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GLOUCESTERSHIRE STRUCTURE PLAN: BISHOPS CLEEVE

AGRICULTURAL LAND CLASSIFICATION

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GLOUCESTERSHIRE STRUCTURE PLAN: BISHOPS CLEEVE

AGRICULTURAL LAND CLASSIFICATION SURVEY

SUMMARY

The survey was carried out by ADAS on behalf of MAFF as part of its statutory role in the preparation of the Gloucestershire Structure Plan. The fieldwork at Bishops Cleeve was completed in November and December 1994 at a scale of 1:10,000. Data on climate, soils, geology and previous ALC Surveys was used and is presented in the report. The distribution of grades is detailed below and illustrated on the accompanying ALC maps and summarised below. Information is correct at this scale but could be misleading if enlarged.

Distribution of ALC grades: Bishops Cleve

Grade	Area (ha)	% of Survey Area	% of Agricultural Land (412.8 ha)
2	33.7	6.8	8.2
3a	153.6	30.9	37.2
3b	225.2	45.2	54.6
Urban	37.6	7.6	0.0
Non Agricultural	41.6	8.4	0.0
Agricultural Buildings	5.3	1.1	0.0
TOTAL	497.3	100.0	100.0

Of the agricultural land which was surveyed 45% was found to be 'best and most versatile'. Most of the site has an overall wetness limitation with the depth to gleying and the depth to a slowly permeable layer determining whether the land is Grade 2, Subgrade 3a or Subgrade 3b. There are some localised areas which are well drained and have an overall droughtiness or workability limitation.

1. INTRODUCTION

A reconnaissance scale Agricultural Land Classification (ALC) Survey was carried out in November and December 1994 at Bishops Cleeve on behalf of MAFF as part of its statutory role in the preparation of the Gloucestershire Structure Plan. The fieldwork covering 497.3 ha of land was conducted by ADAS at a scale of 1:25,000 (approximately 4 borings per hectare of agricultural land). A total of 90 auger borings were examined and 5 soil profile pits used to assess subsoil conditions.

The published provisional one inch to the mile ALC map of this area (MAFF 1968) shows the grades of the site at a reconnaissance scale. Most of the survey area is mapped as Grade 3. However a significant area of Grade 2 land is mapped immediately to the West of Bishops Cleeve. Here also is a large block of urban and non-agricultural land.

Part of the area was also surveyed in 1981 at a scale of 1:10,000 using the original guidelines for grading agricultural land. The land to the north of the village is mapped as Grade 2 with another small area around Southam Field Farm. The rest was mapped as Grade 3, predominantly Subgrade 3a.

The recent survey supersedes these maps having been carried out using the 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 agricultural use. The grading takes account of the top 120 cm of the soil profile. A description of the grades used in the ALC system can be found in Appendix 2.

2. CLIMATE

The grade of the land is determined by the most limiting factor present. The overall climate is considered first because it can have an overriding influence on restricting land to a lower grade despite other favourable conditions.

Estimates of climatic variables were interpolated from the published agricultural climate dataset (Meteorological Office 1989). The parameters used for assessing overall climate are accumulated temperature (a measure of the relative warmth of a locality) and average annual rainfall (a measure of overall wetness). The results shown in Table 1 indicate there is no overall climatic limitation. There is an important Field Capacity days boundary at 63 m AOD. Below this the value is <150 days and above >150 days. This affects the grading for wet soils.

Table 1: Climatic Interpolations: Bishops Cleeve

Grid Reference	SO 966 281	SO 957 286	SO 948 267
Altitude (m)	65	50	45
Accumulated Temperature (day °)	1442	1459	1466
Average Annual Rainfall (mm)	681	671	649
Overall Climatic Grade	1	1	1
Field Capacity Days	151	148	144
Moisture deficit (mm):			
Wheat	105	107	108
Potatoes	97	100	101

Climatic data on Field Capacity Days (FCD) and Moisture Deficits for wheat and potatoes are also shown. These data are used in assessing the soil wetness and droughtiness limitations referred to in later sections.

3. RELIEF AND LANDCOVER

The survey area is gently undulating around 45 m AOD with a gentle rise in the east to 65 m AOD.

At the time of survey the agricultural land was being used for arable cropping and grazing. An area south of Irish Butts forms part of a sand and gravel extraction area, part of which is currently being restored. New housing and an industrial area to the west of the village forms a large block of urban land.

4. GEOLOGY AND SOILS

The geology of the site is shown on the published 1:50,000 scale solid and drift geology maps, sheet 216,217 British Geological Survey 1988.

Most of the survey area is underlain by Lower Lias Clay with two areas of River Terrace deposits (sand and gravel) west of Bishops Cleeve. The larger of these extends from Wingmoor Farm, south east to the industrial works south of Southern Field Farm. The smaller deposit occurs south of Dean Farm. Isolated patches of alluvium occur associated with water courses.

The soils were mapped by the Soil Survey of England and Wales in 1983 at a reconnaissance scale of 1:250,000 most of the survey area is overlain by soils of the Badsey 2 Association. However, significant areas are composed of Evesham 2 soils. The latter are to be found along the southern edge of the site, in a small patch on the western edge and to the north in a narrow band running along the Dean Brook, east to Homelands Farm, then south to the urban fringe of Bishops Cleeve. Badsey 2 soils are described as well drained calcareous fine loamy soils over limestone gravel. Evesham 2 soils are described as slowly permeable calcareous clayey soils. Some slowly permeable seasonally waterlogged non-calcareous clayey and fine loamy or fine silty over clayey soils are also found.

The soils found during the recent survey were similar to those of the Evesham 2 series. They had calcareous heavy clay loam and clay topsoils over clayey subsoils which were found on the whole to be slowly permeable.

5. AGRICULTURAL LAND CLASSIFICATION

The distribution of ALC grades is shown in Table 2 and on the accompanying ALC map. The information could be misleading if shown at a larger scale.

Table 2: Distribution of ALC grades: Bishops Cleeve

Grade	Area (ha)	% of Survey Area	% of Agricultural Land (412.8 ha)
2	33.7	6.8	8.2
3a	153.6	30.9	37.2
3b	225.2	45.2	54.6
Urban	37.6	7.6	0.0
Non Agricultural	41.6	8.4	0.0
Agricultural Buildings	5.3	1.1	0.0
TOTAL	497.3	100.0	100.0

Grade 2

Two areas of Grade 2 land have been identified. Around Tom Bridge the profiles consist of calcareous sandy loam, clay loam and clay topsoils over well drained clay subsoils. These were assessed as Wetness Class I (see Appendix 3) and suffer from minor droughtiness and workability limitations. To the north and south of the mineral works the profiles were found to have gleyed horizons and slowly permeable layers below 55 cm and were assessed as Wetness Class II. With the calcareous heavy clay loam topsoils a slight wetness limitation is imposed.

Subgrade 3a

The three areas of Subgrade 3a land are all slightly variable. The predominant profiles have gleyed horizons and slowly permeable layers below 45 cm and were assessed as being Wetness Class II and III. With the calcareous heavy clay loam and clay topsoils these profiles suffer from a moderate wetness limitation. Within this grade there are also some localised areas with better drainage that have only minor limitations.

Subgrade 3b

The areas of Subgrade 3b land are slightly variable but the predominant profiles suffer from moderate wetness limitations. They have gleyed horizons and slowly permeable layers below 30 cm which were assessed as Wetness Class IV, or in places the gleyed horizons and slowly permeable layers start lower down and these profiles were assessed as Wetness Class II and III. With these wetness classes and a combination of calcareous and non-calcareous heavy clay loam and clay topsoils. Some localised areas are better drained but have similar topsoils and suffer from moderate workability limitations.

Other Land

The built up areas and roads are shown as urban. Areas of derelict land and land from the mineral works are shown as non-agricultural land. Agricultural buildings are so marked.

Resource Planning Team
Taunton Statutory Unit
December 1994

APPENDIX 1

REFERENCES

BRITISH GEOLOGICAL SURVEY (1988) Sold and Drift Edition, Sheet 216, 217, Tewkesbury, Moreton-in-Marsh 1:50,000

MAFF (1968) Agricultural Land Classification Map, Sheet 143, Provisional 1:63,360 scale.

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

METEOROLOGICAL OFFICE (1989) Climatological Data for Agricultural Land Classification.

SOIL SURVEY OF ENGLAND AND WALES (1983) Sheet 5, Soils of South West England, 1:250,000 scale.

APPENDIX 2

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.

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: private park land, 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.

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

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

APPENDIX 3

DEFINITION OF SOIL WETNESS CLASSES

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).

SOIL PLASTICITY RECORDING SHEET

ANNEX 2

SITE DATA

<u>Grid Ref</u> SO 92 NW, NE	<u>Site Name</u> Bishops Cleeve	<u>LPA</u> Gloucester County
<u>AAR</u> 671	<u>ATO</u> 1459	<u>FCD</u> 144
	<u>MD (wheat)</u> 107	<u>MD (potatoes)</u> 100

SOIL PIT DATA

PIT ONE SO 9515 2888			PIT TWO SO 9422 2779			PIT THREE SO 9608 2831			
SOIL SERIES Evesham 2			SOIL SERIES Evesham 2			SOIL SERIES Evesham 2			
DEPTH	TEXTURE	PLASTIC Y/N	COMMENTS	TEXTURE	PLASTIC Y/N	COMMENTS	TEXTURE	PLASTIC Y/N	COMMENTS
10 cm	C	Y		HCL	Y		SCL	N	
20 cm	C	Y		HCL	Y		SCL	Y	
30 cm	C	Y		C	Y		SC	Y	
40 cm	C	Y		C	N		SC	Y	
50 cm	C	Y		C	N		SC	Y	
60 cm	C	Y		C	Y		SCL	N	

INL569

SITE NAME		PROFILE NO.	SLOPE AND ASPECT	LAND USE	Av Rainfall: 671 mm	PARENT MATERIAL
Bishops Cleeve		Pit 1	1° South	Ley	ATO: 1459 day °C	Lower Lias Clay
JOB NO.		DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 148	SOIL SAMPLE REFERENCES
121/94		24/11/94	SO 9515 2888	HLJ/PRW	Climatic Grade: 1	RPT/HLJ/105
					Exposure Grade: 1	

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	24	C	10YR53	<1% HR Total (Vis)	None	None	-	-	-	G	MF+VF	Y	Abrupt smooth
2	41	C	10YR54	<1% HR Total (Vis)	None	None	MCSAB	Fm	M	P	CF, VF	N	Clear smooth
3	75	C	2.5Y53	<1% HR Total (Vis)	CDMO (10YR66)	None	MCAB	Fr	M	P	CF, VF	N	Abrupt smooth
4	90+	C	2.5Y51	<1% HR Total (Vis)	CDMO (10YR66)	None	MCSAB	Fm	M	P	FVF	Y	-

Profile Gleyed From: 41 cm
Depth to Slowly Permeable Horizon: 41 cm
Wetness Class: III
Wetness Grade: 3a

NL336k

Available Water Wheat: 137 mm
Potatoes: 113 mm
Moisture Deficit Wheat: 107 mm
Potatoes: 100 mm
Moisture Balance Wheat: 30 mm
Potatoes: 13 mm
Droughtiness Grade: 1 (Calculated to 120 cm)

Final ALC Grade: 3a
Main Limiting Factor(s): Wetness
Remarks:
3a because calcareous topsoil

SITE NAME Bishops Cleeve		PROFILE NO. Pit 2	SLOPE AND ASPECT 0°	LAND USE PGR	Av Rainfall: 671 mm ATO: 1459 day °C FC Days: 148 Climatic Grade: 1 Exposure Grade: 1	PARENT MATERIAL Lower Lias Clay	
JOB NO. 121/94		DATE 30/1194	GRID REFERENCE SO 9422 2779	DESCRIBED BY GMS/BD	SOIL SAMPLE REFERENCES RPT/GMS/466		

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	28	HCL	10YR53	<1% HR (Vis)	none	none	WMSAB	Friable	-	Good	MVF	Yes weak	Clear smooth
2	35	C	10YR51	<1% HR (Vis)	MDMO 10YR68	none	MCAB	V Firm	Poor	Low	MVF	Yes	Clear smooth
3	56	C	2.5Y56	<1% HR (Vis)	none	none	MCAB	Friable	Moderate	Low	CVF	Yes	Gradual smooth
4	90+	C	10YR51	<1% HR (Vis)	MDMO 10YR56	none	MCAB	Firm	Moderate	Low	FVF	Yes	-

Profile Gleyed From: 56 cm
 Depth to Slowly Permeable Horizon: 56 cm
 Wetness Class: II
 Wetness Grade: 2

NL336k

Available Water Wheat: 138 mm
 Potatoes: 114 mm
 Moisture Deficit Wheat: 107 mm
 Potatoes: 100 mm
 Moisture Balance Wheat: 31 mm
 Potatoes: 14 mm
 Droughtiness Grade: 1 (Calculated to 120 cm)

Final ALC Grade: 2
 Main Limiting Factor(s): Wetness

Remarks:
 Horizon 2 causing wetness within it. Horizon 3 not SPL because wetness above not caused by it.

SITE NAME Bishops Cleeve		PROFILE NO. Pit 3	SLOPE AND ASPECT 0°	LAND USE Cereal	Av Rainfall: 671 mm ATO: 1459 day °C	PARENT MATERIAL Lower Lias Clay
JOB NO. 121/94		DATE 2/12/94	GRID REFERENCE (ASP 61) SO 9608 2831	DESCRIBED BY GMS	FC Days: 148 Climatic Grade: 1 Exposure Grade: 1	SOIL SAMPLE REFERENCES RPT/GMS/470,1

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	SCL	2.5Y44	2% HR (Vis)	none	none	MCSAB	Friable	Moderate	Good	CVF	Very slight	Abrupt smooth
2	56	SC	2.5Y56	5% HR (Vis)	none	none	MCAB	Friable	Moderate	Good	FVF	Yes	Gradual smooth
3	120	SCL	10YR56	15% HR (Vis)	FDFO 10YR58	none	MCSAB	Friable	Moderate	Good	FVF	Yes	-

Profile Gleyed From: Not
 Depth to Slowly Permeable Horizon: No SPL
 Wetness Class: I
 Wetness Grade: I

NL336k

Available Water Wheat: 137 mm
 Potatoes: 103 mm
 Moisture Deficit Wheat: 107 mm
 Potatoes: 100 mm
 Moisture Balance Wheat: 30 mm
 Potatoes: 3 mm
 Droughtiness Grade: 2 (Calculated to 120 cm)

Final ALC Grade: 2
 Main Limiting Factor(s): Droughtiness

Remarks:
 Pit dug to 80 cm, augered to 120 cm.

SITE NAME		PROFILE NO.	SLOPE AND ASPECT	LAND USE	Av Rainfall: 671 mm	PARENT MATERIAL	
Bishops Cleeve		Pit 4	0°	PGR	ATO: 1459 day °C	River Terrace Deposits	
JOB NO.		DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 148	SOIL SAMPLE REFERENCES	
121/94		5/12/94	(ASP 47) SO 9505 2668	GMS	Climatic Grade: 1	RPT/GMS/472-4	
					Exposure Grade: 1		

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	13	MCL	10YR42	<1% HR (Vis)	none	none	WCSAB	Friable	Moderate	Good	MVF	Yes	Clear smooth
2	45	SCL	10YR53	7% HR (S+D)	none	none	MCSAB	Friable	Moderate	Good	MVF	Yes	Clear smooth
3	70	SCL	10YR54	25% HR (S+D)	CDFO 10YR56	none	MCSAB	Friable	Moderate	Good	CVF	Yes	Gradual smooth
4	120	MS	10YR54	38% HR (S+D)	none	none	WMSAB	V. Friable	Good	Good	FVF	Yes	-

Profile Gleyed From: Not gleyed

Depth to Slowly Permeable Horizon: No SPL

Wetness Class: I

Wetness Grade: 1

NL336k

Available Water Wheat: 102 mm

Potatoes: 97 mm

Moisture Deficit Wheat: 107 mm

Potatoes: 100 mm

Moisture Balance Wheat: -5 mm

Potatoes: -3 mm

Droughtiness Grade: 3a (Calculated to 120 cm)

Final ALC Grade: 3a

Main Limiting Factor(s): Droughtiness

Remarks:

SITE NAME Bishops Cleeve		PROFILE NO. Pit 5	SLOPE AND ASPECT 0°		LAND USE Ploughed		Av Rainfall: 671 mm ATO: 1459 day °C FC Days: 148 Climatic Grade: 1 Exposure Grade: 1		PARENT MATERIAL Lower Lias Clay				
JOB NO. 121/94		DATE 5/12/94	GRID REFERENCE (ASP 50) SO 9644 2883		DESCRIBED BY GMS		SOIL SAMPLE REFERENCES None						

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	35	C	2.5Y44	0% (Vis)	none	none	WCSAB	Friable	Moderate	Good	FVF	Yes	Clear smooth
2	60+	C	2.5Y64, 50	0% (Vis)	CDFO 10YR66	none	WCAB	Firm	Poor	Low	FVF	Yes	-

Profile Gleyed From: 35 cm

Depth to Slowly Permeable Horizon: 35 cm

Wetness Class: IV

Wetness Grade: 3b

NL336k

Available Water Wheat: 128 mm

Potatoes: 105 mm

Moisture Deficit Wheat: 107 mm

Potatoes: 100 mm

Moisture Balance Wheat: 21 mm

Potatoes: 5 mm

Droughtiness Grade: 2 (Calculated to 120 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks: