8FCS8180B

Coalpit Heath

Agricultural Land Classification

May 1997

Resource Planning Team
Bristol
FRCA Western Region

Job Number 7/97
Commission 1316
MAFF Reference EL 34/01208

COALPIT HEATH

AGRICULTURAL LAND CLASSIFICATION SURVEY

CONTENTS

COALPIT HEATH

AGRICULTURAL LAND CLASSIFICATION SURVEY

INTRODUCTION

1. This report presents the findings of a semi-detailed Agricultural Land Classification (ALC) survey of 43.3 ha of land at Coalpit Heath, Bristol. Field survey was based on 23 auger borings and 2 soil profile pits, and was completed in April 1997.

2. The survey was conducted by the Resource Planning Team of FRCA Western Region (formerly of ADAS Taunton Statutory Group) on behalf of MAFF in its statutory role in the preparation of South Gloucestershire Local Plan.

3. Information on climate, geology and soils, and from previous ALC surveys was considered and is presented in the relevant section. Apart from the published regional ALC map (MAFF, 1977), which shows the site at a reconnaissance scale as Grade 3, the site had not been surveyed previously. However, the current survey uses the Revised Guidelines and Criteria for grading the quality of agricultural land (MAFF, 1988) and supersedes any previous ALC survey. Grade descriptions are summarised in Appendix I.

4. A recent survey of a small site at Heath Farm, Coalpit Heath, some 500 m to the south east (ADAS 1992) found Subgrade 3b. However, the parent material in this case was the Red Measures of the Upper Coal Series, different from the parent material at the current site.

5. At the time of survey land cover was all permanent grass although this was severely under utilised, with grazing by only a few horses. Despite the low level of agricultural use and the proximity of housing estates on three sides, the site shows relatively little evidence of the tipping, trespass and vandalism which would normally be associated with sites such as this on the urban fringe.

SUMMARY

6. The distribution of ALC grades is shown on the accompanying 1:10 000 scale ALC map. The detail of information shown at this scale is appropriate to the intensity of field survey but could be misleading if enlarged or applied to small areas. Areas are summarised in the Table 1.

Table 1: Distribution of ALC grades: Coalpit Heath

Grade	Area (ha)	% Surveyed Area (39.9 ha)
3a	14.7	37
3b	25.2	63
Other land	3.4	
Total site area	43.3	

7. This shows 37% of the area surveyed to be best and most versatile. This is found on the areas of underlying sandstone parent material and although shown as Subgrade 3a is considered to be borderline to Grade 2, limited only by a minor droughtiness limitation. The remainder of the site was found to be Subgrade 3b with a more serious moderate limitation due to wetness.

CLIMATE

8. Estimates of climatic variables for this site were derived from the published agricultural climate dataset "Climatological Data for Agricultural Land Classification" (Meteorological Office, 1989) using standard interpolation procedures. Data for key points around the site are given in Table 2 below.

9. Since the ALC grade of land is determined by the most limiting factor present, overall climate is considered first because it can have an overriding influence by restricting land to a lower grade despite more favourable site and soil conditions. Parameters used for assessing overall climate are accumulated temperature, a measure of relative warmth and average annual rainfall, a measure of overall wetness. The results shown in Table 2 indicate that there is no overall climatic limitation.

10. Climatic variables also affect ALC grade through interactions with soil conditions. The most important interactive variables are Field Capacity Days (FCD) which are used in assessing soil wetness and potential Moisture Deficits calculated for wheat and potatoes, which are compared with the moisture available in each profile in assessing soil droughtiness limitations. These are described in later sections.

Table 2: Climatic Interpolations: Coalpit Heath

Grid Reference		ST 664 802	ST 668 809
Altitude (m)		68	53
Accumulated Temperature (day °C)		1467	1483
Average Annual Rainfall (mm)		769	769
Overall Climatic Grade		1	1
Field Capacity Days		172	172
Moisture deficit (mm):	Wheat	98	100
	Potatoes	89	91

RELIEF

11. Altitude ranges from 53 m near the farm buildings to 68 m at the western edge of the site. Two ridges and valleys run north to south through the site but slopes are gentle to moderate and are not limiting.

GEOLOGY AND SOILS

12. The underlying geology of the site is shown on the published geology map (IGS, 1970) as mainly shale and sandstone of the Upper Coal Measures (Pennant Series). The published distribution was entirely borne out by the current survey and has proved critical to ALC grading with the sandstone parent material causing a minor or possibly moderate limitation due to droughtiness and the shale parent material showing a more serious moderate limitation due to wetness.

13. Soils were mapped by the Soil Survey of England and Wales at a detailed scale of 1:63 360 (SSEW, 1974) as Swindon Bank series on the sandstone and Dale series on the shale. Swindon Bank is described as a stony brown earth developed on fine grained Carboniferous sandstone and Dale series is described as a clayey surface water gley developed on Carboniferous mudstone. This distribution was entirely borne out by the current survey.

AGRICULTURAL LAND CLASSIFICATION

14. The distribution of ALC grades found by the current survey is shown on the accompanying *1:10 000* scale map and areas are summarised in Table 1. The detail of information shown at this scale is appropriate to the intensity of field survey but could be misleading if enlarged or applied to small areas.

Subgrade 3a

15. The area shown as Subgrade 3a was found to be Wetness Class I with medium sandy loam topsoil and with a variable content of soft sandstone, mainly penetrable to the auger, at least to 60-80 cm. The shallower profiles with a higher stone content were found mainly at the top of the ridge and are represented by Pit 1 which found stone contents ranging from 15% in the topsoil to approaching 60% in the lower subsoil. When calculated to 100 cm, this profile indicated ALC droughtiness Grade 2, borderline to 3a. Although it may have been reasonable to continue the droughtiness calculation to 120 cm in this case, profiles within the mapping unit may well have a higher stone content or less extensive exploitation by roots which in either case would be Subgrade 3a. The mapping unit as a whole is therefore shown as Subgrade 3a although considerable areas within the mapping unit are known to be Grade 2.

Subgrade 3b

16. Areas shown as Subgrade 3b were found to be mainly Wetness Class 4 with a slowly permeable layer starting in the upper subsoil or occasionally Wetness Class 3 with a slowly permeable layer starting in the lower subsoil, both with gleying evident in the upper subsoil. With topsoils of heavy clay loam or occasionally clay, these are all Wetness Grade 3b. One profile was found to be Wetness Class 5, Wetness Grade 4, although this was an isolated area of marshy rough grazing.

17. This mapping unit is illustrated by Pit 2 which shows a heavy clay loam topsoil overlying clay subsoil with gleying evident from the surface and a slowly permeable layer starting at 32 cm.

P Barnett
Resource Planning Team
FRCA Bristol
6 May 1997

REFERENCES

ADAS RESOURCE PLANNING TEAM, (1992) Agricultural Land Classification Survey of Heath Farm, Scale 1: 10 000, Reference 45.92, ADAS Bristol.

INSTITUTE OF GEOLOGICAL SCIENCES Sheet 265, Bath, 1:63 360 series Solid and Drift edition. IGS, London.

HODGSON, J M (Ed) (1974) Soil Survey Field Handbook, Technical Monograph No 5. Soil Survey of England and Wales, Harpenden.

HODGSON, J M (In preparation) Soil Survey Field Handbook, Revised edition.

MAFF (1977) 1:250 000 series Agricultural Land Classification, South West Region. MAFF Publications, Alnwick.

MAFF (1988) Agricultural Land Classification of England and Wales. Revised Guidelines and Criteria for grading the quality of agricultural land. MAFF Publications, Alnwick.

METEOROLOGICAL OFFICE (1989) Climatological Data for Agricultural Land Classification. Meteorological Office, Bracknell.

SOIL SURVEY OF ENGLAND AND WALES (1974) 1:63 360 scale Malmesbury and Bath, SSEW, Harpenden.

APPENDIX I

DESCRIPTION OF GRADES AND SUBGRADES

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 include 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 most 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.

Source: MAFF (1988) Agricultural Land Classification of England and Wales Revised Guidelines and Criteria for Grading the Quality of Agricultural Land, MAFF Publications, Alnwick.

APPENDIX II

DEFINITION OF SOIL WETNESS CLASSES

Soil wetness is classified according to the depth and duration of waterlogging in the soil profile.

Wetness Class I

The soil profile is not wet within 70 cm depth for more than 30 days in most years.

Wetness Class 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.

Wetness Class 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.

Wetness Class 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.

Wetness Class V

The soil profile is wet within 40 cm depth for 211-335 days in most years.

Wetness Class VI

The soil profile is wet within 40 cm depth for more than 335 days in most years.

Notes: The number of days specified is not necessarily a continuous period.

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

Source: Hodgson, J M (In preparation) Soil Survey Field Handbook, Revised Edition.

APPENDIX III

ABBREVIATIONS AND TERMS USED IN SURVEY DATA

Soil pit and auger boring information collected during ALC survey is held on a computer database and is reproduced in this report. Terms used and abbreviations are set out below. These conform to definitions contained in the Soil Survey Field Handbook (Hodgson, 1974).

1. Terms used on computer database, in order of occurrence.

GRID REF: National 100 km grid square and 8 figure grid reference.

LAND USE: At the time of survey

WHT:	Wheat	**SBT:**	Sugar Beet	**HTH:**	Heathland
BAR:	Barley	**BRA:**	Brassicas	**BOG:**	Bog or Marsh
OAT:	Oats	**FCD:**	Fodder Crops	**DCW:**	Deciduous Wood
CER:	Cereals	**FRT:**	Soft and Top Fruit	**CFW:**	Coniferous Woodland
MZE:	Maize	**HRT:**	Horticultural Crops	**PLO:**	Ploughed
OSR:	Oilseed Rape	**LEY:**	Ley Grass	**FLW:**	Fallow (inc. Set aside)
POT:	Potatoes	**PGR:**	Permanent Pasture	**SAS:**	Set Aside (where known)
LIN:	Linseed	**RGR:**	Rough Grazing	**OTH:**	Other
BEN:	Field Beans	**SCR:**	Scrub		

GRDNT: Gradient as estimated or measured by hand-held optical clinometer.

GLEY, SPL: Depth in centimetres to gleying or slowly permeable layer.

AP (WHEAT/POTS): Crop-adjusted available water capacity.

MB (WHEAT/POTS): Moisture Balance. (Crop adjusted AP - crop potential MD)

DRT: Best grade according to soil droughtiness.

If any of the following factors are considered significant, 'Y' will be entered in the relevant column.

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

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:**	Erosion Risk	**WD:**	Soil Wetness/Droughtiness
ST:	Topsoil Stoniness				

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
ZL:	Silt 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 the following 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)

MOTTLE COL: Mottle colour using Munsell notation.

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%+

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.

PED. COL: Ped face colour using Munsell notation.

GLEY: If the soil horizon is gleyed a 'Y' will appear in this column. If slightly gleyed, an 'S' will appear.

STONE LITH: Stone Lithology - One of the following is used.

HR:	All hard rocks and stones	**SLST:**	Soft oolitic or dolimitic limestone

CH:	Chalk	**FSST:**	Soft, fine grained sandstone
ZR:	Soft, argillaceous, or silty rocks	**GH:**	Gravel with non-porous (hard) stones
MSST:	Soft, medium grained sandstone	**GS:**	Gravel with porous (soft) stones
SI:	Soft weathered igneous or metamorphic rock		

Stone contents are given in % by volume for sizes >2cm, >6cm and total stone >2mm.

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		

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

SUBS STR: Subsoil structural condition recorded for the purpose of calculating profile droughtiness: **G:** Good **M:** Moderate **P:** Poor

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

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

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

CALC: If the soil horizon is calcareous with naturally occurring calcium carbonate exceeding 1% a 'Y' will appear this column.

2. Additional terms and abbreviations used mainly in soil pit descriptions.

STONE ASSESSMENT:

VIS:	Visual	**S:**	Sieve	**D:**	Displacement

MOTTLE SIZE:

EF:	Extremely fine <1mm	**M:**	Medium 5-15mm
VF:	Very fine 1-2mm>	**C:**	Coarse >15mm
F:	Fine 2-5mm		

MOTTLE COLOUR: May be described by Munsell notation or as ochreous (OM) or grey (GM).

ROOT CHANNELS: In topsoil the presence of 'rusty root channels' should also be noted.

MANGANESE CONCRETIONS: Assessed by volume

N:	None		**M:**	Many	20-40%
F:	Few	<2%	**VM:**	Very Many	>40%
C:	Common	2-20%			

STRUCTURE: Ped Development *

WA:	Weakly adherent	**M:**	Moderately developed
W:	Weakly developed	**S:**	Strongly developed

POROSITY:

P:	Poor	- less than 0.5% biopores at least 0.5mm in diameter
G:	Good	- more than 0.5% biopores at least 0.5mm in diameter

ROOT ABUNDANCE:

The number of roots per $100cm^2$:		Very Fine and Fine	Medium and Coarse
F:	Few	1-10	1 or 2
C:	Common	10.25	2 - 5
M:	Many	25-200	>5
A:	Abundant	>200	

ROOT SIZE

VF:	Very fine	<1mm	**M:**	Medium	2 - 5mm
F:	Fine	1-2mm	**C:**	Coarse	>5mm

HORIZON BOUNDARY DISTINCTNESS:

Sharp:	<0.5cm	**Gradual:**	6 - 13cm
Abrupt:	0.5 - 2.5cm	**Diffuse:**	>13cm
Clear:	2.5 - 6cm		

HORIZON BOUNDARY FORM: Smooth, wavy, irregular or broken.*
* See Soil Survey Field Handbook (Hodgson, 1974) for details.

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Coalpit Heath	Pit 1 (Nr ASP 13/17)	3°NE	PGR	Av Rainfall: 769 mm ATO: 1470 day °C	Carboniferous sandstone
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 172 Climatic Grade: 1 Exposure Grade: 1	PSD SAMPLES TAKEN
7.97	21.4.97	ST 6643 8040	PB		-

Horizon No.	Lowest Av. Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness: Size,Type, and Field Method	Mottling Abundance, Contrast, Size and Colour	Mangan Concs	Structure: Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots: Abundance and Size	Calcium Carbonate Content	Horizon Boundary: Distinctness and form
1	21	MSL	7.5YR43	3% > 2 cm (S) 12% < 2 cm (S+D) 15% MSST	0	0	-	-	-	-	MF,VF	-	Clear smooth
2	52	MSL	5YR44	10% > 2cm (S) 22% < 2cm (S+D) 32% MSST	0	0	MM, FSAB	Fr	G	G	MF,VF	-	Grad smooth
3	100+	SCL	2.5YR44	30% > 2cm (S) 26% < 2cm (S+D) 56% MSST	0	0	WCSAB	Fr	G	P	FVF	-	-

Profile Gleyed From: -

Depth to Slowly Permeable Horizon: -

Wetness Class: I

Wetness Grade: 1

Available Water Wheat: 104 mm

Potatoes: 88 mm

Moisture Deficit Wheat: 99 mm

Potatoes: 90 mm

Moisture Balance Wheat: +5 mm

Potatoes: -2 mm

Droughtiness Grade: 2 (Calculated to 100 cm)

Final ALC Grade: 2

Main Limiting Factor(s): Dr

Remarks: Grade 3a mapping unit.

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Coalpit Heath	Pit 2 (Nr ASP 14)	2° SW	PGR	Av Rainfall: 769 mm ATO: 1470 day °C FC Days: 172 Climatic Grade: 1 Exposure Grade: 1	Carboniferous mudstone
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY		PSD SAMPLES TAKEN
7.97	21.4.97	ST 6662 8046	PB		-

Horizon No.	Lowest Av. Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness: Size,Type, and Field Method	Mottling Abundance, Contrast, Size and Colour	Mangan Concs	Structure: Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots: Abundance and Size	Calcium Carbonate Content	Horizon Boundary: Distinctness and form
1	22	HCL	10YR52	0	CDFO 7.5YR58	0	-	-	-	-	MF,VF	-	Ab smooth
2	32	C	7.5YR63	0	MDFO 7.5YR58	0	MCPr	Fm	P	G	CVF	-	Clear smooth
3	50+	C	2.5YR72	0	MDMO 10YR58	0	MVCPr	Fm	P	P	FVF	-	-

Profile Gleyed From: 0 cm

Depth to Slowly Permeable Horizon: 32 cm

Wetness Class: IV

Wetness Grade: 3b

Available Water	Wheat:	125 mm
	Potatoes:	102 mm
Moisture Deficit	Wheat:	99 mm
	Potatoes:	90 mm
Moisture Balance	Wheat:	+26 mm
	Potatoes:	+12 mm

Droughtiness Grade: 2 (Calculated to 120 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): We

Remarks: