

**RACE FARM, CAMBORNE  
AGRICULTURAL LAND CLASSIFICATION SURVEY**

**CONTENTS**

	<b>Page</b>
INTRODUCTION	1
SUMMARY	1
CLIMATE	2
RELIEF	3
GEOLOGY AND SOILS	3
AGRICULTURAL LAND CLASSIFICATION AND MAP	3
REFERENCES	5
APPENDIX I    Description of the Grades and Subgrades	6
APPENDIX II    Definition of Soil Wetness Classes	8
APPENDIX III    Survey Data:	9
Sample Point Location Map	
Pit Descriptions	
Boring Profile Data	
Boring Horizon Data	
Abbreviations and Terms used in Survey Data	

**RACE FARM, CAMBORNE  
PROPOSED SEWAGE WORKS**

**AGRICULTURAL LAND CLASSIFICATION SURVEY**

**INTRODUCTION**

1. This report presents the findings of a detailed Agricultural Land Classification (ALC) survey of 13.9 ha of land at Race Farm., Camborne. Field survey was based on 19 auger borings and 1 soil profile pit, and was completed in April 1998. During the survey 2 samples were 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 connection with an application to the Planning Authority under the Town and Country Planning Act, 1990 for a new sewage treatment works.
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 mainly Grade 2, the site was previously surveyed in 1978 at a scale of 1: 50 000 (ADAS 1978).
4. Although the 1978 survey of Camborne and Redruth shows the current site as mainly Grade 2 with some Grade 3 in the east, this survey was carried out to guidelines for classification which have now been superseded and the current survey uses the Revised Guidelines and Criteria for grading the quality of agricultural land (MAFF 1988) and therefore supersedes the previous survey. Grade descriptions are summarised in Appendix 1.
5. Recent surveys have also been carried out on land adjacent to the site at West Camborne (ADAS 1991) and on land nearby at Tehidy and Illogan (ADAS 1991). The West Camborne survey on land to the south of the current site shows mainly Grade 2 and found mainly medium clay loam topsoil textures. The survey at Tehidy and Illogan on land to the east of the current site also shows mainly Grade 2 but includes several PSD analyses which found heavy clay loam topsoil textures.
6. At the time of survey land cover was grass for mixed stock, mainly beef.

**SUMMARY**

7. 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.



12. Evidence from the flagging of trees indicates that much of the site is subject to a significant exposure limitation, but this is considered to be no more than to Grade 2. The site is adjacent to Rosewarne Research Station where extensive trials have been carried out over the years into the effects of exposure and the benefits of shelter hedges.

## **RELIEF**

13. Altitude ranges from 50 metres at the east of the site to 78 metres in the west with mainly gentle and moderate slopes which are not limiting, although very small areas on the valley sides were found to be limited to Subgrade 3b or even in one case to Grade 4, by gradient.

## **GEOLOGY AND SOILS**

14. The underlying geology of the site is shown on the published geology map (BGS, 1990) as Devonian Mylor Slate Formation. This was entirely consistent with the soil profiles examined during the current survey.

15. Soils were mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1:250 000 (SSEW, 1983) as Denbigh 2 Association. This is described as well drained fine loamy soils over slate or slate rubble with some fine loamy soils variably affected by ground water. This was also entirely borne out by the current survey, although the soils in the west of the site were found to be deeper, brighter in colour and less stony than those in the east.

## **AGRICULTURAL LAND CLASSIFICATION**

16. 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.

### **Grade 2**

17. Most of the site was found to be Grade 2 with a minor limitation due to restricted workability with medium clay loam topsoil texture. This is in broad agreement with the findings of previous nearby surveys and with the 1978 survey on this site, and was confirmed by laboratory PSD analysis.

18. Although only 4 borings and the pit extended to the full 80 cm, the area was assessed as Wetness Class I. Those borings which were impenetrable, typically at around 65 cm, were considered to be approaching slate bedrock with no evidence of slowly permeable layer or even gleying except at ASP 11 which was in the valley bottom.

### **Subgrade 3b**

19. The three areas shown as Subgrade 3b are all limited by gradient and are found on short valley sides.

### **Grade 4**

20. The small area shown as Grade 4 was found in a valley bottom where the main limitation is wetness. The single auger boring at ASP 7 found a slowly permeable layer starting immediately below the heavy clay loam topsoil and was assessed as Wetness Class IV.

P Barnett  
Resource Planning Team  
FRCA Bristol  
1 May 1998

## REFERENCES

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

## 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, 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.

**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.

<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
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<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
<b>SI:</b>	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 pedes 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 this column.

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

### STONE ASSESSMENT:

<b>VIS:</b> Visual	<b>S:</b> Sieve	<b>D:</b> Displacement
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**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:**

**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 <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: 1069mm	PARENT MATERIAL
Camborne S Works		Pit 1 (ASP 19)	4 ° NE	PGR	ATO: 1567day °C	Mylor Slate
JOB NO.		DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 210	PSD SAMPLES TAKEN
52.98		15.4.98	SW 6352 4082	PB	Climatic Grade: 1	TS 0-25 cm: MCL (HCL) (S25: Z49: C26%)
					Exposure Grade: 2	

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	MCL	10YR43	1% > 2 cm (s) 10% < 2 cm (s+d) 11% HR	0	0	-	-	-	-	MF, VF	-	Grad Smooth
2	43	HCL	10YR44	3% > 2 cm (s) 17% < 2 cm (s+d) 20% HR	0	0	MDM, FSAB	FR	G	G	MVF	-	Grad Smooth
3	70	HCL	10YR54	7% > 2 cm (s) 21% < 2 cm (s+d) 28% HR	0	0	WKCAB	FR	M	G	CVF	-	Grad Wavy
4	90+	(Z) C	10YR63	15% < 2 cm (s) 27% < 2cm (s+d) 42% HR	0	0	Too stony	FR	(M)	(G)	FVF	-	

Profile Gleyed From: -  
 Slowly Permeable Horizon From: -  
 Wetness Class: I  
 Wetness Grade: 2

Available Water Wheat: 118 mm  
 Potatoes: 103 mm  
 Moisture Deficit Wheat: 94 mm  
 Potatoes: 84 mm  
 Moisture Balance Wheat: +24 mm  
 Potatoes: +19 mm  
 Droughtiness Grade: 2 (Calculated to 120 cm)

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

Remarks: