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ADAS LAND MANAGEMENT SERVICES

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AGRICULTURAL LAND CLASSIFICATION

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STONEHILL AND STONEHILL GREEN FARMS

NEAR SWANLEY, KENT

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LAND AT STONEHILL AND STONEHILL GREEN FARMS NEAR SWANLEY, KENT

1. BACKGROUND

1.1 A detailed Agricultural Land Classification (ALC) survey of 185 acres (72 ha) at Stonehill and Stonehill Green Farms, Near Swanley was undertaken between 23 and 31 January 1989 on behalf of B.L. Gibson and Sons, Stonehill Green Farm, Birchwood Road, Wilmington, Dartford, Kent.

1.2 The Agricultural Land Classification 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 limitations can operate in one or more of four principal ways: they may affect the range of crops which can be grown, the level of yield, the consistency of yield and the cost of obtaining it. The classification system gives considerable weight to flexibility of cropping, whether actual or potential, but the ability of some land to produce consistently high yields of a somewhat narrower range of crops is also taken into account.

1.3 The principal physical factors influencing agricultural production are climate, site and soil. These factors together with interactions between them form the basis for classifying land into one of five grades; Grade 1 land being of excellent quality and Grade 5 land of very poor quality. Grade 3 which constitutes about half of the agricultural land in England and Wales, is now divided into two subgrades designated 3a and 3b. General descriptions of the grades and subgrades are given in Appendix 1.

1.4 Further details of the Agricultural Land Classification System are contained in the MAFF publication "Agricultural Land Classification of England and Wales - Revised guidelines and criteria for grading the quality of agricultural land" (MAFF, 1988).

1.5 In connection with the detailed ALC survey work at Stonehill and Stonehill Green Farms 71 auger borings were made over the site together with a number of soil inspection pits. At the time of survey the majority of the area was in arable/horticultural use with a small area of mainly ley grassland. Typical cropping includes cabbage, spring onions, leeks and lettuce. Mains irrigation water is available and can supply the whole site as required.

2. PHYSICAL FACTORS AFFECTING LAND QUALITY

Climate

2.1 Swanley is an area of low rainfall by national standards with the site having an estimated average annual rainfall of 592-614 mm (23.3"-24.2") (Met. Office, 1988). The accumulated temperature*, a measure of the relative warmth of the locality, is expected to lie in the range of 1408-1443 day degrees (Met Office, 1988), values which are typical of much of south east England. The site has between 119 and 123 field capacity days, which provides a measure of the effect climate on the soil water regime. The values for the site are very low in a national context and further reflect the dry climate of the area. Crop adjusted moisture deficits are relatively high at this location with values for wheat and potatoes of 112-119 mm and 106-111 mm respectively. The site is unlikely to be especially frost-prone or exposed.

2.2 In overall terms, climatic factors per se place no limitations in terms of the agricultural land quality of the site.

Relief

2.3 The site lies at altitudes of 55 m to 86 m above ordnance datum. The lowest land occurs towards the north east corner of the site and forms part of a shallow valley running north-eastwards from the buildings at Stonehill Green. The majority

* Median accumulated temperature above $0^{\circ}C$, April to September.

of the land lies above 65 m A.O.D., with the highest land (ie that above 75 m A.O.D.) forming a ridge along the length of the western site boundary. Overall the majority of the area has relatively gentle gradients which are typically in the range 2-5°. However, west of Stonehill Green, close to the western boundary of the site where the land falls steeply in a westerly direction, gradients were measured between 8.5° and 11°. Such slopes can create difficulties with mechanised harvesting and the use of precision drilling equipment.

Geology and Soils

2.4 The published geological map sheet for the area (Sheet 271 - Dartford) Geol. Surv. Eng. and Wales, 1951) indicates a succession of geological deposits from Upper Chalk on the lowest land, through Thanet Sands, with Woolwich Beds on the higher slopes. The highest land (typically areas above 80 m) may be capped with pebbly Blackheath Beds. Detailed survey of the site confirms these geological deposits with the exception of the Upper chalk. This possibly lies at some depth beneath the upper soil forming deposits.

2.5 Soils on the site can be broadly grouped into four main types. On middle and lower slopes below about 65-75 m are deep loamy and sandy soils. The lighter sandy soils occur adjacent to and south of Stonehill Green and typically comprise fine sandy loam or loamy fine sand topsoils overlying similar textured or progressively lighter subsoils of loamy fine sand or fine sand. These are permeable, well drained (wetness class 1) soils but may suffer from very slight to slight droughtiness. The high content of fine sand in the topsoil makes them inherently weakly structured and they are prone to surface capping and slaking, especially if they have a low organic matter content. On sloping land soil erosion may also be a problem.

2.6 The second group of soils on middle and lower slopes are more variable in nature but usually comprise very slightly stony fine sandy loam or fine sandy clay loam topsoils and upper subsoils which typically extend to depth or pass into intercalated clays, clay loams and sandy clay loams. These are well or moderately well drained soils (Wetness class I or II) with no or minor droughtiness and wetness limitations.

2.7 The third main soil type occurs at altitudes above 65-75 m and comprises non or slightly calcareous and slightly stony topsoils of fine sandy clay loam, sandy clay loam or heavy clay loam texture overlying gleyed slowly permeable clay or sandy clay subsoils which may contain sandy lenses. Occasional profiles have a thin loamy upper subsoil horizon before the underlying clay is reached. These soils mainly fall within wetness class III and are limited by wetness and workability constraints. At some locations stone content is also a factor influencing the land quality.

2.8 The final soil type is more limited in extent and occurs on the highest parts of the site. It is believed to be associated with an exposure of the pebbly Blackheath Beds and comprises deep stony and very stony (15-40% + by volume) soils of fine sandy loam or sandy loam texture which may pass into loamy sand or sand with depth. Occasional profiles have a higher clay content giving rise to sandy clay loam textures over clay. However, the majority of profiles are permeable and freely draining (wetness class I). The main long term agricultural limitations of such land are high stone content and drought-risk.

3. AGRICULTURAL LAND CLASSIFICATION

3.1 The ALC grading of the site is primarily determined by interactions between climatic and soil factors namely droughtiness and wetness, although at some locations stone content and gradient form the overriding limitations in terms of the ALC grading. In accordance with the criteria for

grading land the availability of irrigation has been taken into account since this can significantly enhance the potential of agricultural land, especially in drier areas. However, the extent to which the grading has been enhanced in this way is somewhat limited, mainly because much of the land also has limitations other than droughtiness (eg wetness, unstable structure, gradient or high stone) which prevent the land rising into a higher grade.

3.2 ALC grades 1, 2, 3a, 3b and 4 have been mapped on the site. Areas of non-agricultural land, woodland and farm buildings have also been identified. A breakdown of the ALC grades in terms of area and extent is given below:

Grade	Ha	%
1	16.38	25
2	25.88	38
3a	18.11	27
3b	5.66	9
4	0.40	1
Total of Agricultural Land	66.03	100
Woodland	0.52	
Agricultural Buildings	1.20	
Non-Agricultural	3.82	
Total Area of Site	71.57	

Grade 1

3.3 Land of this quality occurs on gently sloping land where deep loamy or loamy over sandy soils are found (see paragraphs 2.5 and 2.6). Topsoil textures are typically fine sandy loam or fine sandy clay loam. Subsoil textures are either fine sandy loam or loamy fine sand which may pass into fine sand with depth or into sandy clay loams with occasional lenses of sandy clay or clay. These soils are well or moderately well drained (wetness class I and II) and no significant limitation affects their agricultural use. Where minor drought restrictions occur these are offset by the availability of irrigation.

Grade 2

3.4 Grade 2 land mainly occurs in two situations. Firstly where deep soils having loamy fine sand topsoils over loamy fine sand or fine sand subsoils occur. These tend to be located within the southern half of the site, and are permeable and well drained (wetness class I). However, due to their high content of fine sand they are structurally unstable and liable to capping and slaking especially where organic matter contents are low. On sloping land they are also potentially prone to water erosion. In the absence of irrigation they may be slightly droughty, but the availability of such water on the site offsets this limitation. The main reason for the inclusion of these soils in grade 2 is therefore related to their structural instability and the potential adverse effects this may have upon crop germination and establishment.

3.5 The remaining areas included in grade 2 typically comprise moderately well drained soils (wetness class II) having fine sandy clay loam topsoils overlying similar textured upper subsoils which pass into slowly permeable lower subsoils of clay, fine sandy clay or intercalated sandy and clay horizons. This land has minor wetness limitations and is therefore appropriately placed in grade 2. Occasional areas are also included in this grade where fine sandy loams pass into stony or medium sand subsoils. Such soils are drought-prone and included in this grade due to the availability of irrigation.

Grade 3

Subgrade 3a

3.6 Land graded 3a is almost entirely associated with the soil type described in paragraph 2.7, namely non- or very slightly calcareous fine sandy clay loam, sandy clay loam or heavy clay loam topsoils overlying slowly permeable clay or sandy clay subsoils which may contain sandy lenses. These soils have moderate wetness limitations (wetness class III) which will reduce the flexibility of agricultural use. At some locations

topsoil stone contents up to 12-15% (by volume) of flints in the size range 2-6 cm also limits land quality by increasing, for example, the wear and tear to implements and types and also by the impairment of crop quality and establishment.

Subgrade 3b

3.7 Subgrade 3b land on the site is largely associated with the pebbly soils derived from the Blackheath Beds. Soils are deep stony fine sandy loams or sandy loams which may pass into loamy sand or sand with depth. The majority of soils examined were well drained (wetness class I) although occasional heavier and less well drained profiles did occur. The main agricultural limitations of such land are drought-risk and high stone content. Although the drought effects can be partly ameliorated by the presence of irrigation the high topsoil stone content (typically 20-25% of rounded pebbly 2-6 cm in size) is a long term and overriding limitation. A high stone content can increase production costs by causing extra wear and tear to implements and types. Crop quality may also be reduced in stony soils by causing, for example, the distortion of root crops or bruising of potatoes during harvesting. Stones can impair crop establishment by causing reduced plant populations in precision drilled crops, and they reduce the nutrient capacity of the soils.

3.8 A further area included in subgrade 3b occurs on strongly sloping land on west facing slopes immediately beyond the ridge of higher land west of Stonehill Green. At this location gradients were measured in the range 8.5^{o}-11^{o}. This will have a significant effect on the efficiency of mechanised farming operations causing difficulties with precision drilling and mechanised harvesting. Consequently such land is appropriately placed in subgrade 3b.

Grade 4

3.9 This comprises a small area of especially stony soils similar in character to those described in paragraph 3.7 but with a higher content of rounded flint pebbles. 40% by volume of pebbles in the size range 2-6 cm were measured in this area, and in addition it was estimated that a further 20% by volume of small (<2cm) rounded pebbles was also present. Such soils experience the limitations of high stone content outlined previously but in a more severe form and give rise to an area of poor quality land.

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SOURCES OF REFERENCE

GEOLOGICAL SURVEY OF ENGLAND AND WALES (1951) Geological Map Sheet No 251 (Dartford). 1:63360 Scale.

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

METEOROLOGICAL OFFICE (1988 - in press). Climatological datasets for Agricultural Land Classification.

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.