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Agricultural Land Classification

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LAUNCESTON

AGRICULTURAL LAND CLASSIFICATION SURVEY

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LAUNCESTON

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INTRODUCTION

1. This report presents the findings of a semi-detailed Agricultural Land Classification (ALC) survey of 265.2 ha of land at Launceston, Cornwall. Field survey was based on 131 auger borings and 2 soil profile pits, and was completed in May 1997. During the survey 6 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 the preparation of North Cornwall 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 mainly Grade 3, the site was previously surveyed in 1984 at a scale of 1:25 000 (ADAS, 1984). 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. Three small areas adjacent to the current survey area have been surveyed in recent years to the revised guidelines. These are at Badash (ADAS 1995) which shows Subgrade 3b, one small site to the west of Quarry Lane which shows Subgrade 3a and a rather larger site around the sewage works at Scarne which shows Grade 4 (ADAS 1994). Although the latter area was finally shown as entirely Grade 4, in fact the survey found a mixture of Subgrade 3b and Grade 4, with auger boring observations extensively modified in the light of soil profile pit information.

5. At the time of survey land cover was mainly permanent grass for beef and sheep. Several areas, total 14.1 ha of agricultural land within the survey area were not surveyed, either because permission for access was not available, or in one case because it had been refused. Other land which was not surveyed included mainly roads, residential land, agricultural buildings, one area of woodland and one area of quarry and woodland.

SUMMARY

6. The distribution of ALC grades is shown on the accompanying 1:15 000 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: Launceston

Grade	Area (ha)	% Surveyed Area (245.2 ha)
3b	169.0	69
4	56.0	23
5	6.1	2
Agricultural land not surveyed	14.1	6
Other land	20.0	
Total site area	265.2	

7. This shows that none of the area was found to be best and most versatile. The best of the land was found to be Subgrade 3b, limited mainly by workability and also by gradient, although these limitations are not distinguished on the accompanying ALC map. Other areas shown as Grade 4 and Grade 5 are more severely limited, mainly by steeper gradients.

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 an overall climatic limitation which limits the land to Grade 2, although a further limitation to Subgrade 3a was identified as operating above 140 m altitude.

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. A critical boundary of 250 FC Days was found identified around 145 m altitude.

Table 2: Climatic Interpolations: Launceston

Grid Reference		SX 339 849	SX 334 832
Altitude (m)		75	155
Accumulated Temperature (day °C)		1531	1441
Average Annual Rainfall (mm)		1152	1315
Overall Climatic Grade		2	3a
Field Capacity Days		230	255
Moisture deficit (mm):	Wheat	79	60
	Potatoes	66	41

RELIEF

11. Altitude ranges from 60 metres at Kensey Vean to 158 metres at Scarne with mainly gentle and moderate slopes which are not limiting on the rounded upper slopes, but frequently with steeper slopes on the valley sides which can limit the classification of the land to Grade 4 or even Grade 5.

GEOLOGY AND SOILS

12. The underlying geology of the site is shown on the published geology map (IGS, 1977) as mainly shale and grit of the Carboniferous Culm Measures with alluvium in the flood plain of the River Kensey and a small igneous intrusion running from the west towards the Castle Hill. This was largely borne out by the current survey and despite some variation between the areas of shale and grit, all PSD samples were remarkably consistent.

13. Soils were mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1:250 000 (SSEW, 1983) as mainly Denbigh 1 and Denbigh 2 Associations. These are more or less similar, described as well drained fine loamy soils developed on slaty mudstone and siltstone. Both can be shallow and both are associated with similar soils which have slight seasonal waterlogging. This was largely borne out by the current survey with most of the profiles being well drained and assessed as Wetness Class I. However, where profiles were found to show evidence of seasonal waterlogging, the effect on ALC grade was quite profound as even gleying in the absence of a slowly permeable layer caused considerable downgrading within the ALC system because of the relatively high field capacity days at this site.

AGRICULTURAL LAND CLASSIFICATION

14. *The distribution of ALC grades found by the current survey is shown on the* accompanying 1:15 000 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 3b

15. The best of the soils were found to be Subgrade 3b with mainly heavy clay loam topsoils at Wetness Class I limited only by workability. Although in several areas, particularly to the south of the town, hand texturing of the brighter coloured topsoils may have indicated medium clay loam, the PSD samples of even the best profiles showed heavy clay loam with only one being borderline to medium clay loam and two being borderline to clay.

16. Other observations within the area showing Subgrade 3b were found to be limited by gradient with slopes measured between 8 and 11°. A few profiles were also found to be Wetness Class II, also with heavy clay loam topsoil texture. The various limiting factors are not distinguished on the ALC map.

Grade 4

17. The area shown as Grade 4 is limited mainly by gradient, with slopes of 12 to 18°, although small areas around Ridgegrove Farm and in the valley near Landlake Wood were found to be limited by severe wetness, mainly assessed as Wetness Class IV.

Grade 5

18. Small areas of steeper valley sides with slopes of 19° or more are shown as Grade 5.

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4 September 1997

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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 (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
Launceston	Pit 1 (Nr ASP 89)	6° South	PGR	Av Rainfall: 1315 mm ATO: 1441 day °C	Slate
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 249 Climatic Grade: 2 Exposure Grade: 1	PSD SAMPLES TAKEN
40/97	18/6/97	SX 3428 8341	PB		TS 0-25 cm HCL (S32: Z36: C32%)

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	HCL	10YR43	20% ZR (VIS)	0	0	-	-	-	-	AVF	-	Clear smooth
2	38	HZCL	10YR54	40% ZR (VIS)	0	0	MCGr	Fr	G	G	MVF	-	Ab smooth
3	66+	HZCL	10YR63	80% ZR (VIS)	FDFO 10YR58	0	Too stony	-	(M)	(G)	CVF	-	-

Profile Gleyed From: -

Depth to Slowly Permeable Horizon: -

Wetness Class: I

Wetness Grade: 3b

Available Water Wheat: 102 mm

Potatoes: 92 mm

Moisture Deficit Wheat: 64 mm

Potatoes: 47 mm

Moisture Balance Wheat: +38 mm

Potatoes: +45 mm

Droughtiness Grade: 1 (Calculated to 100 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wk

Remarks:

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE			PARENT MATERIAL
Launceston	Pit 2 (Nr ASP 138)	4 ° SW	PGR	Av Rainfall:	1277 mm	Slate
				ATO:	1444 day °C	
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days:	249	PSD SAMPLES TAKEN
40/97	19/6/97	SX 3346 8274	PB	Climatic Grade:	2	TS 0-25 cm HCL (S26: Z42: C32%)
				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	20	HCL	10YR42	10% HR (VIS)	CRRC	0	-	-	-	-	MF, VF	-	Clear smooth
2	40	HCL	10YR42	30% HR (VIS)	0	0	MM, FSAB	Fr	G	G	CVF	-	Grad wavy
3	70	ZC	2.5YR63	50% ZR (VIS)	FDFO* 10YR56	0	Too stony	Fm	(M)	P	CVF	-	Grad smooth
4	90+	ZC	2.5Y72	70% ZR (VIS)	CDFO 10YR56	0	Too stony	-	(P)	P	FVF	-	-

Profile Gleyed From: 70 cm

Depth to Slowly Permeable Horizon: -

Wetness Class: I

Wetness Grade: 3b

Available Water	Wheat:	115 mm
	Potatoes:	97 mm
Moisture Deficit	Wheat:	64 mm
	Potatoes:	47 mm
Moisture Balance	Wheat:	+51 mm
	Potatoes:	+50 mm

Droughtiness Grade: 1 (Calculated to 120 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wk

Remarks: H3 mottles common in parts - borderline WC II (3b)