which it was not originally intended.

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CONTENTS

1 INTRODUCTION

1.1 Background

1.1.1 This report was commissioned by The Dartington Hall Trust to determine the quality of agricultural land, and the nutrient status of topsoil, at a site proposed for agroforestry at the Dartington Hall, Totnes, Devon, TQ9 6ED ('the Site'). The assessment was made in accordance with the Agricultural Land Classification (ALC) system for England and Wales (see 'Methodology' below).

1.1.2 The approximately 20 hectare (ha) Site is located on the Dartington Hall Estate at National Grid Reference (NGR) SX796622 (approximate centre of the Site). The location and boundary of the Site is shown on Figure 1.

1.2 Methodology

1.2.1 The work has been carried out by a Chartered Scientist, who is a Member of the Institute of Professional Soil Scientists (IPSS). The IPSS is the chartered and professional body of the British Society of Soil Science (BSSS). In addition, this ALC survey has been carried out by a soil scientist who meets the requirements of the IPSS Professional Competency Scheme for ALC (see IPSS PCSS Document 2 '*Agricultural Land Classification of England and Wales*', given as Appendix A). The IPSS Professional Competency Scheme 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 Appendix A also).

1.2.2 This assessment is based upon the findings of a study of published information on climate, geology and soil in combination with a soil investigation carried out in accordance with the Ministry of Agriculture, Fisheries and Food (MAFF)[1] '*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 versatile*' category in Paragraph 112 and Annex 2 of the National Planning Policy Framework (NPPF) of March 2012. Further details of the ALC system and national planning policy implications are set out by

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

Natural England in its Technical Information Note 049, given as Appendix B, and in Section 2.0 of this report.

1.2.4 A detailed ALC survey was carried out on 16th and 19th September 2016. The detailed survey involved examination of the soil's physical properties at nineteen locations located on a 100m by 100m grid. The auger and trial pit locations of the detailed soil survey are shown on Figure 1.

1.2.5 The sample 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.

1.2.6 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 5 cm diameter Dutch (Edleman) soil auger. A number of soil pits were excavated at selected locations with a spade in order to examine physical soil profile characteristics, including subsoil structure and stone content, of the main representative soil types determined at the Site.

1.2.7 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.

1.2.8 A sample of topsoil was collected at auger locations 1, 3, 5, 7, 9, 10, 12, 14 and 17 (i.e. total nine locations), which yielded a total of nine samples.

1.2.9 The topsoil at each sampling location was collected by extracting four cores of soil at locations 1 m to north, east, south and west of the sample location. Each soil core was taken from between the surface and a depth of approximately 25cm by hand with the use of a 5 cm diameter Dutch (Edleman) soil auger. A The cores were loosened and mixed in a black plastic bucket and a sub-samples of approximately 300g was placed in a 8.5cm by 7.5cm by 4.5cm sample box provided by the laboratory.

1.2.10 All nine samples of topsoil were sent to an accredited laboratory (NRM Ltd) for chemical analysis of the following parameters (as set out in Natural England TIN 035, given as Appendix C):

- pH (water);
- available phosphorus (P) using the Olsen method;
- available potassium (K);
- available magnesium (Mg);
- total nitrogen (N) using the Dumas method; and
- organic matter (loss on ignition).

1.2.11 Two samples of topsoil (i.e. from locations 1 and 17) were sent to the laboratory for particle size analysis, i.e. the proportions of sand, silt and clay. This is to determine the definitive texture class of the topsoil, especially with regard to distinguishing between medium clay loams (i.e. <27% clay) and heavy clay loams (27% to 35% clay).

1.3 Structure of the Remainder of this Report

1.3.1 The remainder of this report is structured as follows:

- Section 2 – Agricultural Land Classification;
  - Climate;
  - Site (Gradient, Micro-relief, Risk of Flooding);
  - Soil (Geology, Soil Properties);
  - Interactive Limitations (Soil Droughtiness, Soil Wetness);
  - ALC Grading at the Site.
- Section 3 – Topsoil Nutrient Assessment.

2 AGRICULTURAL LAND CLASSIFICATION

2.1 Background

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 soil survey carried out on Site by a Chartered Soil Scientist in September 2016 (see 'Methodology' above).

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

- Climate;
- Site;
- Soil;
- Interactive Limitations.

3.1.2 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 within the Site is given in Table 2.1 below.

Table 2.1: ALC Climate Data for National Grid Reference SX796622

Climate Parameter	Data
Average Altitude (m)	51
Average Annual Rainfall (mm)	1211
Accumulated Temperature above 0˚C (January – June)	1558
Moisture Deficit (mm) Wheat	85
Moisture Deficit (mm) Potatoes	74
Field Capacity Days (FCD)	242

2.2.2 With reference to Figure 1 '*Grade according to climate*' on page 6 of the ALC Guidelines, there is a slight overall climatic limitation to the quality of agricultural land at the Site; this means

that agricultural land at the Site can be graded no higher than ALC Grade 2 in overall climatic terms, 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 242 days per year, mainly over the late autumn, winter and early spring. This is a relatively long period in comparison with central, lowland England (i.e. approximately 150 FCD) and, in an interaction with topsoil texture, will cause an '*interactive limitation*' to agricultural land quality at the Site - namely soil wetness (see below).

2.2.4 The Site receives high levels of precipitation. It has an average annual rainfall of 1211 mm, in comparison with approximately 600mm in central, lowland England.

2.3 Site

2.3.1 The Site is located to on the Dartington Hall Estate, near Tones, Devon, TQ9 6EL. The centre of the Site is located at NGR SX796622. At the time of the soil survey, most of the Site was under grassland being grazed by a flock of ewes.

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 Site is located on a broadly south-west facing slope. The highest point occurs at the entrance to the Site in the far north, at an elevation of approximately 67 m Above Ordnance Datum (AOD). From the highest point (67 mAOD), the land slopes over a strong gradient (8° to 11°) to the lowest point in the western corner (near sample location 10, Figure 1) at an elevation of approximately 40 mAOD. From the highest point in the north, the land slopes to the south-east corner (near sample location 15, Figure 1) at an elevation of approximately 45 mAOD, and to the south-west corner (near sample location 19, Figure 1) at an elevation of approximately 56 mAOD.

2.3.4 With reference to Table 1 '*Grade according to gradient*' of the ALC Guidelines, the strongly sloping land (i.e. gradient 8° to 11°) in the north-west of the Site (i.e. in the area around sample locations 1, 5 and 6 on Figure 1) is limited by gradient to Subgrade 3b (moderate quality), as per Table 1 'Grade according to Gradient of the ALC Guidelines). Where the gradient of the slope is 7° or less, the quality of the agricultural land is not limited by gradient in ALC terms.

2.3.5 There is a small, circular hollow in the north-east (NGR SX 79739 62346) of the Site. This appears to be a former limestone quarry, which is now partially wooded. This area is limited by micro-relief (i.e. where there are complex changes in slope angle over short distances).

II. Risk of Flooding

2.3.6 From an Environment Agency (EA) Flood Map[2], the Site is not predicted to be at risk of flooding by rivers or the sea. Therefore, agricultural land quality at the Site is not limited by a risk of flooding in terms of Figure 2 '*Grade according to flood risk in summer*' and Figure 3 '*Grade 3 according to flood risk in winter*'.

2.4 Soil

I. Geology/Soil Parent Material

2.4.1 British Geological Survey (BGS) information available online[3] has been utilised to identify the Bedrock underlying the Site and any Superficial (Drift) Deposits over the Bedrock. This provides information on soil forming materials at the Site.

2.4.2 The BGS Bedrock map (1:50,000) indicates that north and north-west of the Site (i.e. the highest elevations) is underlain by the Nardon Formation (i.e. mudstone, siltstone, limestone and sandstone). The remainder of the Site is underlain by the Dartington Limestone Member.

2.4.3 The BGS Superficial Deposit map (1:50,000) indicates that Site is not covered by any superficial deposit, and therefore the soil here is formed directly over the bedrock.

II. Soil Survey

2.4.4 The Soil Survey of England and Wales (SSEW) soil map of South West England (Sheet 5) at a scale of 1:250,000 and accompanying Bulletin No. 14 '*Soils and their Use in South West England*' (D.C. Findlay *et al*, Harpenden, 1984) reports that agricultural land at the Site is mainly covered by soil grouped in the Denbigh 1 Association.

2.4.5 The Denbigh 1 Association has brown stony well drained soils of moderate depth over Palaeozoic sedimentary rocks. It includes brown, slightly stony, well drained soils (Wetness Class I) which can be occasionally waterlogged by groundwater (Wetness Class II), of moderate depth over siltstone, sandstone and slate (see Geology/Soil Parent Material above). The main Soil Series within this Association is the Denbigh Series, which are fine loamy (e.g. clay loam

[2] Environment Agency Flood Risk Map. Available online @ http://maps.environment-agency.gov.uk/wiyby/wiybyController?value=TQ9+6ED&submit.x=0&submit.y=0&submit=Search%09&lang=_e&ep=map&topic=floodmap&layerGroups=default&scale=9&textonly=off Last viewed 3rd November 2016.

[3] British Geological Survey 'Geology of Britain Viewer'. Available online @ http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html Last viewed 3rd November 2016.

or silty clay loam) typical brown earths over solid or shattered rock within 100 cm depth below ground level. The locations and extent of soils in the Denbigh Series is shown on Figure 2.

2.4.6 One soil pit was excavated by hand digging with a spade in the north of the Site (see location of Pit 1, Figure 1). The soil profile had non-calcareous, brown (Munsell colour 10YR 4/3), slightly stony (10% stones) heavy clay loam to heavy silty clay loam topsoil to 25cm, over dark yellowish brown (Munsell colour 10YR 3/4), very stony (45% stones), heavy clay loam or heavy silty clay loam subsoil, over weathered, grey rock encountered at depths of approximately 40cm. The soil profiles were well drained with no signs of mottling and were placed in Wetness Class I (as per Table 6 of the ALC Guidelines). A photograph of the soil profile at Pit 1 (figure 1) is given as Plate 1 (below).

Plate 1: Soil profile at Pit 1 (Figure 1) – Denbigh Series

2.4.7 Over parts of the Site in the north-east (in the area between sample locations 7, 8, 13 and 14 on Figure 1), the soils are very shallow and brashy (rocky), brown rankers over limestone. There is a small area of similar shallow and brashy soil in the south-west (sample location 19 on Figure 1). A typical profile comprises of a dark brown, very stony (35% to 70% hard limestone), heavy clay loam or heavy silty clay loam, with fragmented limestone rock encountered at a depth of approximately 20cm to 25 cm. The soil profiles are well drained (Wetness Class I). These soils were formerly grouped in the Torbryan Series, but are now grouped in the Powys Series (i.e. brown rankers formed on brows and ridges). The location and extent of the Powys soils are shown on Figure 2. A photograph of the brashy surface at sample location 8 (Figure 1) is given as Plate 2 (overleaf).

Plate 2: Brashy surface at Sample Location 8 (Figure 1) – Powys Series

2.4.8 In order to substantiate topsoil texture determined during the ALC survey by hand-texturing, two samples of topsoil were collected over the Site (i.e. sample locations 1 and 17, Figure 1). The topsoil samples were sent to an accredited laboratory for analysis of particle size distribution (PSD), based on the British Standard Institution particle size grades. The findings of the PSD analysis are given in Table 2.2 and Appendix C.

Table 2.2: Topsoil Particle Size Distribution

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
1	31	35	34	Heavy Clay Loam
17	13	55	32	Heavy Silty Clay Loam

2.5 Interactive Limitations

2.5.1 From the published information above, together with the findings of the detailed soil survey, it has been determined that the quality of agricultural land at the Site is limited mainly by soil wetness/workability.

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*'. Agricultural land quality at the Site is limited by soil wetness as per 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	Sandy Clay Loam/Medium Clay Loam*	3a
	Heavy Silty Clay Loam, Heavy Clay Loam**	**3b**
	Sandy Clay/Silty Clay/Clay	3b

Key

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

2.5.3 Therefore, soil profiles on Site with heavy clay loam or heavy silty clay loam topsoil, and which are placed in Wetness Class I, are limited by soil wetness to Subgrade 3b in this climate area with a high number of field capacity days (i.e. 242 FCD).

2.6 ALC Grading at the Site

2.6.1 The detailed ALC survey carried out as part of this investigation in September 2016 has determined that the quality of agricultural land at the Site is limited mainly by soil wetness / workability limitations to Subgrade 3b (moderate good quality) on well drained, brown, heavy clay loam to heavy silty clay loams over shattered rock within 100cm (Denbigh Series).

2.6.2 In the north to north-west, the quality of the land is also limited to Subgrade 3b (moderate quality) by gradient (i.e. where the gradient of the slopes is >7° and up to 11°).

2.6.3 The quality of agricultural land in the central part of the Site (corresponding with soils in the Powys series, Figure 2) is limited by the shallow depth of soil over fragmented limestone, coupled with very brashy (rocky) soil, i.e. 36% to 70% hard limestone. These profiles are limited by soil depth, stone content and soil droughtiness. An overall classification of Grade 4 (poor quality) is given due to the high stone content in the topsoil (re Table 5 'Grade according to stoniness' of the ALC Guidelines).

2.6.4 The quality of agricultural land in a small area of shallow, brashy Powys soil in the south-west (sample location 19, Figure 1) is also limited by soil depth, stone content and soil droughtiness to Grade 4 (poor quality).

2.6.5 A farm track, crossing the Site from the north to south-east, is classified as non-agricultural land.

2.6.6 The spatial distribution of Agricultural Land Classification (ALC) grades determined by the detailed ALC survey is shown on Figure 3, and the area of land within each ALC grade is given in Table 2.4.

Table 2.4: Agricultural Land Classification – Agroforestry Site, Dartington Hall, Devon

ALC Grade	Area (Ha)	Area (%)
Grade 1 (Excellent)	0	0
Grade 2 (Very Good)	0	0
Subgrade 3a (Good)	0	0
Subgrade 3b (Moderate)	17.7	88.5
Grade 4 (Poor)	2.0	10.0
Grade 5 (Very Poor)	0	0
Other Land / Non-agricultural	0.3	1.5
Total	**20.0**	**100**

3 TOPSOIL NUTRIENT ASSESSMENT

3.1 Nutrient Status

3.1.1 As described in Section 1.0, a total of 9 samples of topsoil were sent to an accredited laboratory for analysis of the following chemical parameters: pH, available phosphorus, potassium, magnesium and total nitrogen. A certificate of Analysis is given as Appendix C, and the laboratory results are given in Table 3.1. A brief interpretation of the findings is given in Section 3.0 of this report.

Table 3.1: Analysis of Nutrients in Topsoil at Agroforestry Site, Dartington Hall

Topsoil Sample Location (See Fig. 1)	pH (1:2.5 water)	Available Phosphorus mg/l (index)	Available Potassium mg/l (index)	Available Magnesium mg/l (index)	Total Nitrogen % w/w	Organic Matter (LOI) % w/w
1	5.9	20.4 (2)	124 (2-)	154 (3)	0.31	6.3
3	5.5	23.6 (2)	179 (2-)	147 (3)	0.19	4.3
5	6.4	9.0 (0)	146 (2-)	127 (3)	0.24	4.8
7	5.9	12.8 (1)	92.8 (1)	101 (3)	0.23	4.3
9	7.3	25.0 (2)	122 (2-)	90.1 (2)	0.25	5.2
10	6.3	13.6 (1)	96.3 (1)	121 (3)	0.24	5.6
12	6.2	27.4 (3)	119 (1)	129 (3)	0.22	4.7
14	6.6	27.7 (3)	151 (2-)	286 (5)	0.33	7.2
17	5.9	12.4 (1)	132 (2-)	117 (3)	0.23	5.2

4 BRIEF INTERPRETATION OF RESULTS

4.1 Introduction

4.1.1 A brief interpretation of the nutrient status of the topsoil samples against the British Standard for Topsoil (BS3882, 2007) is made below.

4.2 Available Phosphorus

4.2.1 Laboratories in England and Wales which analyse topsoil for nutrient status routinely classify laboratory results given in mg/l as indices (re Appendix 4, Defra 'Fertilizer Manual' (2010), see Section 4.7 below). The classification of extractable phosphorus (mg/l, Olsen) into indices is given in Table 4.1 below.

Table 4.1: Defra Index for Olsen's Phosphorus (P)

Index	Olsen's P (mg/l)
0	0-9
1	10-15
2	16-25
3	26-45
4	46-70
5	71-100
6	101-140
7	141-200
8	201-280
9	>280

4.2.2 As shown in Table 4.1 (above), the British Standard for Topsoil (BS 3882:2007) uses Index 1 for extractable phosphorus (Olsen) (i.e. 15 mg/l or below) as a measure of 'low fertility' in topsoil.

4.2.3 Topsoil sample 5 has a phosphorus value of 9.0 mg/l (Index 0). This is considered to be of 'low fertility' with regard to phosphorus.

4.2.4 The topoil samples 1, 3, 7, 9, 10, and 17 have phosphorus values ranging between 12.4 mg/l (Index 1) to 23.6 mg/l (Index 2) are considered to be of 'low to medium fertility' with regard to phosphorus.

4.2.5 The topsoil samples 12 and 14 are considered to be of 'medium to high fertility' in terms of phosphorus, i.e. range 27.4 mg/l (Index 3) and 27.8 mg/l (Index 3).

4.3 Available Potassium

4.3.1 From BS3882, topsoil with values of extractable potassium (K) of less than 120 mg/l are considered to be of 'low fertility'; this includes topsoil sample 10 (96.3 mg/l)

4.3.2 The remainder of the topsoil sample are considered to be of moderate fertility in terms of potassium, i.e. index 1 to 2-.

4.4 Available Magnesium

4.4.1 From BS3882, topsoil with values of extractable magnesium (Mg) of between 51 mg/l to 600 mg/l are considered to be adequately supplied for 'multi-purpose' topsoil. Therefore, all of the topsoil samples are considered to be adequately supplied with magnesium with regard to BS3882.

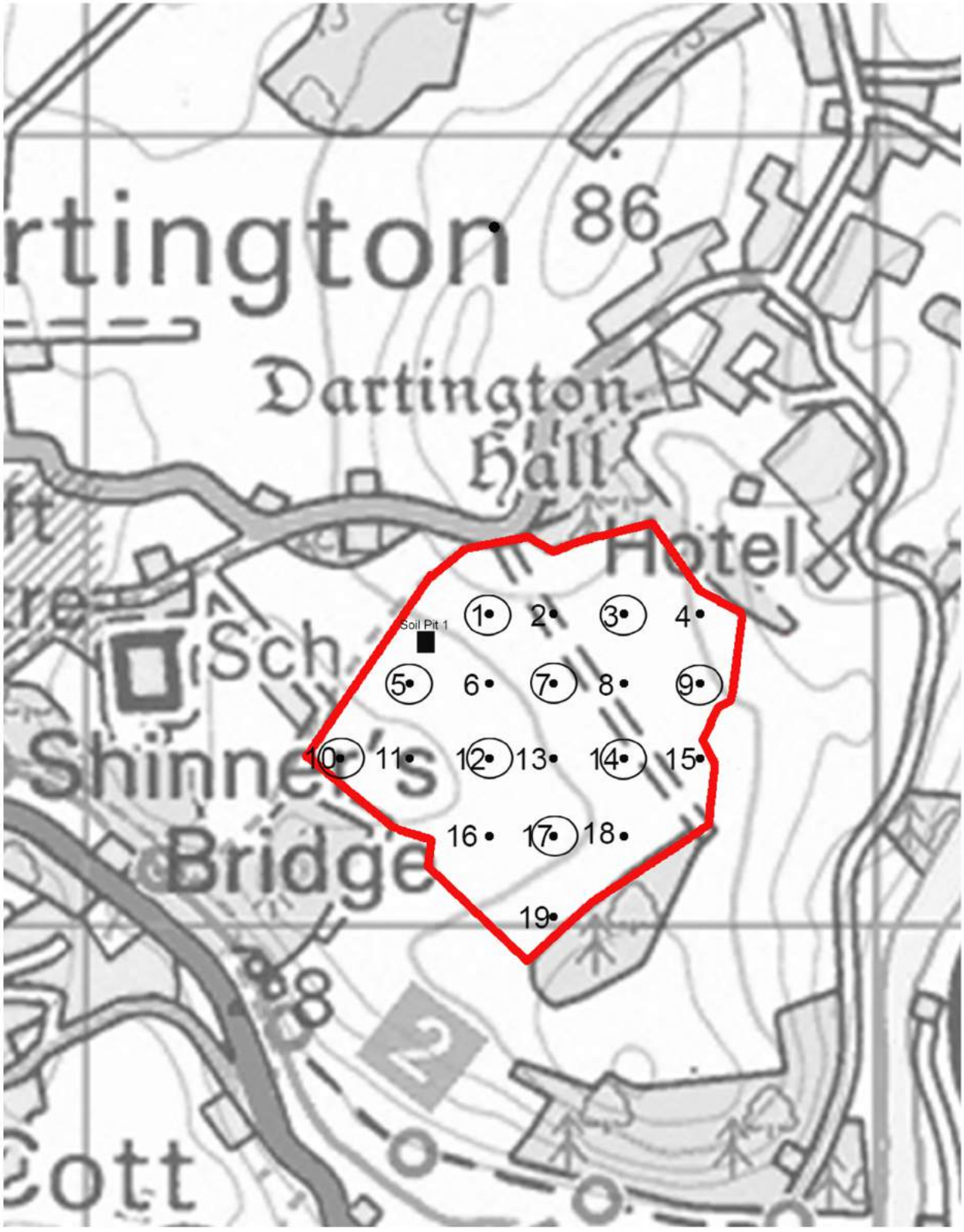
4.5 Total Nitrogen

4.5.1 From BS3882, topsoil with values with 0.2 % w/w or above are considered to be adequately supplied for 'multi-purpose topsoil'. Therefore, all the topsoil samples are considered to be adequately supplied with nitrogen with regard to BS3882.

4.6 Fertilizer Recommendations for Agricultural and Horticultural Crops (RB209)

4.6.1 The interpretation above has been made against the British Standard for Topsoil (BS3882). For specific fertilizer recommendations for agricultural and horticultural crops, it is recommended that guidance be sought from an agronomist, or consideration is given to 'Fertilizer Recommendations for Agricultural and Horticultural Crops' (RB209), available online at https://www.gov.uk/guidance/managing-nutrients-and-fertilisers#fertiliser-recommendations-for-agricultural-and-horticultural-crops-rb209.

Figures



Site boundary

Auger location point

Auger & Topsoil Sample

Soil Pit

N

Client

Dartington Hall

Project No C528

Dwg. No 1

Scale NTS

Date 2/11/2016

Drawn By RWA

Figure 1:

Sample Locations

Project Name

Dartington Estate, Agroforestry Site

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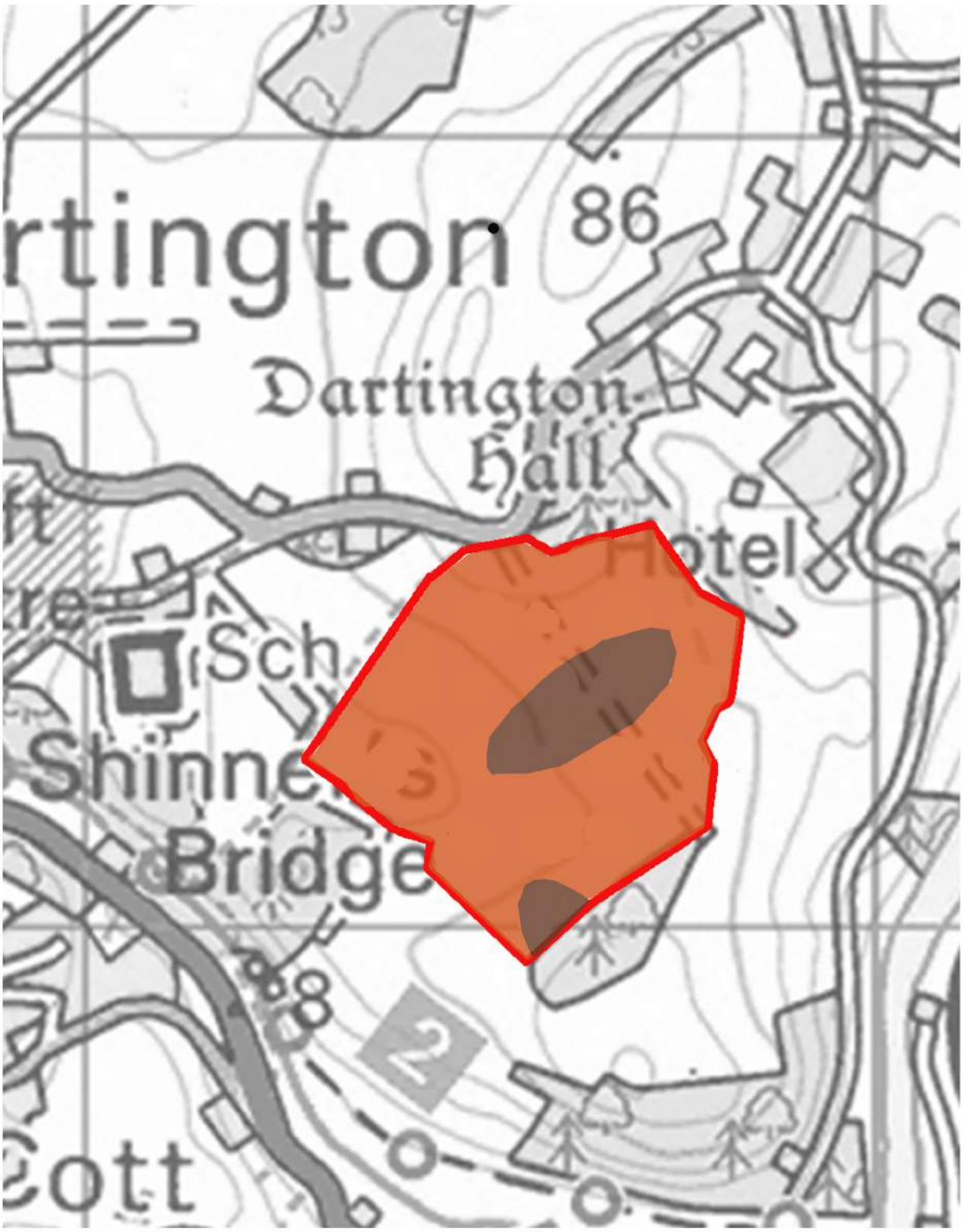

Denbigh

Powys

Site boundary

N

Client
Dartington Hall

Figure 2:
Soil Series

Project Name
Dartington Estate, Agroforestry Site

Project No	C528
Dwg. No	3
Scale	NTS
Date	2/11/2016
Drawn By	RWA

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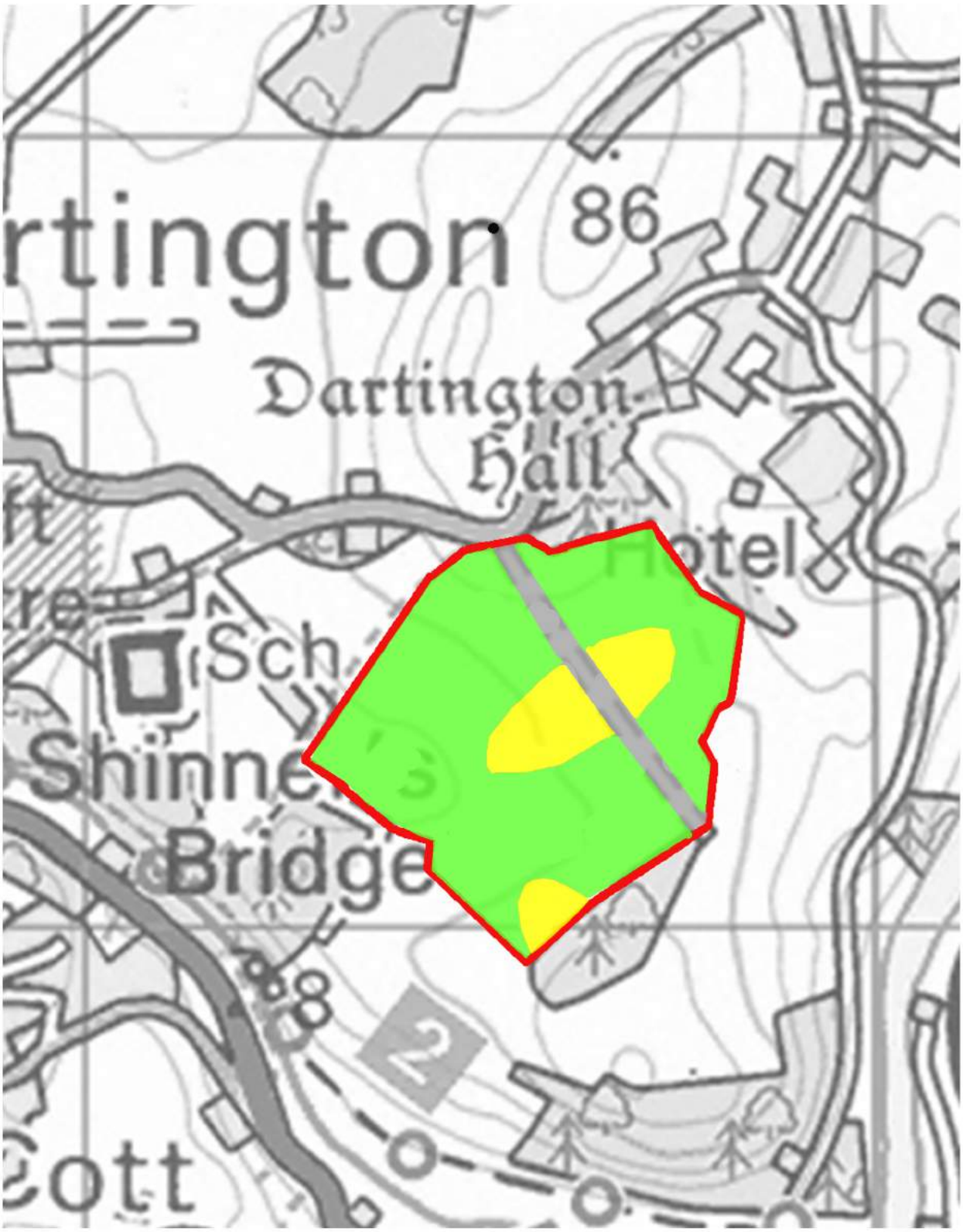

ALC Grade

- Grade 1
- Grade 2
- Subgrade 3a
- Subgrade 3b
- Grade 4
- Grade 5
- Other land

Site boundary

N

Client
Dartington Hall

Project No C528
Dwg. No 2
Scale NTS
Date 2/11/2016
Drawn By RWA

Figure 3:
Agricultural Land Classification

Project Name
Dartington Estate, Agroforestry Site

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Appendix A:
IPSS Professional Competency Scheme Doc. 2 – Agricultural Land Classification

DOCUMENT 2

Agricultural Land Classification (England and Wales)

Background

The evaluation of land for its agricultural potential in England and Wales[1] is accomplished by application of the Agricultural Land Classification[2] (ALC). Professional competence in Agricultural Land Classification builds upon foundation skills in field soil investigation, description and interpretation (IPSS PCSS Document 1). This system of professional competence is based upon a detailed written procedures document developed by the Farming and Rural Conservation Agency[3].

Qualifications

Professional soil scientists with competence in Agricultural Land Classification will have graduated in a relevant science subject. They will also have a number of years of relevant field experience and will have, or be adequately qualified for, membership of a relevant professional body such as the Institute of Professional Soil Scientists.

Minimum competencies

Skills and Knowledge:

These are described under a number of subheadings that relate to different tasks. A professionally competent contractor should have the skills and knowledge identified under the **General heading** and **all other headings that are relevant** to the tasks required.

General

1. A general knowledge and understanding of natural soil development and of world, European and national soil taxonomy
2. A detailed knowledge and understanding of the Agricultural Land Classification system relevant to the site and of the classification of land according to the current published Guidelines and other documents[1,2,] and the ability to apply it accurately and consistently in the classification of an area of land

[1] Similar systems are employed in Scotland and Northern Ireland

[2] ALC Revised Guidelines and Criteria for the Grading the Quality of Agricultural Land (MAFF, 1988) and Climatological Datasets for ALC (Met. Office, 1989)

[3] A former Executive Agency of the Ministry of Agriculture , Fisheries and Food (now Defra)

DOCUMENT 2

Agricultural Land classification (England and Wales)

Institute of Professional Soil Scientists

3. An awareness and knowledge of existing published and unpublished, paper-based and digital ALC information and sources
4. A knowledge of paper and digital topographic, geology and soil maps, mineral assessment reports and memoirs and other technical sources of reference; and of their role in ALC work
5. An understanding of map scales and of the Ordnance Survey National Grid
6. The ability to investigate, sample, describe and interpret soils in the field in a consistent manner and to professional standards (IPSS PCSS Document 1)
7. Knowledge of relevant European and national regulations and policies including national and local land use planning policy and guidance, and soil protection policy
8. The ability to effectively communicate soil information in a simple and relevant form to developers, planners and other relevant professionals with clear statements as to the reliability and certainty of the results
9. The ability to write accurate, concise reports in clear English and in line with best practice examples of ALC survey that communicate the relevant information to all relevant communicants
10. An awareness of the importance of systems of quality assurance and control in all aspects of professional work

Preparations prior to field survey

1. The ability to compile background site physical data (e.g. relief, geology, soils, climate, flood-risk, exposure and grade from published and unpublished sources) and understanding of the limitations of the data obtained
2. An understanding of scale and of how different survey sampling densities may impact on the certainty of results obtained. A knowledge of how to tailor survey density appropriately to the requirements of the client, and understanding of the limitations that might impose
3. The ability to compute gradients from map contours
4. A thorough knowledge of climatic data interpolation procedures (and any available associated bespoke computer software), and the ability to obtain representative site values
5. An understanding of soil maps, the concepts of soil associations and soil series and their limitations as a background to ALC grading
6. A knowledge of GPS and data logger technology and its uses and limitations for field survey work
7. A knowledge and understanding of relevant Health and Safety legislation requirements for work in the field
8. An understanding of basic biosecurity requirements and any animal or plant health restrictions which may be in force

Field survey for Agricultural Land Classification

1. The ability to determine, lay out and work to a relevant sampling strategy
2. Competency in the Foundation Skills (field soil investigation, sampling, description and interpretation) as per IPSS PCSS Document 1
3. The ability to accurately and consistently apply the ALC system to soil and other data collected during the field survey

Reporting

1. The knowledge and ability to compile an ALC map from background information and data collected during the field survey
2. The ability to write an ALC survey report according to an agreed format
3. Understanding of the principles of quality assurance and the ability to apply these as required by the client
4. The ability to convey the findings of the survey verbally such that they are understood by the client

SUPPORTING ORGANISATIONS

The following organisations have given their support to the Institute of Professional Soil Scientist's Working with Soils Professional Competency Initiative:

iPSS
Institute of Professional Soil Scientists

'Defra welcomes initiatives, such as the IPSS Working with Soils Competency Statements, that aim to improve the quality of professional soils advice'

ADAS

afbi Agri-Food and Biosciences Institute

AHDB Agriculture & Horticulture Development Board

AICC Association of Independent Crop Consultants

National Parks Britain's breathing spaces
Parciau Cenedlaethol Prydain
Na Pàircean Nàiseanta na h-Alba

BALI British Association of Landscape Industries

BIAC

CEH Centre for Ecology & Hydrology
Natural Environment Research Council

CIWEM

The co-operative farms

CPRE Campaign to Protect Rural England
Standing up for your countryside

Cresswell
a Hyder Consulting group company

Earthcare Technical

Asiantaeth yr Amgylchedd Cymru
Environment Agency Wales

ENPAA English National Park Authorities Association

FWAG Farming & Wildlife Advisory Group

Comisiwn Coedwigaeth Cymru
Forestry Commission Wales

Game & Wildlife Conservation Trust

Greenvale AP
Natural choice for fresh potatoes

IAgrE

iema
Institute of Environmental Management & Assessment

The James Hutton Institute

Landscape Institute
Inspiring great places

Land Research Associates

defra
Department for Environment Food and Rural Affairs

SUPPORTING ORGANISATIONS

The following organisations have given their support to the Institute of Professional Soil Scientist's Working with Soils Professional Competency Initiative:

IPSS
Institute of Professional Soil Scientists

'Defra welcomes initiatives, such as the IPSS Working with Soils Competency Statements, that aim to improve the quality of professional soils advice'

LEAF
LINKING ENVIRONMENT AND FARMING
Integrated Farm Management

NIAB TAG

NFU

National Trust

NATURAL ENGLAND

PRODUCE WORLD
GROWING TRUST

ROTHAMSTED RESEARCH

Royal Agricultural College

ROYAL AGRICULTURAL SOCIETY of ENGLAND

SAC

Sainsbury's

SALMON & TROUT ASSOCIATION

SEPA
Scottish Environment Protection Agency

SOCIETY OF Biology

Soil Association

SNIFFER
SCOTLAND & NORTHERN IRELAND FORUM FOR ENVIRONMENTAL RESEARCH

The Scottish Government

the SCIENCE council

THE wildlife TRUSTS

TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

TOPSOIL The Sustainable Choice from British Sugar

Unilever

Llywodraeth Cymuliad Cymru
Welsh Assembly Government

Waitrose

wrap Working together for a world without waste

Appendix B:
Natural England
Technical Information Note 049 –
Agricultural Land Classification

Natural England Technical Information Note TIN049

Agricultural Land Classification: protecting the best and most versatile agricultural land

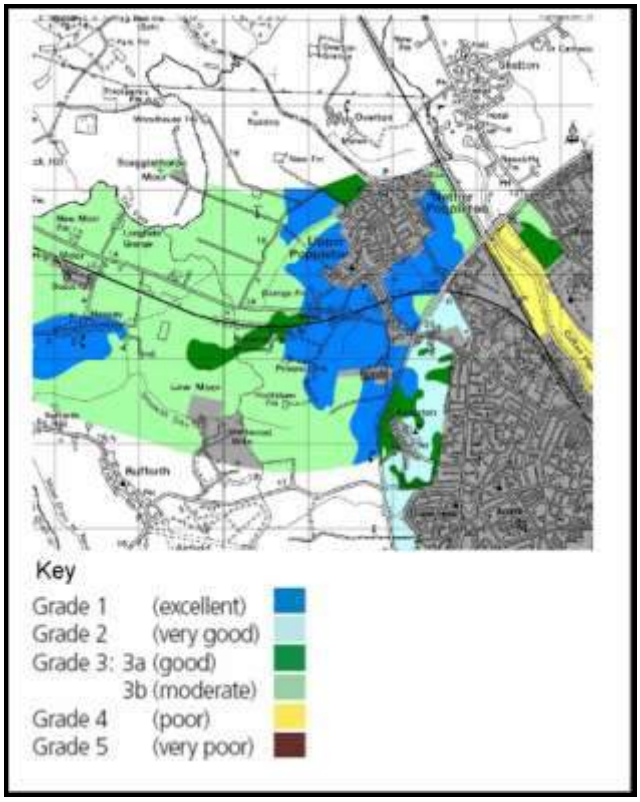
Most of our land area is in agricultural use. How this important natural resource is used is vital to sustainable development. This includes taking the right decisions about protecting it from inappropriate development.

Policy to protect agricultural land

Government policy for England is set out in the National Planning Policy Framework (NPPF) published in March 2012 (paragraph 112). Decisions rest with the relevant planning authorities who should take into account the economic and other benefits of the best and most versatile agricultural land. Where significant development of agricultural land is demonstrated to be necessary, local planning authorities should seek to use areas of poorer quality land in preference to that of higher quality. The Government has also re-affirmed the importance of protecting our soils and the services they provide in the Natural Environment White Paper The Natural Choice:securing the value of nature (June 2011), including the protection of best and most versatile agricultural land (paragraph 2.35).

The ALC system: purpose & uses

Land quality varies from place to place. The Agricultural Land Classification (ALC) provides a method for assessing the quality of farmland to enable informed choices to be made about its future use within the planning system. It helps underpin the principles of sustainable development.



Agricultural Land Classification - map and key

Second edition 19 December 2012
www.naturalengland.org.uk

The ALC system classifies land into five grades, with Grade 3 subdivided into Subgrades 3a and 3b. The best and most versatile land is defined as Grades 1, 2 and 3a by policy guidance (see Annex 2 of NPPF). This is the land which is most flexible, productive and efficient in response to inputs and which can best deliver future crops for food and non food uses such as biomass, fibres and pharmaceuticals. Current estimates are that Grades 1 and 2 together form about 21% of all farmland in England; Subgrade 3a also covers about 21%.

The ALC system is used by Natural England and others to give advice to planning authorities, developers and the public if development is proposed on agricultural land or other greenfield sites that could potentially grow crops. The Town and Country Planning (Development Management Procedure) (England) Order 2010 (as amended) refers to the best and most versatile land policy in requiring statutory consultations with Natural England. Natural England is also responsible for Minerals and Waste Consultations where reclamation to agriculture is proposed under Schedule 5 of the Town and Country Planning Act 1990 (as amended). The ALC grading system is also used by commercial consultants to advise clients on land uses and planning issues.

Criteria and guidelines

The Classification is based on the long term physical limitations of land for agricultural use. Factors affecting the grade are climate, site and soil characteristics, and the important interactions between them. Detailed guidance for classifying land can be found in: *Agricultural Land Classification of England and Wales: revised guidelines and criteria for grading the quality of agricultural land* (MAFF, 1988):

- **Climate:** temperature and rainfall, aspect, exposure and frost risk.
- **Site:** gradient, micro-relief and flood risk.
- **Soil:** texture, structure, depth and stoniness, chemical properties which cannot be corrected.

The combination of climate and soil factors determines soil wetness and droughtiness. Wetness and droughtiness influence the choice of crops grown and the level and consistency of yields, as well as use of land for grazing livestock. The Classification is concerned with the inherent potential of land under a range of farming systems. The current agricultural use, or intensity of use, does not affect the ALC grade.

Versatility and yield

The physical limitations of land have four main effects on the way land is farmed. These are:

- the range of crops which can be grown;
- the level of yield;
- the consistency of yield; and
- the cost of obtaining the crop.

The ALC gives a high grading to land which allows more flexibility in the range of crops that can be grown (its 'versatility') and which requires lower inputs, but also takes into account ability to produce consistently high yields of a narrower range of crops.

Availability of ALC information

After the introduction of the ALC system in 1966 the whole of England and Wales was mapped from reconnaissance field surveys, to provide general strategic guidance on 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 in the period 1967 to 1974. 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 and can be downloaded from the Natural England **website**. This data is also available on ‘Magic’, an interactive, geographical information website **http://magic.defra.gov.uk/**.

Since 1976, selected areas have been re-surveyed in greater detail and to revised

guidelines and criteria. Information based on detailed ALC field surveys in accordance with current guidelines (MAFF, 1988) is the most definitive source. Data from the former Ministry of Agriculture, Fisheries and Food (MAFF) archive of more detailed ALC survey information (from 1988) is also available on **http://magic.defra.gov.uk/**. Revisions to the ALC guidelines and criteria have been limited and kept to the original principles, but some assessments made prior to the most recent revision in 1988 need to be checked against current criteria. More recently, strategic scale maps showing the likely occurrence of best and most versatile land have been prepared. Mapped information of all types is available from Natural England (see *Further information* below).

New field survey

Digital mapping and geographical information systems have been introduced to facilitate the provision of up-to-date information. ALC surveys are undertaken, according to the published Guidelines, by field surveyors using handheld augers to examine soils to a depth of 1.2 metres, at a frequency of one boring per hectare for a detailed assessment. This is usually supplemented by digging occasional small pits (usually by hand) to inspect the soil profile. Information obtained by these methods is combined with climatic and other data to produce an ALC map and report. ALC maps are normally produced on an Ordnance Survey base at varying scales from 1:10,000 for detailed work to 1:50 000 for reconnaissance survey

There is no comprehensive programme to survey all areas in detail. Private consultants may survey land where it is under consideration for development, especially around the edge of towns, to allow comparisons between areas and to inform environmental assessments. ALC field surveys are usually time consuming and should be initiated well in advance of planning decisions. Planning authorities should ensure that sufficient detailed site specific ALC survey data is available to inform decision making.

Consultations

Natural England is consulted by planning authorities on the preparation of all development plans as part of its remit for the natural environment. For planning applications, specific consultations with Natural England are required under the Development Management Procedure Order in relation to best and most versatile agricultural land. These are for non agricultural development proposals that are not consistent with an adopted local plan and involve the loss of twenty hectares or more of the best and most versatile land. The land protection policy is relevant to all planning applications, including those on smaller areas, but it is for the planning authority to decide how significant the agricultural land issues are, and the need for field information. The planning authority may contact Natural England if it needs technical information or advice.

Consultations with Natural England are required on all applications for mineral working or waste disposal if the proposed afteruse is for agriculture or where the loss of best and most versatile agricultural land agricultural land will be 20 ha or more. Non-agricultural afteruse, for example for nature conservation or amenity, can be acceptable even on better quality land if soil resources are conserved and the long term potential of best and most versatile land is safeguarded by careful land restoration and aftercare.

Other factors

The ALC is a basis for assessing how development proposals affect agricultural land within the planning system, but it is not the sole consideration. Planning authorities are guided by the National Planning Policy Framework to protect and enhance soils more widely. This could include, for example, conserving soil resources during mineral working or construction, not granting permission for peat extraction from new or extended mineral sites, or preventing soil from being adversely affected by pollution. For information on the application of ALC in Wales, please see below.

Further information

Details of the system of grading can be found in: *Agricultural Land Classification of England and Wales: revised guidelines and criteria for grading the quality of agricultural land* (MAFF, 1988).

Please note that planning authorities should send all planning related consultations and enquiries to Natural England by e-mail to **consultations@naturalengland.org.uk**. If it is not possible to consult us electronically then consultations should be sent to the following postal address:

Natural England
Consultation Service
Hornbeam House
Electra Way
Crewe Business Park
CREWE
Cheshire
CW1 6GJ

ALC information for Wales is held by Welsh Government. Detailed information and advice is available on request from Ian Rugg (**ian.rugg@wales.gsi.gov.uk**) or David Martyn (**david.martyn@wales.gsi.gov.uk**). If it is not possible to consult us electronically then consultations should be sent to the following postal address:

Welsh Government
Rhodfa Padarn
Llanbadarn Fawr
Aberystwyth
Ceredigion
SY23 3UR

Natural England publications are available to download from the Natural England website: **www.naturalengland.org.uk**.

For further information contact the Natural England Enquiry Service on 0300 060 0863 or e-mail **enquiries@naturalengland.org.uk**.

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Appendix C:
Laboratory Certificate of Analysis

ANALYTICAL REPORT

Report Number	**33063-16**	**N717**
Date Received	**22-SEP-2016**	
Date Reported	**27-SEP-2016**	
Project	**SOIL**	
Reference	**ROB ASKEW**	
Order Number		

Laboratory Reference		**SOIL320188**	**SOIL320189**	**SOIL320190**	**SOIL320191**	**SOIL320192**	**SOIL320193**	**SOIL320194**			
Sample Reference		**T3**	**T5**	**T7**	**T9**	**T10**	**T12**	**T14**			
Determinand	**Unit**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**			
pH water [1:2.5]		5.5	6.4	5.9	7.3	6.3	6.2	6.6			
Available Phosphorus (Index)	mg/l	23.6 (2)	9.0 (0)	12.8 (1)	25.0 (2)	13.6 (1)	27.4 (3)	27.8 (3)			
Available Potassium (Index)	mg/l	179 (2-)	146 (2-)	92.8 (1)	122 (2-)	96.3 (1)	119 (1)	151 (2-)			
Available Magnesium (Index)	mg/l	147 (3)	127 (3)	101 (3)	90.1 (2)	121 (3)	129 (3)	286 (5)			
Organic Matter LOI	% w/w	4.3	4.8	4.3	5.2	5.6	4.7	7.2			
Total Nitrogen	% w/w	0.19	0.24	0.23	0.25	0.24	0.22	0.33			

Notes

Analysis Notes

The sample submitted was of adequate size to complete all analysis requested.
The results as reported relate only to the item(s) submitted for testing.
The results are presented on a dry matter basis unless otherwise stipulated.

Reported by

Darren Whitbread

Natural Resource Management, a trading division of Cawood Scientific Ltd.
Coopers Bridge, Braziers Lane, Bracknell, Berkshire, RG42 6NS
Tel: 01344 886338
Fax: 01344 890972
email: enquiries@nrm.uk.com

ANALYTICAL REPORT

Report Number	**32997-16**	**N717**	**Client C528 DARTINGTON ESTATE**
Date Received	**22-SEP-2016**		
Date Reported	**27-SEP-2016**		
Project	**SOIL**		
Reference	**DARTINGTON ESTATE**		
Order Number			

Laboratory Reference		**SOIL320128**	**SOIL320129**
Sample Reference		**T1**	**T17**
Determinand	**Unit**	**SOIL**	**SOIL**
pH water [1:2.5]		5.9	5.9
Available Phosphorus (Index)	mg/l	20.4 (2)	12.4 (1)
Available Potassium (Index)	mg/l	124 (2-)	132 (2-)
Available Magnesium (Index)	mg/l	154 (3)	117 (3)
Sand 2.00-0.063mm	% w/w	31	13
Silt 0.063-0.002mm	% w/w	35	55
Clay <0.002mm	% w/w	34	32
Organic Matter LOI	% w/w	6.3	5.2
Total Nitrogen	% w/w	0.31	0.23
Textural Class **		HCL	HZCL

Notes

Analysis Notes

The sample submitted was of adequate size to complete all analysis requested.
The results as reported relate only to the item(s) submitted for testing.
The results are presented on a dry matter basis unless otherwise stipulated.

** Please see the attached document for the definition of textural classes.

Reported by

Darren Whitbread

Natural Resource Management, a trading division of Cawood Scientific Ltd.
Coopers Bridge, Braziers Lane, Bracknell, Berkshire, RG42 6NS
Tel: 01344 886338
Fax: 01344 890972
email: enquiries@nrm.uk.com

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.