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AGRICULTURAL LAND CLASSIFICATION

BARNARD GATE, NEAR FREELAND,

OXFORDSHIRE

Reconnaissance Survey

Ministry of
Agriculture
Fisheries
and Food

AGRICULTURAL LAND CLASSIFICTION
BARNARD GATE, NEAR FREELAND, OXFORDSHIRE
RECONNAISSANCE SURVEY

1. BACKGROUND

1.1 This 265.5 ha site was surveyed in connection with proposals for the development of a new settlement. The site lies to the north-west of Oxford, its far southern boundary being close to the A40 at Barnard Gate. The northern boundary is located adjacent to the village of Freeland, which forms part of the eastern boundary along with a minor road. Eynsham Park marks much of the western boundary of the site.

1.2 The site was inspected during November 1991 using 120 cm Dutch soil augers. Samples were taken on a regular grid basis at intervals of approximately 200 m. A number of soil inspection pits were examined to enable more detailed soil description.

Land-use

1.3 At the time of survey the majority of the site in agricultural use was given over to winter cereals, although smaller areas were under permanent pasture. A significant proportion of the area surveyed was woodland. An area associated with Freeland House was not surveyed.

2. PHYSICAL FACTORS AFFECTING LAND QUALITY

Relief

2.1 The site lies at an altitude between 75 m and 105 m A.O.D. The land rises gently from south to north across the site, the highest land occurring to the west of Freeland and the lowest land occurring around Barnard Gate and east of here around Acre Hill Farm. Nowhere on the site does altitude or gradient represent a limitation to the agricultural land quality.

Climate

2.2 Estimates of climatic variables were obtained by interpolation from a 5 km grid point database, (Met. Office, 1989) for a representative location in the survey area. Variables are adjusted for altitude.

Climatic Interpolation

Grid Reference	SP41501120	SP41601230
Altitude (m, A.O.D)	76	104
Average Annual Rainfall (mm)	682	700
Accumulated Temperature (° days, Jan-June)	1427	1394
Field Capacity Days	148	151
Moisture deficit, wheat (mm)	105	100
Moisture deficit, potatoes (mm)	97	91

2.3 The important parameters in assessing an overall climate limitation are, average annual rainfall, (a measure of overall wetness), and accumulated temperature, (an indication of the cumulative build up of warmth available for crop growth from January to June). At this locality there is no overall climatic limitation, although the climatic regime is relatively warm and dry in terms of the national situation. The site is not expected to be frost-prone or exposed.

Although there is no overall climate limitation acting on this site, climatic factors may act in combination with soil factors to give rise to interactive limitations, namely soil wetness and droughtiness.

Geology and Soils

2.4 Sheet 236 of The Institute of Geological Sciences, (1982), shows a complex pattern of geological deposits in this area. Much of the north-western part of the site is shown to be underlain by Glacial sand and gravel deposits. These have also been mapped as a localised unit to the west of Castles Copse. The remainder of the site is shown to be underlain by Oxford Clay, with the exception of small areas of Kellaways Sand, west of Little Green Farm and east of Bowles Farm.

2.5 Soil Survey of England and Wales, Sheet 6, (1983), shows the site to comprise two major soil associations. Across the northern part of the site, Essendon soils have developed from the Glacial Sand and gravel deposits, whilst soils of the Denchworth association have been mapped across the southern part of the site in conjunction with the Oxford Clay deposits. The Essendon association is described as, 'flinty coarse over clayey paleo-argillic stagnogley soils with slowly permeable subsoils', (SSEW, 1984), whilst the Denchworth association is described as, 'wet, clayey pelo-stagnogley soils', (SSEW, 1984).

2.6 Detailed field examination of the site indicates the presence of two soil groups which broadly correspond with those described by the Soil Survey of England and Wales.

2.7 Across much of the north of the site, soils which have developed in association with Glacial sand and gravel deposits were found to occur. In general terms, profiles tend to be sandy and gravelly, and often become impenetrable to soil auger over gravel

at variable depths. More specifically, profiles comprise very slightly to moderately stony (ie, 2% - 25% v/v total flints) medium or sandy clay loam, or occasionally heavy clay loam topsoils, all of which are non-calcareous. These overlie subsoils which are generally heavier, typically clay or sandy clay and which contain 2-25% v/v total flints in common with the topsoil. Profiles pass to similar textures in the lower subsoil, although some become more sandy below about 60-70 cm, passing to sandy clay loam, medium sandy loam or loamy medium sand. Commonly stone contents increase with depth up to 70% v/v flints and profiles often become impenetrable, (to soil auger), between 55 and 95 cm over gravelly horizons.

The drainage status of this soil group is variable, ranging from wetness class II - IV depending on depth to gleying, (which typically occurs within the range 22-48 cm depth) and depth to slowly permeable clay or sandy clay, (which ranges from 32 cm to 48 cm). Not all profiles contain slowly permeable horizons although all are gleyed.

2.8 The second soil group is most extensive in terms of the total agricultural area surveyed and occurs across the southern part of the site in association with the Oxford Clay deposits. These soils are clayey and generally poorly drained and may occasionally become impenetrable, (to soil auger), over gravelly horizons. Profiles typically comprise non-calcareous heavy clay loam or occasionally medium or sandy clay loam topsoils. These may be free of stones or they may contain between 2% and 22% v/v total flints. Topsoils may overlie similar textures in the upper subsoil, but more usually pass directly to clay or sandy clay which is gleyed and slowly permeable. Profiles are mostly free of stones, although occasionally horizons may contain between 5% and 20% v/v total flints and occasionally profiles become impenetrable, (to soil auger), between 45 cm and 95 cm, as a result of gravelly horizons.

Soils assigned to this group are poorly drained, wetness class IV, or very occasionally III, being appropriate given the relatively shallow depths to gleyed and slowly permeable horizons.

3. AGRICULTURAL LAND CLASSIFICATION

3.1 The grading of this site is determined by interactions between soil and climatic factors, namely soil wetness and droughtiness. In addition, topsoil stone contents act to influence the land quality across parts of the site. ALC grades 3a and 3b have been mapped, the area and extent of which are given below.

Grade	Area (ha)	% Total agricultural land
3a	13.0	6%
3b	192.0	94%
Total agricultural area	205.0	100%
Non-agricultural	4.9	
Woodland	45.6	
Agricultural Buildings	2.2	
Urban	4.9	
Not surveyed	2.9	
Total area of site	265.5	

3.2 Appendix 1 gives a general description of the grades and sub-grades identified in this survey.

Grade 3a

3.3 This is defined as good quality agricultural land, (MAFF, 1988). It represents a small proportion of the land on this site and occurs as two discrete mapping units, which differ in terms of the soils observed and the limitations which are acting.

3.3.1 - Towards the centre of the site land has been graded 3a as a result of a combination of factors. The soils identified in this mapping unit are similar to those described in section 2.7. Profiles comprise medium or sandy clay loam topsoils over similar textures or sandy clay in the subsoil. Where moderately to very stony (ie, 15-70% v/v total flints) profiles occur the land is limited by a slight droughtiness restriction as a result of reduced reserves of water available for plant growth. Where topsoil stone contents of 10-15% v/v flints >2 cm occur this causes a limitation through the increased wear to farm machinery and reduced crop establishment, growth and quality. Where gleyed and slowly permeable horizons of sandy clay occur in the profile below 45 cm, (wetness class III), the land is limited by moderately poor drainage and workability restrictions. All of these limiting factors are acting singly or in combination to cause this land to be assigned to grade 3a.

3.3.2 - An area of grade 3a has been mapped towards the south of the site. Here the soils observed are similar to those described in section 2.8 and the overriding limitation to agricultural land quality is that of wetness. Medium or heavy clay loam topsoils and upper subsoils overlie gleyed and slowly permeable clay below 44-45 cm depth. Wetness class III has been assigned to these profiles accordingly. The moderately poor drainage and heavy textural condition of this land is likely to adversely affect plant growth, specifically seed germination and root development, and impose restrictions on cultivations or grazing by livestock due to the risk of soil structural damage.

Grade 3b

3.4 This is defined as moderate quality agricultural land, (MAFF, 1988). Land of this quality represents the majority of the area surveyed.

Soils described in both section 2.7 and 2.8 have been assigned to this grade. The limitations to the quality of this land are the same as those affecting grade 3a land, ie, wetness, droughtiness and topsoil stone content, but they are limiting to a greater extent. They may act singly or in combination.

The overriding limitation to land of this quality is that of wetness. Many profiles show evidence of impeded drainage in the form of gleying, typically between 22 and 48 cm, (occasional profiles have gleyed topsoils). Slowly permeable horizons occur within the same depth range. Profiles are thereby assigned to wetness class III or IV depending on the depth to gleying and slowly permeable horizons; this is generally higher in the profile than land graded 3a.
Profiles principally limited by wetness may also have topsoil stone contents in the range 6% - 15% >2 cm flints which would cause an additional, but less severe, limitation to the use of the land by way of increased implement wear and reduced crop establishment, growth and quality.

Less commonly land has been assigned to grade 3b solely on the basis of droughtiness and/or topsoil stone contents. A severe droughtiness limitation is apparent where moderately stony and shallow over gravelly horizons or sandy profiles occur, ie, towards the north of the site, principally to the north-west of Freeland House. Profiles contain 15-35% v/v flints throughout and are impenetrable over gravelly horizons, (containing about 70% v/v flints), at about 40 cm. Profiles may also contain horizons of sandy loam or loamy sand. The combination of these characteristics cause the soil moisture reserves to be very much reduced, thereby placing a severe drought stress on vegetation.

Very rarely, topsoil stone contents of 15% v/v flints >2 cm were found to occur. Such stoniness acts as a severe limitation to the agricultural use of the land for those reasons stated in section 3.3.1, and thereby causes land to be assigned to grade 3b.

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SOURCES OF REFERENCE

INSTITUTE OF GEOLOGICAL SCIENCES (1982), Sheet 236, Witney.

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

METEOROLOGICAL OFFICE (1989) Climatic datasets for agricultural land classification.

SOIL SURVEY OF ENGLAND AND WALES (1983) Sheet 6, Soils of South-East England.

SOIL SURVEY OF ENGLAND AND WALES (1984) Bulletin 15, Soils and their use in South-East England.

APPENDIX 1
DESCRIPTION OF THE GRADES AND SUBGRADES

The ALC grades and subgrades are described below in terms of the types of limitation which can occur, typical cropping range and the expected level and consistency of yield. In practice, the grades are defined by reference to physical characteristics and the grading guidance and cut-offs for limitation factors in Section 3 enable land to be ranked in accordance with these general descriptions. The most productive and flexible land falls into Grades 1 and 2 and Subgrade 3a and collectively comprises about one-third of the agricultural land in England and Wales. About half the land is of moderate quality in Subgrade 3b or poor quality in Grade 4. Although less significant on a national scale such land can be locally valuable to agriculture and the rural economy where poorer farmland predominates. The remainder is very poor quality land in Grade 5, which mostly occurs in the uplands.

Descriptions are also given of other land categories which may be used on ALC maps.

Grade 1 – excellent quality agricultural land

Land with no or very minor limitations to agricultural use. A very wide range of agricultural and horticultural crops can be grown and commonly includes top fruit, soft fruit, salad crops and winter harvested vegetables. Yields are high and less variable than on land of lower quality.

Grade 2 – very good quality agricultural land

Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural and horticultural crops can usually be grown but on some land in the grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable root crops. The level of yield is generally high but may be lower or more variable than Grade 1.

Grade 3 – good to moderate quality agricultural land

Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.

Subgrade 3a – good quality agricultural land

Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape, potatoes, sugar beet and the less demanding horticultural crops.

Subgrade 3b – moderate quality agricultural land

Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.

Grade 4 – poor quality agricultural land

Land with severe limitations which significantly restrict the range of crops and/or level of yields. It is mainly suited to grass with occasional arable crops (eg cereals and forage crops) the yields of which are variable. In moist climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land.

Grade 5 – very poor quality agricultural land

Land with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

Descriptions of other land categories used on ALC maps

Urban

Built-up or 'hard' uses with relatively little potential for a return to agriculture including: housing, industry, commerce, education, transport, religious buildings, cemeteries. Also, hard-surfaced sports facilities, permanent caravan sites and vacant land; all types of derelict land, including mineral workings which are only likely to be reclaimed using derelict land grants.

Non-agricultural

'Soft' uses where most of the land could be returned relatively easily to agriculture, including: golf courses, private parkland, public open spaces, sports fields, allotments and soft-surfaced areas on airports/airfields. Also active mineral workings and refuse tips where restoration conditions to 'soft' after-uses may apply.

Woodland

Includes commercial and non-commercial woodland. A distinction may be made as necessary between farm and non-farm woodland.

Agricultural buildings

Includes the normal range of agricultural buildings as well as other relatively permanent structures such as glasshouses. Temporary structures (eg polythene tunnels erected for lambing) may be ignored.

Open water

Includes lakes, ponds and rivers as map scale permits.

Land not surveyed

Agricultural land which has not been surveyed.

Where the land use includes more than one of the above land cover types, eg buildings in large grounds, and where map scale permits, the cover types may be shown separately. Otherwise, the most extensive cover type will usually be shown.

FIELD ASSESSMENT OF SOIL WETNESS CLASS

SOIL WETNESS CLASSIFICATION

Soil wetness is classified according to the depth and duration of waterlogging in the soil profile. Six revised soil wetness classes (Hodgson, in preparation) are identified and are defined in Table 11.

Table 11 Definition of Soil Wetness Classes

Wetness Class	Duration of Waterlogging[1]
I	The soil profile is not wet within 70 cm depth for more than 30 days in most years[2].
II	The soil profile is wet within 70 cm depth for 31-90 days in most years *or*, if there is no slowly permeable layer within 80 cm depth, it is wet within 70 cm for more than 90 days, but not wet within 40 cm depth for more than 30 days in most years.
III	The soil profile is wet within 70 cm depth for 91-180 days in most years *or*, if there is no slowly permeable layer within 80 cm depth, it is wet within 70 cm for more than 180 days,but only wet within 40 cm depth for between 31 and 90 days in most years.
IV	The soil profile is wet within 70 cm depth for more than 180 days but not within 40 cm depth for more than 210 days in most years *or*, if there is no slowly permeable layer within 80 cm depth, it is wet within 40 cm depth for 91-210 days in most years.
V	The soil profile is wet within 40 cm depth for 211-335 days in most years.
VI	The soil profile is wet within 40 cm depth for more than 335 days in most years.

[1] The number of days specified is not necessarily a continuous period.

[2] 'In most years' is defined as more than 10 out of 20 years.

Soils can be allocated to a wetness class on the basis of quantitative data recorded over a period of many years or by the interpretation of soil profile characteristics, site and climatic factors. Adequate quantitative data will rarely be available for ALC surveys and therefore the interpretative method of field assessment is used to identify soil wetness class in the field. The method adopted here is common to ADAS and the SSLRC.