

**A1
LAND AT DEATH HILL
FARNINGHAM, KENT
RECONNAISSANCE SURVEY
AGRICULTURAL LAND CLASSIFICATION
ALC MAP AND REPORT
JULY 1993**

**LAND AT DEATH HILL, FARNINGHAM, KENT
RECONNAISSANCE SURVEY
AGRICULTURAL LAND CLASSIFICATION REPORT**

1.0 Introduction

- 1.1 In July 1993, a semi-detailed Agricultural Land Classification, (ALC), survey was carried out on approximately 13 hectares of land to the south-east of Farningham, near Swanley in Kent. ADAS was commissioned by MAFF's Land Use Planning Unit to determine the quality of land affected by proposals for a cemetery.
- 1.2 The survey was conducted by members of the Resource Planning Team, Guildford Statutory Group at an observation density of approximately one boring every two hectares. A total of eight borings and two soil inspection pits were described in accordance with MAFF's revised guidelines and criteria for grading the quality of agricultural land (MAFF, 1988). These guidelines provide a framework for classifying land according to the extent to which its physical or chemical characteristics impose long term limitations on its use for agriculture.

At the time of survey, the land was in oilseed rape.

- 1.3 The distribution of the grades and sub-grades is shown on the attached ALC map and the area and extent are given in the table below. The map has been drawn at a scale of 1:5000. It is accurate at this scale, but any enlargement may be misleading. This map supersedes any previous information for the site.

Table 1: Distribution of Grades and Sub-grades

	<u>Area (ha)</u>	<u>% of agricultural use</u>
Grade 3a	9.4	72.9
3b'	3.5	27.1
Total agricultural area	<u>12.9</u>	<u>100.0</u>
Total area of site	12.9 ha	

- 1.4 A general description of the grades and land-use categories identified in this survey is provided as an appendix. The grades are described in terms of the type of limitation that can occur, the typical cropping range and the expected level and consistency of yield.
- 1.5 Land has been graded good to moderate quality. Towards the southern boundary, an area of Subgrade 3b land has been mapped on the basis of a significant soil droughtiness limitation arising from shallow soil depth over chalk. The remainder

of the site comprises soil developed in deposits of clay-with -flints. The principal limitation to this land is that of topsoil stoniness such that Subgrade 3a is appropriate, although small areas which were very stony have been graded 3b.

2.0 Climate

2.1 The climatic criteria are considered first when classifying land since climate can be overriding in the sense that severe limitations will restrict land to low grades irrespective of favourable site or soil conditions.

2.2 Estimates of climatic variables relevant to the assessment of agricultural land quality were obtained by interpolation from a 5 km grid point dataset, (Met. Office, 1989) for a representative location in the survey area.

Table 2: Climatic Interpolation

Grid Reference	TQ 567 658
Altitude (m, AOD)	130
Accumulated Temperature (° days, Jan - June)	1359
Average Annual Rainfall (mm)	689
Field Capacity (days)	140
Moisture Deficit, Wheat (mm):	103
Moisture deficit, Potatoes (mm)	94

2.3 The important parameters in assessing an overall climatic limitation are accumulated temperature, as a measure of overall warmth, and average annual rainfall, as a measure of overall wetness. There is no overall climatic limitation at this locality. No local climatic factors, such as exposure or frost risk, influence the agricultural land quality of this site either.

2.4 Climatic factors do, however, interact with soil factors to influence soil wetness and droughtiness limitations.

3.0 Relief

3.1 The site lies at an altitude of 120 - 130 m AOD. Most of the land is relatively flat or very or very undulating, but the land falls away more steeply towards the south-west.

Nowhere on the site is gradient or micro-relief a limitation to agricultural land quality.

4.0 Geology and Soil

- 4.1 British Geological Survey, (1977) Sheet 271, Dartford shows most of the site to be underlain by Recent and Pleistocene Clay-with-Flints deposits which overlies Cretaceous Upper Chalk. The Chalk outcrops towards the south-west of the site where the land falls away more steeply. The boundary between the two deposits is clearly marked by a break in slope.
- 4.2 Soil Survey of England and Wales (1983) Sheet 6, Soils of South East England shows the entire site to comprise soils of the Andover I Association. These are described as variably flinty and chalky, silty brown rendzinas over chalk, (SSEW, 1984)
- 4.3 Detailed field examination of the site confirms the presence of shallow soils over chalk as described by the Soil Survey over the south-western part of the site, below the distinct break in slope. However, deep, variably flinty and clayey soils developed in association with Clay-with-Flints deposits occur across the remainder of the site.

5.0 Agricultural Land Classification

- 5.1 The site has been graded Sub-grades 3a and 3b principally on the basis of soil droughtiness or topsoil stone limitations. The land may also be limited to a lesser extent by soil workability due to the combination of heavy topsoil textures and climatic factors.

Subgrade 3a

- 5.2 The majority of the area surveyed, (i.e. approximately 73%) has been assigned to Sub-grade 3a, good quality agricultural land. Profiles typically comprise calcareous, (although occasionally non-calcareous), heavy clay loam or heavy silty clay loam topsoils. These contain between 5 and 18% total flints by volume, (2-13% >2 cm), although it is more common for topsoil stone contents to be in the range 10-13% >2 cm. Clay subsoils typically contain 10-12% total flints by volume and are usually impenetrable, (to soil auger), at depths between 25 and 45 cm. Soil inspection pit 2 is typical of these soils and provided evidence that despite being impenetrable to auger, profiles are generally deep and well drained (Wetness Class I), but become more chalky at depth.
- This land is primarily limited to Sub-grade 3a on the basis of topsoil stone contents in the range 10-15% >2 cm, (flints). These will act to impede cultivations, crop germination and growth and adversely affect crop quality and yield. Production costs will be increased due to the wear of farm machinery.
- Workability also restricts this land, but to a lesser extent. Heavy topsoil textures combine with climatic factors to reduce opportunities for landwork and cultivations such that land cannot be graded higher than Grade 2.

Sub-grade 3b

- 5.3 Two small units of Sub-grade 3b have been mapped towards the north of the site, adjacent to the M20 on the basis of a topsoil stone limitation. Profiles are similar to those described in paragraph 5.2 above, but topsoils are generally more stony, having 15-20% flints > 2 cm by volume. Such high topsoil stone contents will severely affect crop growth and quality and significantly increase production costs through the wear of farm implements and machinery.
- The larger unit of Sub-grade 3b mapped across the south-western part of the site is associated with an outcrop of Upper Chalk deposits close to the surface. The land is thereby limited by soil droughtiness. Profiles typically comprise slightly stony, (i.e. 5-10% total flints by volume), heavy clay loam or heavy silty clay loam topsoils which directly overlie soft, weathered Chalk.
- The combination of shallow soil depth and shallow rooting into the Chalk substrate, (i.e. to a maximum of about 70-75 cm) gives rise to severely reduced reserves of available water for plant growth. As a result crops are likely to experience severe drought stress and the land has been graded as moderate quality, Sub-grade 3b, accordingly.

ADAS Ref: 2009/126/93
MAFF Ref: EL 20/420

Resource Planning Team
Guildford Statutory Group
ADAS Reading

SOURCES OF REFERENCE

- * British Geological Survey (1977) Sheet No. 271, Dartford, 1:50,000
- * MAFF (1988), Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land.
- * Meteorological Office (1989), Climate datasets for Agricultural Land Classification.
- * Soil Survey of England and Wales (1983), Sheet No. 6, Soils of South East England, 1:250,000.
- * Soil Survey of England and Wales (1984), Bulletin No. 15, Soils and their use in South East England.

DESCRIPTION OF THE GRADES AND SUB-GRADES

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 or horticultural crops can usually be grown but on some land on 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. When more demanding crops are grown yields are generally lower or more variable than on land in grades 1 and 2.

Sub-grade 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.

Sub-grade 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 the 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.

Urban

Built-up or 'hard' uses with relatively little potential for a return to agriculture : 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 : 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.

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, eg. buildings in large grounds, and where map scale permits, the cover types may be shown separately. Otherwise, the most extensive cover type will be shown.

SOIL PIT AND SOIL BORING DESCRIPTIONS

- Contents :
- * Soil Abbreviations : Explanatory Note
 - * Soil Pit Descriptions
 - * Database Printout : Boring Level Information
 - * Database Printout : Horizon Level Information

SOIL PROFILE DESCRIPTIONS : EXPLANATORY NOTE

Soil pit and auger boring information collected during ALC fieldwork is held on a database. This has commonly used notations and abbreviations as set out below.

Boring Header Information

1. GRID REF : national grid square and 8 figure grid reference.
2. USE : Land use at the time of survey. The following abbreviations are used.

ARA : Arable WHT : Wheat BAR : Barley CER : Cereals OAT : Oats MZE : Maize OSR : Oilseed rape
BEN : Field Beans BRA : Brassicae POT : Potatoes SBT : Sugar Beet FCD : Fodder Crops LIN : Linseed
FKT : Soft and Top Fruit HRT : Horticultural Crops PGR : Permanent Pasture LEY : Ley Grass RGR : Rough Grazing
SCR : Scrub CFW : Coniferous Woodland DCW : Deciduous Woodland HTH : Heathland BOG : Bog or Marsh
FLW : Fallow PLO : Ploughed SAS : Set aside OTH : Other

3. GRDNT : Gradient as measured by a hand-held optical clinometer.
4. GLEY/SPL : Depth in cm to gleying or slowly permeable layers.
5. AP (WHEAT/POTS) : Crop-adjusted available water capacity.
6. MB (WHEAT/POTS) : Moisture Balance.
7. DRT : Best grade according to soil droughtiness.
8. If any of the following factors are considered significant, an entry of 'Y' will be entered in the relevant column.

MREL : Microrelief limitation FLOOD : Flood risk EROSN : Soil erosion risk EXP : Exposure limitation FROST : Frost
DIST : Disturbed land CHEM : Chemical limitation

9. LIMIT : The main limitation to land quality. The following abbreviations are used.

OC : Overall Climate AE : Aspect EX : Exposure FR : Frost Risk GR : Gradient MR : Microrelief
FL : Flood Risk TX : Topsoil Texture DP : Soil Depth CH : Chemical WE : Wetness WK : Workability
DR : Drought ER : Soil Erosion Risk WD : Combined Soil Wetness/Droughtiness ST : Topsoil Sioniness

Soil Pits and Auger Borings

1. TEXTURE : soil texture classes are denoted by the following abbreviations.

S : Sand LS : Loamy Sand SL : Sandy Loam SZL : Sandy Silt Loam CL : Clay Loam ZCL : Silty Clay Loam
SCL : Sandy Clay Loam C : Clay SC : Sandy Clay ZC : Silty Clay OL : Organic Loam P : Peat SP : Sandy Peat
LP : Loamy Peat PL : Peaty Loam PS : Peaty Sand MZ : Marine Light Silts

For the sand, loamy sand, sandy loam and sandy silt loam classes, the predominant size of sand fraction will be indicated by the use of prefixes.

F : Fine (more than 66% of the sand less than 0.2mm)
M : Medium (less than 66% fine sand and less than 33% coarse sand)
C : Coarse (more than 33% of the sand larger than 0.6mm)

The clay loam and silty clay loam classes will be sub-divided according to the clay content.

M : Medium (< 27% clay) H : Heavy (27-35% clay)

2. MOTTLE COL : Mottle colour

3. MOTTLE ABUN : Mottle abundance, expressed as a percentage of the matrix or surface described.

F : few <2% C : common 2-20% M : many 20-40 VM : very many 40%+

4. MOTTLE CONT : Mottle contrast

F : faint - indistinct mottles, evident only on close inspection D : distinct - mottles are readily seen
P : prominent - mottling is conspicuous and one of the outstanding features of the horizon

5. PED. COL : Ped face colour

6. STONE LITH : One of the following is used.

HR : all hard rocks and stones MSST : soft, medium or coarse grained sandstone
SI : soft weathered igneous or metamorphic SLST : soft oolitic or dolimitic limestone
FSST : soft, fine grained sandstone ZR : soft, argillaceous, or silty rocks CH : chalk
GH : gravel with non-porous (hard) stones GS : gravel with porous (soft) stones

Stone contents (> 2cm, > 6cm and total) are given in percentages (by volume).

7. STRUCT : the degree of development, size and shape of soil peds are described using the following notation:

- degree of development WK : weakly developed MD : moderately developed ST : strongly developed

- ped size F : fine M : medium C : coarse VC : very coarse

- ped shape S : single grain M : massive GR : granular AB : angular blocky SAB : sub-angular blocky PR : prismatic
PL : platy

8. CONSIST : Soil consistence is described using the following notation:

L : loose VF : very friable FR : friable FM : firm VM : very firm EM : extremely firm EH : extremely hard

9. SUBS STR : Subsoil structural condition recorded for the purpose of calculating profile droughtiness.

G : good M : moderate P : poor

10. POR : Soil porosity. If a soil horizon has less than 0.5% biopores > 0.5 mm, a 'Y' will appear in this column.

11. IMP : If the profile is impenetrable a 'Y' will appear in this column at the appropriate horizon.

12. SPL : Slowly permeable layer. If the soil horizon is slowly permeable a 'Y' will appear in this column.

13. CALC : If the soil horizon is calcareous, a 'Y' will appear in this column.

14. Other notations

APW : available water capacity (in mm) adjusted for wheat

APP : available water capacity (in mm) adjusted for potatoes

MBW : moisture balance, wheat

MBP : moisture balance, potatoes

SOIL PIT DESCRIPTION

Site Name : FARNINGHAM, KENT

Pit Number : 1P

Grid Reference: TQ56556575 Average Annual Rainfall : 689 mm
Accumulated Temperature : 1359 degree days
Field Capacity Level : 140 days
Land Use : Oilseed Rape
Slope and Aspect : 02 degrees S

HORIZON	TEXTURE	COLOUR	STONES >2	TOT.STONE	MOTTLES	STRUCTURE
0- 31	HCL	10YR4/2 4/3	12	17		
31- 75	CHALK		0	5		

Wetness Grade : 2 Wetness Class : I
Gleying : cm
SPL : No SPL

Drought Grade : 3B APW : 082mm MBW : -21 mm
APP : 084mm MBP : -10 mm

FINAL ALC GRADE : 3B
MAIN LIMITATION : Droughtiness

SOIL PIT DESCRIPTION

Site Name : FARNINGHAM, KENT

Pit Number : 2P

Grid Reference: TQ56646587 Average Annual Rainfall : 689 mm
 Accumulated Temperature : 1359 degree days
 Field Capacity Level : 140 days
 Land Use : Oilseed Rape
 Slope and Aspect : 01 degrees W

HORIZON	TEXTURE	COLOUR	STONES >2	TOT.STONE	MOTTLES	STRUCTURE
0- 24	HZCL	10YR43 00	13	18		
24- 95	C	75YR56 00	0	12	F	MDCSAB
95-120	C	10YR58 00	0	50		

Wetness Grade : 2 Wetness Class : I
 Gleying : cm
 SPL : No SPL

Drought Grade : 2 APW : 125mm MBW : 22 mm
 APP : 103mm MBP : 9 mm

FINAL ALC GRADE : 3A
 MAIN LIMITATION : Topsoil Stoniness

SAMPLE NO.	GRID REF	ASPECT USE	GRDNT	SPL	--WETNESS--		-WHEAT-		-POTS-		M.REL		EROSN	FROST	CHEM	ALC	COMMENTS
					CLASS	GRADE	AP	MB	AP	MB	DRT	FLOOD	EXP	DIST	LIMIT		
1	TQ56596610	OSR N	01		1	2	000	0	000	0						WK 2	IMP 35 FLINTS
1P	TQ56556575	OSR S	02		1	2	082	-21	084	-10	38					DR 3B	ROOT 75
2	TQ56696610	OSR N	01		1	2	083	-20	089	-5	3A					DR 3A	CHALK 27+
2P	TQ56646587	OSR W	01		1	2	125	22	103	9	2					ST 3A	TOPSOIL STONE
4	TQ56676600	OSR N	01		1	2	000	0	000	0						WK 2	IMP 40 FLINTS
7	TQ56596590	OSR SW	01		1	2	072	-31	072	-22	38					DR 3B	IMP 45 FLINTS
9	TQ56796593	OSP W	01		1	2	000	0	000	0						WK 2	IMP 32 FLINTS
10	TQ56496580	OSR SW	02		1	2	084	-19	090	-4	3A					DR 3A	CHALK 28+
12	TQ56696580	OSR W	01		1	2	000	0	000	0						WK 2	IMP 25 FLINTS
13	TQ56596570	OSR W	02		1	2	085	-18	091	-3	3A					DR 3A	CHALK 29+

SAMPLE	DEPTH	TEXTURE	COLOUR	----MOTTLES----			PED		----STONES----			STRUCT/ CONSIST	SUBS					
				COL	ABUN	CONT	COL.	GLEYS	>2	>6	LITH		TOT	STR	POR	IMP	SPL	CALC
1	0-25	hc1	10YR44 00						10	0	HR	10						Y
	25-35	c	75YR56 00						0	0	HR	10	M					Y IMP 35+ FLINTS
1P	0-31	hc1	10YR42 43						12	0	HR	17						Y + CHALK FRAGS
	31-75	chalk							0	0	HR	5	P					Y SOFT CHALK
2	0-27	hzc1	10YR42 00						10	0	HR	10						Y + 2% CHALK
	27-70	chalk							0	0		0	P					Y
2P	0-24	hzc1	10YR43 00						13	0	HR	18						
	24-95	c	75YR56 00	75YR44 00	F		00M00 00		0	0	HR	12	MDCSAB VM M	Y				
	95-120	c	10YR58 00						0	0	CH	50		M				Y
4	0-28	hzc1	10YR44 00						2	0	HR	5						
	28-40	c	75YR56 00						0	0	HR	10	M					IMP 40+ FLINTS
7	0-25	hc1	10YR43 44						3	0	HR	5						Y
	25-45	c	75YR56 46		F		00M00 00		0	0	HR	10	M					Y IMP 45+ FLINTS
9	0-29	hc1	10YR44 00						5	0	HR	5						
	29-32	c	75YR56 00						0	0	HR	10	M					IMP 35+ FLINTS
10	0-28	hc1	10YR43 00						5	0	HR	5						Y + 2% CHALK
	28-70	chalk							0	0		0	P					Y
12	0-25	hc1	10YR43 00						7	0	HR	10						IMP 25+ FLINTS
13	0-29	hzc1	10YR43 00						10	0	HR	10						Y + 2% FLINTS
	29-70	chalk							0	0		0	P					Y ROOTING TO 70