

**Proposed Extension,  
Willington Quarry,  
Bedfordshire.**

**Agricultural Land Classification  
and Soil Physical Characteristics  
Report**

**December, 1998**

**Resource Planning Team  
Eastern Region  
FRCA Cambridge**

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# AGRICULTURAL LAND CLASSIFICATION AND SOIL PHYSICAL CHARACTERISTICS REPORT.

## Proposed Extension, Willington Quarry, Bedfordshire.

### INTRODUCTION

1. This report presents the findings of a detailed, Agricultural Land Classification (ALC) survey of 76.5 ha of land at Willington Quarry, Bedfordshire. The survey was carried out during December 1998. The northeastern part of the site was surveyed in 1991 (Job Ref. RPT, 2/91) the results of which have been incorporated into this report.
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 extend the area of mineral extraction at Willington Quarry. 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 cereals and linseed in the northeast with the remainder under rough grassland. Land mapped as 'Other' includes an area which had been used as a contractor's site and was covered with concrete and rubble.

### 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)	% surveyed area	% site area
2	21.3	29	28
3a	23.5	32	31
3b	28.9	39	38
Other land	2.8	N/A	3
Total surveyed area	73.7	100	97
Total site area	76.5	-	100

7. The fieldwork was conducted at an average density of 1 boring per hectare. A total of 72 borings and 5 soil pits was described.

8. Land mapped as grade 2 (very good quality agricultural land) occurs in the southeast and a small area in the centre of the site. The land is restricted to this grade due to a minor droughtiness limitation.

9. Land mapped as subgrade 3a (good quality agricultural land) occurs through the centre of the site in a northeast/southwest direction. The land is restricted to this subgrade due to a moderate droughtiness limitation.

10. Land mapped as subgrade 3b (moderate quality agricultural land) occurs in the north and west of the site. The land is restricted to this subgrade due to a moderate wetness and workability limitation.

## FACTORS INFLUENCING ALC GRADE

### Climate

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

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

Table 2: Climatic and altitude data

Factor	Units	Values	
		TL 086 504	TL 088 494
Grid reference	N/A	TL 086 504	TL 088 494
Altitude	m, AOD	23	23
Accumulated Temperature	day°C (Jan-June)	1452	1453
Average Annual Rainfall	mm	573	572
Field Capacity Days	days	98	97
Moisture Deficit, Wheat	mm	119	119
Moisture Deficit, Potatoes	mm	115	115
Overall climatic grade	N/A	1	1

13. 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.

14. 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 (AT0, January to June), as a measure of the relative warmth of a locality.

15. The combination of rainfall and temperature impose no overall limitation to land quality and hence the site has a climatic grade of 1.

## Site

16. The site is mainly level at an approximate height of 23m AOD rising to 26 m AOD in the south lying in the valley bottom of the River Great Ouse. It is bounded in the northwest and part north by the River Great Ouse, and in the east and southeast by the A428(T) road. The southwest is bounded by the local sewage works and the northeast by Bedford Airfield. A small part of the site is to the south of the A428(T) road. Although the River Great Ouse forms part of the boundary, records show that flood risk is minimal.

## Geology and soils

17. The small scale geology map for the area (IGS, 1983) shows the whole area to comprise Oxfordian and Callovian Clay.

18. The 1:250 000 scale reconnaissance soils map (SSEW, 1983) shows the site to comprise soils of the Thames Association in the west, near the river, and Efford 1 Association over the remainder of the site. The former are briefly described as stoneless mainly calcareous clayey soils affected by groundwater, the latter as well drained fine loamy soils often over gravel.

19. During the current survey four main soil types were encountered, with the first soil type having a calcareous variant. The spatial distribution of these soil types is shown on the enclosed map.

### *Soil Type I (19.6 ha)*

20. Soil Type I occurs in the western part of the site and also a small area to the south of the A428(T) road. Profiles typically comprise stoneless, non-calcareous clay (occasionally heavy clay loam) topsoil over stoneless, non-calcareous slowly permeable clay and are poorly drained.

### *Soil Type Ia (11.4 ha)*

21. Soil Type Ia occurs along the river margin and is as described in paragraph 20 except that the profiles are calcareous throughout and affected by groundwater.

### *Soil Type II (26.1 ha)*

22. Soil Type II occurs extensively across the centre of the site in an east/west direction. Profiles typically comprise well drained, very slightly stony, non-calcareous medium sandy loam (occasionally medium sandy silt loam) topsoils over slightly stony non-calcareous sandy clay loam upper subsoils. Lower subsoils comprise moderately/very stony sandy clay loam.

*Soil Type III (10.6 ha)*

23. Soil Type III occurs to the northeast and southwest of the sludge lagoons in the centre of the site. Profiles typically comprise well drained, very slightly stony non-calcareous medium clay loam (occasionally sandy clay loam) topsoils over very slightly stony sandy clay loam upper subsoils. Lower subsoils comprise slightly stony sandy clay.

*Soil Type IV (5.9 ha)*

24. Soil Type IV occurs in a small area in the southeast of the site, to the north of the A428(T) road. Profiles typically comprise very slightly stony, non-calcareous medium sandy loam topsoils over very slightly stony non-calcareous medium sandy loam upper subsoils. Lower subsoils comprise very slightly stony, sandy clay loam becoming moderately stony at depths >100 cm.

## **AGRICULTURAL LAND CLASSIFICATION**

25. 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 I, page I.

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

### **Grade 2**

27. Land mapped as grade 2 occurs in the southeast and a small area north of the sludge lagoons, and corresponds to the soils described in paragraphs 23 and 24. The fine loamy over fine loamy soils (Para. 23) and coarse loamy over fine loamy soils (Para. 24) are well drained and have been assessed as Wetness Class I, and the combination of these two factors restricts the land to this grade due to a slight droughtiness limitation. A slightly less stony variant of the soils described in paragraph 22 lies to the south east of the sludge lagoons and the land is restricted to this grade due to a slight droughtiness limitation.

### **Subgrade 3a**

28. Land mapped as subgrade 3a traverses the site in a northeast/southwest direction and corresponds to the soils described in paragraph 22. The coarse loamy over fine loamy soils which are moderately stony in the lower subsoil are free draining and have been assessed as Wetness Class I and the combination of these factors restricts the land to this subgrade due to a moderate droughtiness limitation.

### **Subgrade 3b**

29. Land mapped as subgrade 3b occurs in the western and northwestern part of the site and corresponds to the soils described in paragraphs 20 and 21. The fine loamy and clayey over slowly permeable clay soils (Para. 20) have been assessed as Wetness Class III and the combination of these factors restricts the land to this subgrade due to a severe wetness and workability limitation. The calcareous soils (Para. 21), along the river margin have been assessed as Wetness Class IV due to groundwater and the land is restricted to this subgrade due to the same limitations.

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## **SOURCES OF REFERENCE**

Institute of Geological Sciences (1983) *Sheet No. 52 \*N-02 \*W. East Midlands. Solid Edition.*  
IGS: London.

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.

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

Soil Survey of England and Wales (1983) *Sheet 4, Soils of Eastern England.*  
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

Topsoil	Texture	:	clay, occasionally heavy clay loam
	Colour	:	10YR4/2, 10YR4/1
	Stone	:	< 1% flint
	Roots	:	many, fine and very fine
	CaCO <sub>3</sub>	:	non-calcareous
	Depth	:	35 cm
	Boundary	:	smooth/sharp
	Subsoil	Texture	:
Colour		:	10YR5/1, 10YR5/3, 10YR6/1
Mottles		:	many distinct ochreous 10YR5/8, 6/6
Concretions		:	few, manganese
Stone		:	stoneless
Structure		:	moderate development, coarse angular blocky
Consistence		:	firm
Structural condition		:	poor
Pores		:	< 0.5%
Roots		:	common, fine and very fine
CaCO <sub>3</sub>		:	non-calcareous
Depth		:	120 cm
Wetness Class:			

#### SOIL TYPE Ia

Description as for Soil Type I, except that the profile is calcareous throughout and assessed as Wetness Class IV due to groundwater.

**SOIL TYPE II**

Topsoil	Texture	medium sandy loam, occasionally medium sandy silt loam
	Colour	10YR4/3, 10YR3/3
	Stone	2-5%, flints
	Roots	many, fine and very fine
	CaCO <sub>3</sub>	non-calcareous
	Depth	35 cm
	Boundary	smooth/clear
Upper subsoil	Texture	sandy clay loam
	Colour	7.5YR4/6, 5/6
	Mottles	none
	Concretions	none
	Stone	6-10%, flints
	Structure	weak development, coarse subangular blocky friable
	Consistence	moderate
	Structural condition	> 0.5%
	Pores	common, fine and very fine
	Roots	non-calcareous
	CaCO <sub>3</sub>	50 cm
	Depth	smooth/clear
	Boundary	
Lower subsoil	Texture	sandy clay loam
	Colour	7.5YR4/6, 5/6
	Mottles	none
	Concretions	none
	Stone	30-45%, flints and gravel
	Structure	weak development. coarse subangular blocky friable/firm
	Consistence	moderate
	Structural condition	> 0.5%
	Pores	common, fine and very fine
	Roots	non-calcareous
	CaCO <sub>3</sub>	120 cm
	Depth	

I

Wetness Class:

### SOIL TYPE III

Topsoil	Texture	:	medium clay loam, occasionally sandy clay loam
	Colour	:	10YR4/2, 4/3
	Stone	:	2-3%, flints
	Roots	:	many, fine and very fine. few, medium
	CaCO <sub>3</sub>	:	non-calcareous
	Depth	:	35 cm
	Boundary	:	smooth/abrupt
Upper subsoil	Texture	:	sandy clay loam
	Colour	:	10YR3/2
	Mottles	:	none
	Concretions	:	none
	Stone	:	4-5%, flints
	Structure	:	moderate development, coarse subangular blocky
	Consistence	:	friable
	Structural condition	:	moderate
	Pores	:	> 0.5%
	Roots	:	common, fine and very fine
	CaCO <sub>3</sub>	:	non-calcareous
	Depth	:	80/85cm
	Boundary	:	smooth/clear
Lower subsoil	Texture	:	sandy clay
	Colour	:	10YR3/2
	Mottles	:	none
	Concretions	:	none
	Stone	:	10-12% flints and gravel
	Structure	:	moderate development. coarse angular blocky
	Consistence	:	firm
	Structural condition	:	moderate
	Pores	:	> 0.5%
	Roots	:	few, fine and very fine
	CaCO <sub>3</sub>	:	non-calcareous
	Depth	:	120 cm

Wetness Class: I

## SOIL TYPE IV

Topsoil	Texture	:	medium sandy loam
	Colour	:	10YR3/2
	Stone	:	1% flints
	Roots	:	many, fine and very fine
	CaCO <sub>3</sub>	:	non-calcareous
	Depth	:	45 cm
	Boundary	:	smooth/sharp
Upper subsoil	Texture	:	medium sandy loam
	Colour	:	10YR4/4, 4/6
	Mottles	:	none
	Concretions	:	none
	Stone	:	1% flints
	Structure	:	weak development, coarse subangular blocky
	Consistence	:	very friable
	Structural condition	:	good
	Pores	:	> 0.5%
	Roots	:	common, fine and very fine
	CaCO <sub>3</sub>	:	non-calcareous
	Depth	:	65/80 cm
	Boundary	:	smooth/gradual
Lower subsoil	Texture	:	sandy clay loam
	Colour	:	7.5YR5/4
	Mottles	:	none
	Concretions	:	none
	Stone	:	3% flints
	Structure	:	weak development, coarse subangular blocky
	Consistence	:	friable
	Structural condition	:	moderate
	Pores	:	> 0.5%
	Roots	:	few, fine and very fine
	CaCO <sub>3</sub>	:	non-calcareous
Depth	:	120 cm	

Wetness Class: I