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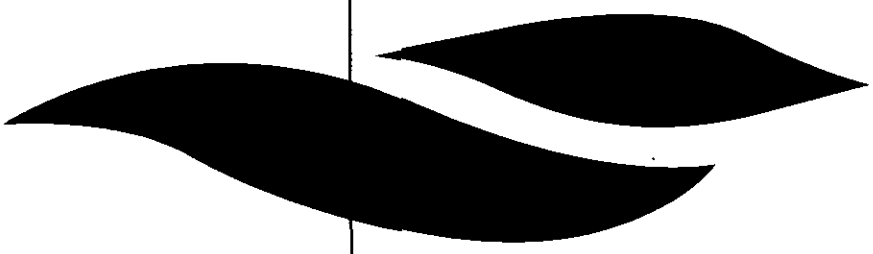

FARMING AND RURAL CONSERVATION AGENCY

An Executive Agency of the Ministry of Agriculture, Fisheries and Food and the Welsh Office

COLLYWESTON QUARRY, DUDDINGTON, NORTHAMPTONSHIRE

Agricultural Land Classification & Statement of Soil Physical Characteristics

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Resource Planning Team
Eastern Region
FRCA Cambridge

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AGRICULTURAL LAND CLASSIFICATION REPORT & STATEMENT OF SOIL PHYSICAL RESOURCES

COLLYWESTON QUARRY, DUDDINGTON, NORTHAMPTONSHIRE

INTRODUCTION

1. This report presents the findings of a detailed Agricultural Land Classification (ALC) survey of 11.9 ha of land situated to the southeast of the village of Duddington. The survey was carried out during April 1998.

2. The survey was carried out by the Farming and Rural Conservation Agency (FRCA) for the Ministry of Agriculture, Fisheries and Food (MAFF), in connection with an application to extract limestone from the site. This survey supersedes previous ALC information for this land.

3. The work was conducted by members of the Resource Planning Team in the Eastern Region of FRCA. The land has been graded in accordance with the published MAFF ALC guidelines and criteria (MAFF, 1988). A description of the ALC grades and subgrades is given in Appendix I.

4. At the time of survey the land use on the site was for cereal crop production or it had been cultivated and was bare. The area mapped as 'Other land' is a small disused quarry which is overgrown with large trees.

SUMMARY

5. The findings of the survey are shown on the enclosed ALC map. The map has been drawn at a scale of 1:10 000; it is accurate at this scale but any enlargement would be misleading.

6. The area and proportions of the ALC grades and subgrades on the surveyed land are summarised in Table 1.

Table 1: Area of grades and other land

Grade/Other land	Area (hectares)	% site area
3a	0.9	8
3b	3.5	29
4	7.4	62
Other land	0.1	1
Total surveyed area	11.8	99
Total site area	11.9	100

7. The fieldwork was conducted at an average density of one boring per hectare. A total of 14 borings and two soil pits was described.

8 In the southeast of the site a small area of land has been graded 3a (good quality agricultural land) and is equally restricted to this grade by a moderate droughtiness limitation and a wetness and workability limitation. The east of the site has been graded 3b (moderate quality agricultural land) due to significant droughtiness imperfections. The majority of the site, particularly the west, has been graded 4 (poor quality agricultural land) due to severe droughtiness limitations.

FACTORS INFLUENCING ALC GRADE

Climate

9. Climate affects the grading of land through the assessment of an overall climatic limitation and also through interactions with soil characteristics.

10. The key climatic variables used for grading this site are given in Table 2 and were obtained from the published 5 km grid datasets using the standard interpolation procedures (Met. Office, 1989).

Table 2: Climatic and altitude data

Factor	Units	Values
Grid reference	N/A	SK 994004
Altitude	m, AOD	80
Accumulated Temperature	day°C (Jan-June)	1370
Average Annual Rainfall	mm	608
Field Capacity Days	days	123
Moisture Deficit, Wheat	mm	106
Moisture Deficit, Potatoes	mm	97
Overall climatic grade	N/A	Grade 1

11. The climatic criteria are considered first when classifying land as climate can be overriding in the sense that severe limitations will restrict land to low grades irrespective of favourable site or soil conditions.

12. The main parameters used in the assessment of an overall climatic limitation are average annual rainfall (AAR), as a measure of overall wetness, and accumulated temperature (ATO, January to June), as a measure of the relative warmth of a locality.

13. The combination of rainfall and temperature at this site mean it is relatively warm and dry. Therefore, the climatic grade for this site has been assessed as 1.

Site

14. The site occupies gently undulating land and slopes in a westerly or southwesterly direction from high ground in the east of the site. The site ranges in altitude from 87 m AOD in the east, to 70 m AOD in the southwest. Therefore, neither gradient nor altitude constitute a limitation to the ALC grade.

Geology and soils

15. The published 1:63 360 scale geology map, sheet 157, Stamford (Geological Survey of Great Britain, 1978) shows the site to comprise a complex geology. In the west, just over half of the site is mapped as Lower Lincolnshire Limestone. In the east, Upper Estuarine Series is shown, while in the southeast is a small area of boulder clay deposits overlie the Limestone.

16. On the 1:250 000 scale published soils map, sheet 4, Soils of Eastern England (Soil Survey of England and Wales, 1983) the site is shown as consisting predominantly of Elmton 1 Association soils. The northeast of the site is mapped as the Denchworth Association and the southeast as the Ragdale Association. These soils are briefly described below:

- Elmton 1 - shallow well drained brashy calcareous fine loamy soils over limestone. Some similar deeper soils and some non-calcareous and calcareous clayey soils.

- Denchworth - slowly permeable seasonally waterlogged clayey soils with similar fine loamy over clayey soil. Some fine loamy over clayey soils with only slight seasonal waterlogging and some slowly permeable calcareous clayey soils.

- Ragdale - slowly permeable seasonally waterlogged clayey and fine loamy over clayey soils. Some slowly permeable calcareous clayey soils especially on slopes.

17. During this survey a more detailed inspection of the soils was carried out and two soil types were identified, the distribution of these is shown on the accompanying soil resources map. The soil resources map is not necessarily a soil stripping map but illustrative of the soil resources available for restoration at the site.

Soil Type I (4.4 hectares)

18. This soil type occurs in the east of the site and profiles typically comprise slightly stony heavy clay loam or clay topsoils, over moderately stony clays. Below 60 cm impenetrable (to the auger and where sampled to the spade) limestone is typically encountered which may comprise solid limestone rock or 90% limestone in a clay loam matrix. In the southeast of the site subsoils very occasionally continue to 120 cm. These soils are free draining where limestone is encountered at or above 60 cm. Where subsoils extend below 60 cm profiles exhibit characteristics of drainage impedance.

Soil Type II (7.4 hectares)

19. The second soil type occurs in the west of the site. Soils typically comprise moderately stony heavy clay loam or occasionally medium clay loam topsoils over impenetrable limestone which may comprise solid limestone rock or 90% limestone in a clay loam matrix. Profiles are free draining.

AGRICULTURAL LAND CLASSIFICATION

20. The details of the classification of the site are shown on the attached ALC map and the area statistics of each grade are given in Table 1, page 1.

21. The location of the auger borings and pits is shown on the attached sample location map and the details of the soils data are presented in Appendix II.

Subgrade 3a

22. A small area of land in the southeast of the site has been graded 3a. This land occurs in conjunction with deeper and typically moderately well drained (Wetness Class II) soils described in paragraph 18 (Soil Type I). Profile textures result in the soils having moderate reserves of water available for plant growth and as a result there is a moderate droughtiness limitation to land quality and the land is graded 3a. In addition, the clay topsoils combine with the moderate drainage to impose a moderate wetness and workability limitation on the land which equally restricts it to subgrade 3a.

Subgrade 3b

23. In the east of the site the land has been graded 3b and corresponds with the shallower and therefore less moisture retentive variants of the soils described in paragraph 18 (Soil Type I). These soils are free draining (Wetness Class I). Lower subsoils typically do not extend below 60 cm. Thus the stony and shallow nature of the soils combine to reduce the water holding capacity of the soils and therefore significant droughtiness limitations restrict the land to subgrade 3b.

Grade 4

24. The majority of the site, particularly in the west, has been graded 4 and corresponds with the very shallow soils over solid limestone rock or 90% limestone in a clay loam matrix described in paragraph 19 (Soil Type II). This combination of factors results in a severe limitation of the potential for water retention in these soils. Consequently severe droughtiness imperfections restrict this land to grade 4.

Soil resources

25. Two soil types have been identified within the site and their distribution is shown on the accompanying soil resources map which is illustrative of the soil resources within the site for restoration purposes but is not a soil stripping map for the site. A statement of the physical characteristics of Soil Types I and II is given in Appendix II. The thickness and the volume of the Soil Types is given overleaf. It should be noted that Soil Types I and II are variable and therefore thicknesses and volumes for these units should be treated with caution.

Table 3: Soil Resources

		Area (ha)	Thickness (cm)	Volume (m^3)
Soil Type I	Topsoil	4.4	30	13 200
	Upper Subsoil	4.4	20	8 800
	Lower Subsoil	4.4	10	4 400
Soil Type II	Topsoil	7.4	30	22 200
	Subsoil	Absent.		

Ruth Tarrant
Resource Planning Team
Eastern Region
FRCA Cambridge

SOURCES OF REFERENCE

Geological Survey of Great Britain (England and Wales) (1978) *Sheet No. 157, Stamford, solid and drift edition, scale 1:50 000.* BGS: London.

Met. Office (1989) *Climatological Data for Agricultural Land Classification.* Met. Office: Bracknell.

Ministry of Agriculture, Fisheries and Food (1988) *Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land.* MAFF: London.

Soil Survey of England and Wales (1983) *Sheet 4, Soils of Eastern England, scale 1:250 000.* SSEW: Harpenden.

Soil Survey of England and Wales (1984) *Soils and their Use in Eastern England.* SSEW: Harpenden

APPENDIX I

DESCRIPTIONS OF THE 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 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 or horticultural crops can usually be grown but on some land of this 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 land.

Grade 3: Good to Moderate Quality Land

Land with moderate limitations which affect the choice of crops, the timing and type of cultivation, harvesting or the level of yield. When 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 the level of yields. It is mainly suited to grass with occasional arable crops (e.g. 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 severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

APPENDIX II

STATEMENT OF SOIL PHYSICAL CHARACTERISTICS

SOIL TYPE I (4.4 hectares)

Topsoil	Texture	:	Heavy clay loam or clay
	Colour	:	Dark yellowish brown (10 YR 4/4) or brown (10 YR 4/3)
	Depth	:	Typically 30 cm, range 30 to 35 cm
	Stoniness	:	Slightly stony (6-12% hard limestone)
	Roots	:	Common fine and very fine
	Calcium carbonate	:	Very slightly or slightly calcareous
	Boundary form	:	Abrupt, smooth
Subsoil*	Texture	:	Clay
	Colour	:	Yellowish brown (10 YR 5/5 or occasionally 10 YR 5/6)
	Depth	:	Typically 60 cm, range 50 to 70 cm
	Stoniness	:	Moderately stony (typically 20% hard limestone)
	Roots	:	Common fine and very fine
	Structure	:	Weakly developed coarse subangular blocky
	Consistence	:	Firm
	Structural condition	:	Moderate
	Porosity	:	>0.5%
	Calcium carbonate	:	Slightly or very slightly calcareous
	Boundary form	:	Sharp, wavy

Very occasionally in the southeast corner of the site the subsoil extends below 60 cm. This lower subsoil also has a clay texture. However, the lower subsoil shows characteristics of drainage impediment such as gleyed matrix colours, mottles and has a poor structural condition.

Wetness Class: I or occasionally II where lower subsoils extend below 60 cm.
* Below the subsoil impenetrable limestone is encountered which may comprise solid limestone rock or 90% limestone in a clay loam matrix.

SOIL TYPE II (7.4 hectares)

Topsoil	Texture	:	Heavy clay loam or occasionally medium clay loam
	Colour	:	Dark yellowish brown (10 YR 4/4)
	Depth	:	Typically 30 cm, range 25 to 40 cm
	Stoniness	:	Moderately stony (20-30% hard limestone)
	Roots	:	Common fine and very fine
	Calcium carbonate	:	Calcareous
	Boundary form	:	Abrupt, wavy

Below this horizon typically impenetrable limestone is encountered which may comprise solid limestone rock or 90% limestone in a clay loam matrix.