RFCS 4003

24/90a,b,c,d

PENZANCE LOCAL PLAN

AGRICULTURAL LAND CLASSIFICATION

REPORT OF SURVEY

1. Introduction

In July 1990 a detailed Agricultural Land Classification (ALC) survey of 4 sites covering 14.3 hectares in the Penzance Local Plan area was carried out. This was in response to a request by Penwith District Council for an agricultural land classification of the sites in connection with the Penzance Local Plan. The sites were as follows:

Site	Locality	Grid Ref	Area (ha)
1	Madron	SW 454321	2.1
2	Trannack	SW 475315	8.7
3	Penzance Heliport	SW 485315	1.6
4	Nanturras	SW 552308	1.9

The survey was carried out by members of the Resource Planning Group (South West Region).

2. Climate, Geology and Soils

Climatic variables were obtained for the 4 sites by interpolation from a 5 km grid database. The variables are as follows:

	Madron	Trannack	Heliport	Nanturras
Altitude	120 m	50 m	5 m	80 m
Accumulated Temperature (ATO)	1524°	1603°	1651°	1567°
Average Annual Rainfall (AAR)	1168 mm	1117 mm	1082 mm	950 mm
Moisture Deficit, Wheat (MDW)	80 mm	90 mm	96 mm	98 mm
Moisture Deficit, Potatoes (MDP)	66 mm	79 mm	86 mm	88 mm
Field Capacity Days (FCD)	227 days	220 days	215 days	189 days

The variables used in the assessment of an overall climatic limitation of a site are the average annual rainfall and the accumulated temperature. The average annual rainfall is a measure of the overall wetness of the site, and the accumulated temperature is a measure of the relative warmth of a locality.

The field capacity days is the median number of days in a year that the soil is at or above field capacity. This variable is used in the determination of soil wetness limitations. The moisture deficits for wheat and potatoes are climatic variables representing the balance between rainfall and potential evapotranspiration during the growing season. They are used for droughtiness assessment in the ALC system.

The effect of the climatic variables on the ALC gradings is discussed for each site individually below.

The underlying geology and the soil associations for the 4 sites are as follows:

Site	Geology	Soil Association	Soil Series
Madron	Biotite - Granite	Denbigh 2	East Keswick
Trannack	Mylor Slates	Denbigh 2	Denbigh
Heliport	Alluvium	Conway	Conway
Nanturras	Mylor Slates	Denbigh 2	East Keswick

East Keswick series are typically well drained, slightly stoney clay loams to approximately 70 cm depth, over a moderately stoney clay loam lower subsoil. Denbigh series are similar, but with a more stoney subsoil and shallower to rock. Conway series are deep, seasonally waterlogged silty clay loam soils developed in alluvium.

3. Agricultural Land Classification (ALC)

The ALC system measures the degree to which the physical characteristics of the land impose long-term limitations on its use for agriculture. The ALC for the 4 sites was determined using the Revised Guidelines and Criteria for grading the quality of agricultural land.

A description of the ALC grades and sub-grades is given as Appendix 1. At each site the soil was examined to a depth of 1 metre by hand auger on an approximate 100 metre grid spacing. Representative soil pits were also dug and described. Auger hole descriptions are given as Appendix 2, and the pit descriptions as Appendix 3.

The distribution of the ALC grades and sub-grades are shown on the ALC maps. The locations of the auger borings and soil pits are shown on the auger sample point maps. The extent and relative proportions of the ALC grades found for each site are as follows:

Site	Grade	Area (ha)	% of Site	% of Agricultural Area
Madron	2	2.1	100	100
Trannack	2	1.58	18	19.5
	3b	4.99	57	61.5
	4	1.24	14	15
	5	0.31	3.5	4
	Farm Buildings	0.24	2.5	-
	Non agricultural	0.44	5	-
Heliport	3b	1.58	100	100
Nanturras	2	1.81	98	100
	Non agricultural	0.04	2	-

3.1 Site 1 - Madron

Five auger borings were made in the 2 hectare site. A pit was dug and described. The entire site is classified as grade 2.

The combination of an accumulated temperature of 1524° and an average annual rainfall of 1168 mm lead to an overall climatic limitation and a best possible grade of 2. No evidence of exposure was found at the site.

There is no soil wetness, stoniness, slope or droughtiness limitations. However, the high number of field capacity days lead to a workability limitation in relation to the sandy loam topsoil. The site is therefore graded as 2 on the basis of climate and workability.

3.2 Site 2 - Trannack

Thirteen auger borings were made in the 8.7 hectare site. A pit was dug and described. The following grades were found:

Grade 2	1.58 ha
Sub-grade 3b	4.99 ha
Grade 4	1.24 ha
Grade 5	0.31 ha
Farm buildings	0.24 ha
Non agricultural	0.44 ha

The combination of an accumulated temperature of 1603° and an average annual rainfall of 1117 mm do not constitute a climatic limiting factor. No evidence of exposure was found at the site.

Grade 2 Land

The grade 2 land has a sandy loam topsoil over a medium clay loam subsoil. The profile is very slightly stoney to a depth of 80 cm, and slightly stoney below. The soil is free draining with no wetness limitation. The gradient is not limiting on the grade 2 land and there is no droughtiness limitation.

The high number of field capacity days (215 FCD) lead to a workability limitation in relation to the sandy loam topsoil. The land is therefore graded as 2 on the basis of workability.

Grade 3b Land

The 3b land to the west of the Higher Trannack farmstead is similar to the grade 2 land, but has gradients of 9°, leading to a grade of 3b due to gradient. Some of this land adjacent to the road also has a high stone content, with 15% stones of more than 6 cm diameter in the topsoil, which leads to a grade of 3b due to stoniness acting as an impediment to cultivation.

The 3b land to the east of Higher Trannack farmstead is downgraded in the north due to gradients of 10-11°. To the south the land is disturbed and severely compacted. The compacted subsoil forms a slowly permeable layer, which in combination with the high field capacity day value leads to a wetness class of IV. This gives a final ALC grade of 3b due to wetness.

Grade 4 Land

The two areas of grade 4 land are limited by gradients of 15-16°. The land on grade 4 slopes in the west of the site also has very stoney topsoil, which leads to a grade of 3b due to stoniness in addition to the slope limitation.

Grade 5 Land

The area mapped as grade 5 land has a gradient of 20°. This slope is considered unsafe for the operation of agricultural machinery. The land was being used for bulb production at the time of the survey, but this practice cannot be recommended on the grounds of safety.

3.3 Site 3 - Penzance Heliport

Four auger borings were made in the 1.6 hectare site. The entire site is classified as sub-grade 3b.

The combination of an accumulated temperature of 1651° and an average annual rainfall of 1082 mm do not constitute a climatic limiting factor. No evidence of exposure was found at the site.

At all the observation points a slowly permeable layer was identified at between 35 cm and 40 cm deep. This was accompanied by gleying. The soil therefore has a wetness class of IV, which in combination with the topsoil texture of sandy silt loam, and 215 field capacity days, leads to a grade of 3b due to wetness.

3.4 Site 4 - Nanturras

Two auger borings were made in the 1.9 hectare site. A pit was dug and described. The entire site is classified as grade 2.

The combination of an accumulated temperature of 1567° and an average annual rainfall of 950 mm do not constitute a climatic limiting factor. No evidence of exposure was found at the site.

The soil has a texture of medium clay loam, is slightly stoney and free draining. There is no soil wetness, stoniness, slope, or droughtiness limitations. The combination of 189 field capacity days with the medium clay loam topsoil gives a grade of 2 due to workability.

APPENDIX 1

DESCRIPTION OF THE AGRICULTURAL LAND CLASSIFICATION SYSTEM GRADES AND SUBGRADES

DESCRIPTION OF THE GRADES AND SUBGRADES

The ALC grades and subgrades are described below in terms of the types of limitation which can occur, typical cropping range and the expected level and consistency of yield. In practice, the grades are defined by reference to physical characteristics and the grading guidance and cut-offs for limitation factors in Section 3 enable land to be ranked in accordance with these general descriptions. The most productive and flexible land falls into Grades 1 and 2 and Subgrade 3a and collectively comprises about one-third of the agricultural land in England and Wales. About half the land is of moderate quality in Subgrade 3b or poor quality in Grade 4. Although less significant on a national scale such land can be locally valuable to agriculture and the rural economy where poorer farmland predominates. The remainder is very poor quality land in Grade 5, which mostly occurs in the uplands.

Descriptions are also given of other land categories which may be used on ALC maps.

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 includes 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 moist 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: golf courses, private parkland, 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.

Woodland

Includes commercial and non-commercial woodland. A distinction may be made as necessary between farm and non-farm woodland.

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

APPENDIX 2

AUGER BORING DESCRIPTIONS

SOIL PROFILE DESCRIPTIONS: EXPLANATORY NOTE

(i) TEXTURE:-

Soil texture classes are denoted by the following abbreviations (all Upper case*):

S	Sand
LS	Loamy Sand
SL	Sandy Loam
SZL	Sand Silt Loam
ZL	Silt Loam
MZCL	Medium Silty Clay Loam
MCL	Medium Clay Loam
SCL	Sandy Clay Loam
HZCL	Heavy Silty Clay Loam
HCL	Heavy Clay Loam
SC	Sandy Clay
ZC	Silty Clay
C	Clay

For the sand, loamy sand, sandy loam and sandy silt loam classes the predominant size of sand fraction may be indicated by the use of prefixes, thus:

F	fine (more than $\frac{2}{3}$ of sand less than 0.2 mm)
C	coarse (more than $\frac{1}{3}$ of sand greater than 0.6 mm)
M	medium (less than $\frac{2}{3}$ fine sand and less than $\frac{1}{3}$ coarse sand)

The sub-divisions of clay loam and silty clay loam classes according to clay content are indicated as follows:-

M	medium (less than 27% clay):
H	heavy (27-35% clay)

Other possible texture classes include:

P	Peat
SP	Sandy Peat
LP	Loamy Peat
PL	Peaty Loam
PS	Peaty Sand
MZ	Marine Light Silts

* There are two exceptions to the Upper Case rule:-

- The prefix "Calc" is used to identify naturally calcareous soils containing more than 1% Calcium Carbonate
- For organic mineral soils, the texture of the mineral fraction is prefixed by "Org".

(ii) STRUCTURE:-

Nature and size of structural units are denoted by the following abbreviations:

SAB	Subangular Blocky
AB	Angular Blocky
P	Prismatic

(single grain, granular and platy are not abbreviated)

F	Fine
M	Medium
C	Coarse
VC	Very Coarse

eg Weak **MSAB** = Weakly developed medium subangular blocky

(iii) OTHER

f	= few	=	less than 2% of the matrix or surface described
c	= commom	=	2-20% of the matrix or surface described
m	= many	=	20-40% of the matrix or surface described
vm	= very many	=	+40% of the matrix or surface described

f	= faint	=	indistinct mottles, evident only on close examination
d	= disinct	=	although not striking, the mottles are readily seen
p	= prominent	=	the mottles are conspicuous, and the mottling is one of the outstanding features of the horizon
gm	= grey mottling		
om	= ochreous mottling		

eg **cdom** = common distinct ochreous mottles

rrc =	rusty root channels
ppf =	pale ped faces
mn =	manganese

st =	stones 6 cm
sst =	stones 2-6 cm
vsst=	stones 2 cm

WC =	Wetness Class (use Roman numerals, eg WC IV)
SPL =	Slowly Permeable Layer
WT =	Water Table
I =	Impenetrable if used in Depth Column
IMP =	Impenetrable if used in soil profile notes

(**IMP 2 x 40 cm** = 2 additional borings, both impenetrable at 40 cm)

ASP =	Auger Sample Point

APPENDIX 3

SOIL PIT DESCRIPTIONS

SITE NAME	PROFILE NUMBER	SLOPE AND ASPECT	LAND USE	Av Rainfall :- 1168	PARENT MATERIAL
Site 1 Penzance	1	2°	Grassland	ATO :- 1524 FC Days :- 227 Climatic grade:- 2	Biotite - Granite
	DATE 24.7.90	GRID REFERENCE SW 454 321			

Horizon Number	Lowest Av Depth	Matrix and Ped Face Colours	Texture	Stoniness: Size, Shape, Type, and Field Method	Mottling Abundance, Contrast Size and Colour	Structure: Development Size and Shape	Pores and Fissures	Structural Condition	Consistence	Roots Abundance Size and Nature	Calcium Carbonate Content	Mangan Concs etc	Horizon Boundary: Distinctness and Form
1	39	10YR33	MCL	Few	-	Moderate MG	+0.5%	good	friable	many	-	-	clear smooth
2	80+	10YR34	MCL	Few	-	Weak MSAB	+0.5%	good	friable	common	-	-	

Depth to Slowly Permeable Horizon :- None Present Not Gleyed

Wetness Class :- I

Wetness Grade :- 2

RPG0023/WJC

Available Water Wheat :-

Potatoes :-

Moisture Deficit Wheat :- 80

Potatoes :- 60

Moisture Balance Wheat :-

Potatoes :-

Droughtiness Grade :- 1

Final ALC Grade :- 2

Main Limiting Factor(s) :- Workability

Remarks :-

SITE NAME	PROFILE NUMBER	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Site 2 Penzance	1	South 6°	Bulbs	Av Rainfall :- 1603 ATO :- 1117 FC Days :- 220 Climatic grade:- 1	Mylor Slates
	DATE 24.7.90	GRID REFERENCE SW 469 316			

Horizon Number	Lowest Av Depth	Matrix and Ped Face Colours	Texture	Stoniness: Size, Shape, Type, and Field Method	Mottling Abundance, Contrast Size and Colour	Structure: Development Size and Shape	Pores and Fissures	Structural Condition	Consistence	Roots Abundance Size and Nature	Calcium Carbonate Content	Mangan Concs etc	Horizon Boundary: Distinctness and Form
1	33	10YR34	MCL	3% sst	-	moderate MSAB	+0.5%	good	friable	common	-	-	clear smooth
2	80	10YR33	MCL	3% sst	-	Ditto	+0.5%	good	friable	common	-	-	clear smooth
3	80+	10YR33	MCL	10% sst	-	-	+0.5%	good	-	-	-	-	-

Depth to Slowly Permeable Horizon :- None Present
Not Gleyed

Wetness Class :- I

Wetness Grade :- 2

RPG0023/WJC

Available Water Wheat :-

Potatoes :-

Moisture Deficit Wheat :- 96

Potatoes :- 86

Moisture Balance Wheat :-

Potatoes :-

Droughtiness Grade :- 1

Final ALC Grade :- 2

Main Limiting Factor(s) :- Workability

Remarks :-

SITE NAME	PROFILE NUMBER	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Penzance Site 4	1 DATE 24.7.90	3° GRID REFERENCE SW 552308	Grassland	Av Rainfall :- 950 ATO :- 1567 FC Days :- 189 Climatic grade:- 1	Mylor Slates

Horizon Number	Lowest Av Depth	Matrix and Ped Face Colours	Texture	Stoniness: Size, Shape, Type, and Field Method	Mottling Abundance, Contrast Size and Colour	Structure: Development Size and Shape	Pores and Fissures	Structural Condition	Consistence	Roots Abundance Size and Nature	Calcium Carbonate Content	Mangan Concs etc	Horizon Boundary: Distinctness and Form
1	0-33	7.5YR34	MCL	1% sst	-	Weak MG	+0.5%	good	friable	many	-	-	clear smooth
2	33-80	7.5YR46	MCL	3% st 3% sst visual	-	weak FSAB	+0.5%	good	friable	common	-	-	-

Depth to Slowly Permeable Horizon :- None Present
Not Gleyed

Wetness Class :- I

Wetness Grade :- 2

RPG0023/WJC

Available Water Wheat :-

Potatoes :-

Moisture Deficit Wheat :- 98

Potatoes :- 88

Moisture Balance Wheat :-

Potatoes :-

Droughtiness Grade :- 1

Final ALC Grade :- 2

Main Limiting Factor(s) :- Workability

Remarks :-