

**Churchwood Quarry Wickwar**  
**Agricultural Land Classification**  
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FRCA Worcester  
Western Region

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**CHURCHWOOD QUARRY WICKWAR**  
**AGRICULTURAL LAND CLASSIFICATION SURVEY**

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# CHURCHWOOD QUARRY WICKWAR

## AGRICULTURAL LAND CLASSIFICATION SURVEY

### INTRODUCTION

- 1 This report presents the findings of a detailed Agricultural Land Classification (ALC) survey of 26.6ha of land at Churchwood Quarry. Field survey was based on 28 auger borings and 3 soil profile pits and was completed in October 1998. During the survey one sample was analysed for particle size distribution (PSD).
- 2 The survey was conducted by the Resource Planning Team of FRCA Western Region on behalf of MAFF in its statutory role in the preparation of the South Gloucestershire Minerals 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 wholly 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 At the time of survey land cover was under grass and recently harvested oilseed rape. Other land which was not surveyed included a woodland strip and several ponds.

### SUMMARY

- 5 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 Churchwood Quarry

Grade	Area (ha)	/ Surveyed Area (25.3ha)
3a	13.9	54.9
3b	11.4	45.1
Other land	1.3	0.0
Total site area	26.6	100.0

- 6 Over half of the site is Subgrade 3a in quality. The soils have heavy clay loam topsoils over shattered limestone. This becomes more solid with depth. The soils have both a moderate droughtiness limitation and a topsoil workability limitation. The remaining site area is of lower Subgrade 3b quality. The soils have medium clay loam topsoils overlying clay. These soils are limited by a moderate wetness limitation.

## CLIMATE

- 7 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
- 8 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
- 9 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 Churchwood Quarry**

Grid Reference	ST 718905
Altitude (m)	77
Accumulated Temperature (day C)	1451
Average Annual Rainfall (mm)	830
Overall Climatic Grade	1
Field Capacity Days	184
Moisture deficit (mm) Wheat	93
Potatoes	82

## RELIEF

- 10 Altitude ranges from 76 metres at the south eastern corner of the site to 81 metres at the south western corner of the site with generally level land

## GEOLOGY AND SOILS

- 11 The underlying geology of the site is shown on the published geology map (IGS 1970) as Jurassic Lias clay over the eastern half of the site and carboniferous limestone across the western half of the site In the recent survey parent materials corresponded well to the published geology
- 12 Soils were mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1:250 000 (SSEW 1983) as the Crwbin Association over the western half of the site and the Denchworth Soil Association over the eastern half

- 13 The Crwbin Soil Association is described as having very shallow and well drained soils over limestone The Denchworth Soil Association is described as having slowly permeable seasonally waterlogged clayey soils
- 14 The recent survey bore out this published soils distribution

### **AGRICULTURAL LAND CLASSIFICATION**

- 15 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
- 16 **Subgrade 3a**
- Land of good quality was mapped across the western half of the site The soils have been described as having heavy clay loam topsoils overlying a stony clay loam horizon where the limestone is shattered passing onto the solid soft limestone bedrock Rooting extended well into the shattered limestone and the soils are limited by a moderate soil droughtiness limitation and also by topsoil workability due to the heavy nature of the topsoil textures
- 17 **Subgrade 3b**
- Land of moderate quality was identified across the eastern half of the site The soils were described as having clay loam topsoil textures which immediately overlay clay to depth A soil profile pit confirmed that the gleyed grey clay was slowly permeable and the soils were placed into Wetness Class IV (see Appendix II) and Subgrade 3b

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## REFERENCES

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Monograph No 5 Silsoe

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

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

SOIL SURVEY OF ENGLAND AND WALES (1984) Soils and Their Use in South West  
England Bulletin No 14 SSEW Harpenden

## 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



## 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 (Ed) (1997) Soil Survey Field Handbook Soil Survey Technical Monograph No 5 Silsoe

**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 1997)

**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

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

**GRDNT** Gradient as estimated or measured by hand held optical clinometer

**GLEYSPL** 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

<b>MREL</b>	Microrelief limitation	<b>FLOOD</b>	Flood risk	<b>EROSN</b>	Soil erosion risk
<b>EXP</b>	Exposure limitation	<b>FROST</b>	Frost prone	<b>DIST</b>	Disturbed land
<b>CHEM</b>	Chemical limitation				

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

<b>OC</b>	Overall Climate	<b>AE</b>	Aspect	<b>EX</b>	Exposure
<b>FR</b>	Frost Risk	<b>GR</b>	Gradient	<b>MR</b>	Microrelief
<b>FL</b>	Flood Risk	<b>TX</b>	Topsoil Texture	<b>DP</b>	Soil Depth

<b>CH</b>	Chemical	<b>WE</b>	Wetness	<b>WK</b>	Workability
<b>DR</b>	Drought	<b>ER</b>	Erosion Risk	<b>WD</b>	Soil Wetness/Droughtiness
<b>ST</b>	Topsoil Stoniness				

**TEXTURE** Soil texture classes are denoted by the following abbreviations

<b>S</b>	Sand	<b>LS</b>	Loamy Sand	<b>SL</b>	Sandy Loam
<b>SZL</b>	Sandy Silt Loam	<b>CL</b>	Clay Loam	<b>ZCL</b>	Silty Clay Loam
<b>ZL</b>	Silt Loam	<b>SCL</b>	Sandy Clay Loam	<b>C</b>	Clay
<b>SC</b>	Sandy clay	<b>ZC</b>	Silty clay	<b>OL</b>	Organic Loam
<b>P</b>	Peat	<b>SP</b>	Sandy Peat	<b>LP</b>	Loamy Peat
<b>PL</b>	Peaty Loam	<b>PS</b>	Peaty Sand	<b>MZ</b>	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

<b>F</b>	Fine (more than 66% of the sand less than 0.2mm)
<b>M</b>	Medium (less than 66% fine sand and less than 33% coarse sand)
<b>C</b>	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

<b>F</b>	faint indistinct mottles evident only on close inspection
<b>D</b>	distinct mottles are readily seen
<b>P</b>	Prominent mottling is conspicuous and one of the outstanding features of the horizon

**PED COL** Ped face colour using Munsell notation

**GLEYS** 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

<b>HR</b>	All hard rocks and stones	<b>SLST</b>	Soft oolitic or dolimitic limestone
<b>CH</b>	Chalk	<b>FSST</b>	Soft fine grained sandstone
<b>ZR</b>	Soft argillaceous or silty rocks	<b>GH</b>	Gravel with non porous (hard) stones
<b>MSST</b>	Soft medium grained sandstone	<b>GS</b>	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

<b><u>Degree of development</u></b>	<b>WA</b> Weakly developed Adherent	<b>WK</b> Weakly developed
	<b>MD</b> Moderately developed	<b>ST</b> Strongly developed
<b><u>Ped size</u></b>	<b>F</b> Fine	<b>M</b> Medium
	<b>C</b> Coarse	<b>VC</b> Very coarse
<b><u>Ped Shape</u></b>	<b>S</b> Single grain	<b>M</b> Massive
	<b>GR</b> Granular	<b>AB</b> Angular blocky
	<b>SAB</b> Sub angular blocky	<b>PR</b> Prismatic
	<b>PL</b> Platy	

**CONSIST** Soil consistence is described using the following notation

<b>L</b> Loose	<b>VF</b> Very Friable	<b>FR</b> Friable	<b>FM</b> Firm
<b>VM</b> Very firm	<b>EM</b> Extremely firm	<b>EH</b> 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 in this column

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

### STONE ASSESSMENT

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

## MOTTLE SIZE

<b>EF</b>	Extremely fine <1mm	<b>M</b>	Medium 5-15mm
<b>VF</b>	Very fine 1-2mm	<b>C</b>	Coarse >15mm
<b>F</b>	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

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

## POROSITY

<b>P</b>	Poor	less than 0.5% biopores at least 0.5mm in diameter
<b>G</b>	Good	more than 0.5% biopores at least 0.5mm in diameter

## ROOT ABUNDANCE

The number of roots per 100cm <sup>2</sup>		Very Fine and Fine	Medium and Coarse
<b>F</b>	Few	1-10	1 or 2
<b>C</b>	Common	10-25	2-5
<b>M</b>	Many	25-200	>5
<b>A</b>	Abundant	>200	

## ROOT SIZE

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

## HORIZON BOUNDARY DISTINCTNESS

<b>Sharp</b>	<0.5cm	<b>Gradual</b>	6-13cm
<b>Abrupt</b>	0.5-2.5cm	<b>Diffuse</b>	>13cm
<b>Clear</b>	2.5-6cm		

**HORIZON BOUNDARY FORM** Smooth wavy irregular or broken \*

\* See Soil Survey Field Handbook (Hodgson 1997) for details

SITE NAME		PROFILE NO	SLOPE AND ASPECT	LAND USE	Av Rainfall	830 mm	PARENT MATERIAL					
Church Wood Quarry		PIT1 (ASP6)	Level	Permanent Grassland	ATO	1451 day C	LOWER LIAS CLAY					
JOB NO		DATE	GRID REFERENCE	DESCRIBED BY	FC Days	184	PSD SAMPLES TAKEN					
65/98		11/06/98	ST 718 907	JLeP/SYH	Climatic Grade	1	NONE					
					Exposure Grade							

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	20	MCL	10YR4/2	None	cfm 10YR5/6	None	MD CSAB breaks down readily	FR			MF+VF		Smooth/clear
2	36	C	25Y4/2	None	mfd 10YR5/6	None	STCAB	FM	M	P	CF+VF		Smooth/gradual
3	69	C	25Y4/1	None	mfd 10YR5/8	None	WKCSAB	FM	M	P	FVF		Smooth/gradual
4	120	(Z)C	10B4/1	None	cfm 25Y4/2	None	MASS	FM	P	P	FVF		

Profile Gleyed From surface  
 Slowly Permeable Horizon From 36  
 Wetness Class 4  
 Wetness Grade 3b

Available Water Wheat 135 mm  
 Potatoes 116 mm  
 Moisture Deficit Wheat 93 mm  
 Potatoes 81 mm  
 Moisture Balance Wheat +42 mm  
 Potatoes +34 mm  
 Droughtiness Grade 1 (Calculated to 120 cm)

Final ALC Grade 3b  
 Main Limiting Factor(s) we

Remarks Water into pit at 76cm  
 H3 = structure extremely weak  
 H4 = structure is massive there are what appear to be shiny ped faces but these are more likely to be fissures in the clay

SITE NAME		PROFILE NO	SLOPE AND ASPECT	LAND USE	Av Rainfall	830 mm	PARENT MATERIAL					
Church Wood Quarry		PIT2 (ASP1 4)	Level	Oilseed rape	ATO	1451 day C	Carboniferous Limestone					
JOB NO		DATE	GRID REFERENCE	DESCRIBED BY	FC Days	184	PSD SAMPLES TAKEN					
65/98		16/6/98	ST 7165 9078	SH/SK	Climatic Grade	1	T S 0 25CM HCL S 23% 2 45% C 32%					
					Exposure Grade							

Horizon No	Lowest Av Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness Size Type and Field Method	Motting 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	20	HCL	10YR4/2	5% >2 m 14% 2 m 19% HR( +d)	None	None	MDF+MSAB	FR	G	G	CF+VF		Wavy abrupt
2	30	HCL	10YR4/4	70% HR (VIS)	None	None	Too stony to assess	Too stony		M	FVF along sides of stones and rocks by 25cm roots are running horizontally		Wavy diffuse
3	45 pit dug to 45cm	SLST	Solid bedrock only very few roots penetrate below 30cm										

Profile Gleyed From	Available Water	Wheat	43 mm	Final ALC Grade	3b
Slowly Permeable Horizon From		Potatoes	43 mm	Main Limiting Factor(s)	Dr
Wetness Class	1	Moisture Deficit	Wheat	93 mm	
Wetness Grade	3a		Potatoes	82 mm	
		Moisture Balance	Wheat	50 mm	
			Potatoes	39 mm	
	Droughtness Grade	3b	(Calculated to 45cm)	Remarks	

SITE NAME		PROFILE NO	SLOPE AND ASPECT	LAND USE	Av Rainfall	830 mm	PARENT MATERIAL					
Church Wood Quarry		PIT 3(ASP12 13)	Level	Oilseed Rape	ATO	1451 day C	Carboniferous Limestone					
JOB NO		DATE	GRID REFERENCE	DESCRIBED BY	FC Days	184	PSD SAMPLES TAKEN					
65/98		29/9/98	ST 7167 9046	SYH/GMS	Climatic Grade	1	None					
					Exposure Grade							

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	25	HCL	7 5YR4/3	<1% SLST(S)	None	None	MDCSAB	FR		G	MF+VF		Smooth/clear
2	50	HCL	75YR4/4	50% SLST(S)	None	None	MDMSAB	FR	G	G	MF+VF		Sharp wavy
3	50+	Softlimestone fractured with roots penetrating the cracks but not extending laterally											

Profile Gleyed From Not gleyed

Slowly Permeable Horizon From No SPL

Wetness Class I

Wetness Grade 3a

Available Water Wheat 82 mm

Potatoes 84 mm

Moisture Deficit Wheat 93 mm

Potatoes 82 mm

Moisture Balance Wheat 11 mm

Potatoes 2 mm

Droughtiness Grade 3a (Calculated to 70 cm)

Final ALC Grade 3a

Main Limiting Factor(s) DR 1 week

Remarks