BUCKINGHAMSHIRE MINERALS

PLAN REVIEW

LAND AT DENHAM

MAFF Ministry of Agriculture Fisheries and Food

BUCKINGHAMSHIRE MINERALS STRUCTURE PLAN REVIEW
AGRICULTURAL LAND CLASSIFICATION

REPORT OF SURVEY

1. In January 1990 a detailed Agricultural Land Classification (ALC) survey was carried out over 94 hectares on the western edge of Uxbridge, south of Junction 1 on the M40 in south Buckinghamshire. The survey was requested as part of MAFF's statutory input to the Minerals Structure Plan Review and was conducted by members of the Resource Planning Group.

   The ALC system provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on its use for agriculture.

   Fieldwork was conducted at an approximate auger sampling density of one boring per hectare; a total of 95 borings and 4 soil pits were examined. The distribution of land quality is shown on the accompanying ALC map and detailed in Table 1 below. The map has been drawn at a scale of 1:10,000 and is accurate at this scale; any enlargement from this base would be misleading.

   Land quality has been assessed using MAFF's revised guidelines and criteria for grading the quality of agricultural land (operational from 1.1.89).

   Table 1: Distribution of ALC Grades

Grade	Area (ha)	% of Survey Area	% of Agricultural Area
2	12	13.2	13.5
3A	56	61.5	62.9
3B	21	23.1	32.6
Non Agric	1	1.1	100% (89 ha)
Farm buildings	1	1.1	
	91 ha	100%	

2. **Climate**

   Estimates of important climatic variables were obtained by interpolation from a 5 km grid database for a representative location in the survey area. The important parameters in assessing an overall climatic limitation are average annual rainfall (a measure of overall wetness) and accumulated temperature (a measure of the relative warmth of a locality). There is no overall climatic limitation affecting the site and no minor climatic factors such as exposure or frost risk were noted.

   Table 2: Climatic Interpolation

Grid Reference	:	TQ 044847
Altitude (m)	:	35
Accumulated Temperature (° days)	:	1471
Average Annual Rainfall (mm)	:	687
Field Capacity Days	:	143
Moisture Deficit, Wheat (m)	:	112
Mositure Deficit Potatoes (mm)	:	106

3. Topography and Geology

The site occupies the western floodplain of the River Colne which cuts through extensive gravel deposits, and it is only the extreme western edge of the survey area at Southlands Manor which is raised above the lower lying floodplain. The tributary stream, the Alder Bourne forms the southern boundary.

Gradient is not a limiting factor anywhere in the site.

A slight microrelief problem affects the land alongside the River Colne in the south-east, but this is not an actively limiting factor by itself.

4. Agricultural Land Classification

4.1 **Grade 2:** a single map unit of Grade 2 land has been identified adjacent to Brickfield Farm. Soil wetness is the active limitation here. These soils, with medium clay loam topsoils, possess lower subsoil horizons of slowly permeable clay which place the profiles in Wetness Class II and restrict their classification to Grade 2. Soil Pit No 2 is typical of these soils.

4.2 **Sub-grade 3A:** The higher land along the ridge at Southlands Manor in the west of the survey area is placed in this sub-grade as a result of a droughtiness limitation. The soils typically are impenetrable by auger at shallow depths but, as Pit 1 reveals, the soil resource extends to 90 cm before changing into gravel deposits (ie + 70% stone content). Profiles are stony throughout, with the topsoil, upper subsoil and lower subsoil containing 7%, 22% and 50% hard stones respectively.

A similar 3A droughtiness limitation affects some of the organic silt loams on the complex floodplain along the River Colne; Pit 4 is representative. These organic topsoils are developed over sandy loams and loamy sand lower subsoils both of which have high stone contents (but have no gravel layers in the top metre). Droughtiness is the main limitation, as the soils are otherwise placed in Wetness Class 1.

The soils in the extreme north of the site are downgraded to 3A as a result of a wetness limitation; Pit 3 is typical of these soils. The profiles here exhibit clear evidence of gleying within the top 40 cm caused by the presence of slowly permeable clay horizons at shallow depths and are therefore placed in Wetness Class III. Given the prevailing Field Capcity Day (FCD) value, 143 days, and the topsoil texture, Medium Clay Loam, sub-grade 3A is the most appropriate classification. These soils are therefore distinctly heavier in topsoil texture and wetter throughout the profile than the adjacent Grade 2 soils and are not as flexible in their workability characteristics.

The 3A land adjacent to the River Colne defines a variable map unit. The history of the area has given rise to soils that change significantly over short distances. Peaty subsoil layers were occasionally encountered, extending to beyond one metre but showing clear evidence of wetness at shallow depths. These soils are believed to be no better than Wetness Class III; at the time of survey the profiles were often saturated within 50 cm. Given this waterlogging, and the range of topsoil textures, the soils fall into a broad 3A grouping.

4.3 **Sub-grade 3B:** land along the southern boundary adjacent to Alder Bourne has been downgraded to 3B as a result of soil wetness and soil variability. These soils are felt to be at least one grade worse than the surrounding 3A profiles. A complex alluvial history and variable microrelief have given rise to complicated and variable soils. Slight depressions may contain shallow soils over gravelly channel deposits, with adjacent poorly drained clay soils on the higher inter-channel ridges. These clay soils may overlie black, wet peaty loam soils at approximately 50 cm. Wetness Class IV is the most appropriate class for these profiles and produces a grade of 3B. Given the great variation in soil profiles here, the workability and flexibility of this southern margin is very limited.

Two other 3B map units in the centre and north of the site define further groups of Wetness Class IV soils with shallow slowly permeable clay layers.

SITE NAME	PROFILE NUMBER	SLOPE AND ASPECT	LAND USE		PARENT MARIAL
Denham, Bucks Mineral Plan (SE Region)	1	0°	GRASS	Av Rainfall :- 687 ATO :- 1471 FC Days :- 1143 Climatic grade:- 1	

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	22	10YR33	MSZL	5%(+ 2 cm) 2%(- 2 cm) Sieve; hard		Moderate CSAB	+0.5%		Friable	Common	Non-C		
2	40	10YR43	MCL	20%(+ 2 cm) 2% (- 2 cm) Sieve; hard		Weak	+0.5%	Good	Friable	Common	Non-C		
3	90	10YR44	C (high_S)	47%(+ 2 cm) 3% (- 2 cm) Sieve; hard		As above but very difficult to assess due to high stone content	+0.5%	Good	Friable	Common	Non-C		
GRAVEL	90-+120	Below 90 cm there is approx greater than 70% stone content. This layer was impenetrable to both auger and pick-axe.											

Depth to Slowly Permeable Horizon :- None present

Wetness Class :- I

No evidence of wetness throughout profile

Wetness Grade :- 1

Available Water	Wheat :-	114 mm
	Potatoes :-	102 mm
Moisture Deficit	Wheat :-	112 mm
	Potatoes :-	106 mm
Moisture Balance	Wheat :-	+2 mm
	Potatoes :-	-4 mm
Droughtiness Grade	:-	3A

Using the "hard stone" value for 0-90 cm and the "gravel: non-porous" value for 90-120 cm.

Final ALC Grade :- 3A

Main Limiting Factor(s) :- Droughtiness

Remarks :- The subsoil structure is very difficult to assess due to the high stone content. The droughtiness calculation is the best scenario, with "good" conditions.

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SITE NAME	PROFILE NUMBER	SLOPE AND ASPECT	LAND USE		PARENT MARIAL
Denham	2	-	Grassland	Av Rainfall :- 687 ATO :- 1471 FC Days :- 143 Climatic grade:- 1	

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	29	10YR4/2	MCL	-	-	Mod, coarse, subangular blocky	>0.5%		Friable	Common Fine	-	-	clear, smooth
2	51	10YR5/3 (ped faces 10YR4/2)	MCL	-	-	Mod, medium, prismatic	>0.5%		Friable	Common Fine	-	-	clear, smooth
3	85	10YR5/3 (grey ped faces)	C	-	V. many fine grey and ochreous	Strong, coarse prismatic	≤0.5%		Slightly firm	Few Fine	-	-	clear, smooth
4	120	10YR6/3	HZCL	-	V. many fine ochreous	Weak massive	>0.5%		Friable	Few Fine	Calcareous	-	

Depth to Slowly Permeable Horizon :- 51

Wetness Class :- II

Wetness Grade :- 2

Available Water Wheat :- N/A

Potatoes :-

Moisture Deficit Wheat :- 112

Potatoes :- 106

Moisture Balance Wheat :- N/A

Potatoes :-

Droughtiness Grade :- 1

Final ALC Grade :- 2

Main Limiting Factor(s) :- Wetness

Remarks :-

RPG0023/WJC

SITE NAME	PROFILE NUMBER	SLOPE AND ASPECT	LAND USE		PARENT MARIAL
Denham Bucks	3	0°	Arable previously maize	Av Rainfall :- ATO :- FC Days :- Climatic grade:-	Gravel

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	23	10YR42	MCL	1%, hard visual	Mottle-free	Moderate CSA Blocky	+ 0.5%		Firm	Common	Non-C	None	Distinct
2	40	2.5Y52	HCL	Stone-free	cdom	Moderate CSA Blocky	+ 0.5% Common E worm channels	Moderate	Friable	Common	Non-C	None	Gradual increase in C
3	80	2.5Y53 Clear ped skins; 10YR62 pale ped faces	C	Stone-free	vmpogm	Strong VC Prismatic	- 0.5% (but few E Worm Channels)	Poor	Firm	Common roots between peds only few within units	Non-C	None	
4	80-95	10YR62	HCL	30% gravel, increasing with depth, visual	cdom	Not assessed							
	Pit dug to 95 cm, impenetrable below												

Depth to Slowly Permeable Horizon :- 40cm
Gleyed from 23 cm

Wetness Class :- III

Wetness Grade :- 3A

RPG0023/WJC

Available Water Wheat :- Not limiting
Potatoes :-

Moisture Deficit Wheat :-
Potatoes :-

Moisture Balance Wheat :-
Potatoes :-

Droughtiness Grade :-

Final ALC Grade :- 3A

Main Limiting Factor(s) :- Wetness

Remarks :-

SITE NAME	PROFILE NUMBER	SLOPE AND ASPECT	LAND USE		PARENT MARIAL
Denham	4	–	Grassland	Av Rainfall :- 687 ATO :- 1471 FC Days :- 143 Climatic grade:- 1	Alluvium

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	15	10YR3/3	OSZL (Med)	–	–	V. weak medium subangular blocky	> 0.5%	Moderate	Very Friable	Common Fine	–	–	clear, smooth
2	30	10YR3/3	OSZL (med)	20% 2-6 cm 3% 2 cm rounded, by sieving	–	V. weak massive	> 0.5%	Moderate	Very Friable	Common Fine	–	–	clear, smooth
3	85	10YR3/1	CSL	1% >6cm 30% 2-6cm 6% > 2 cm rounded, by sieving	–	single grain	–	Moderate	–	Few fine	–	–	clear, smooth
4	95+	10YR5/3	CLS	1% > 6cm 20% 2-6 cm 6% > 2 cm estimated	–	Single grain	–	Moderate	–	Few Fine	–	–	–

Depth to Slowly Permeable Horizon :- N/A

Wetness Class :- 1

Wetness Grade :- 1

Available Water	Wheat :-	110	
	Potatoes :-		
Moisture Deficit	Wheat :-	112	
	Potatoes :-	106	
Balance Moisture Deficit	Wheat :-	-2	
	Potatoes :-		
Droughtiness Grade	:-	3a	

Final ALC Grade :- 3a

Main Limiting Factor(s) :- Droughtiness

Remarks :-

RPG0023/WJC

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
FIELD ASSESSMENT OF SOIL WETNESS CLASS

SOIL WETNESS CLASSIFICATION

Soil wetness is classified according to the depth and duration of waterlogging in the soil profile. Six revised soil wetness classes (Hodgson, in preparation) are identified and are defined in Table 11.

Table 11 Definition of Soil Wetness Classes

Wetness Class	Duration of Waterlogging[1]
I	The soil profile is not wet within 70 cm depth for more than 30 days in most years[2].
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.
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.
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.
V	The soil profile is wet within 40 cm depth for 211-335 days in most years.
VI	The soil profile is wet within 40 cm depth for more than 335 days in most years.

[1] The number of days specified is not necessarily a continuous period.

[2] 'In most years' is defined as more than 10 out of 20 years.

Soils can be allocated to a wetness class on the basis of quantitative data recorded over a period of many years or by the interpretation of soil profile characteristics, site and climatic factors. Adequate quantitative data will rarely be available for ALC surveys and therefore the interpretative method of field assessment is used to identify soil wetness class in the field. The method adopted here is common to ADAS and the SSLRC.

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LAND AT DENHAM

STATEMENT OF PHYSICAL CHARACTERICS.

[Sections 1 - 4 are contained in the Agricultural Land Classification Report (MAFF, February 1990) which should be read in conjunction with this Statement].

5. SOIL RESOURCES

5.1. The soil overlays (topsoil, upper subsoil, lower subsoil) illustrate the pattern and estimated volumes of soil resources available on the site. It should be emphasized that this is not a soil stripping plan but an illustration of the soil resources available for the restoration of the site. When considering these details it is important to remember that the soils were only sampled to 1.2m maximum during survey work. In some cases soil resources may extend below this depth.

TOPSOIL

5.2. See topsoil overlay.

Map Unit	Textures	Average Depth (cm)
A	SZL	20
B	SZL	30
C	Org ZL	20
D	ZL,MCL,MZCL	25
E	MCL	32
F	HCL	20

Upper Subsoil

5.2. See Upper subsoil overlay

Map Unit	Textures	Average Depth (cm)
A	CSL, LCS	100
B	PL	95
C	HCL	20
D	HCL	25
E	C	95
F	No subsoil*	

*Shallow soils over gravel. This alluvial area is, however, very variable and may, on stripping, reveal deeper pockets of clay or peaty subsoil (See also note on Lower Subsoil Map units).

Lower Subsoil

5.3. See Lower subsoil overlay

Map Unit	Textures	Average Depth (cm)
A	C	50
B	Variable *	75

Rest of area has no lower subsoil, simply upper subsoil to depth or upper subsoil over gravel.

* The lower subsoil in this complicated alluvial area vary greatly over short distances. Profiles generally extend to 120cm depth but may contain clay, sandy clay or peaty textures.

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