PROPOSED EXTENSION TO KETTON QUARRY, NR. STAMFORD, RUTLAND.

Agricultural Land Classification and Statement of Soil Physical Characteristics Report

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AGRICULTURAL LAND CLASSIFICATION AND STATEMENT OF SOIL PHYSICAL CHARACTERISTICS REPORT

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INTRODUCTION

1. This report presents the findings of a detailed Agricultural Land Classification (ALC) survey of approximately 106.7 ha of land to the north of the village of Ketton, Rutland, adjacent to the existing workings of the Ketton quarry. The survey was carried out during February 1999.

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 the existing IDO planning consent to extend the 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 within the site consisted of a mixture of previously harvested cereal stubble and winter sown cereals. Additionally, there were two small areas of grassland in the east and west of the site. Areas mapped as 'Other Land' indicate the location of the now demolished Old Heath Lodge towards the north of the site, two areas which have been stripped of topsoils in the west of the site and a barn, associated hard standing and track.

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
3a	3.3	3	3
3b	60.8	60	57
4	38.0	37	36
Other land	4.6	N/A	4
Total surveyed area	102.1	100	96
Total site area	106.7	-	100

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

8. The agricultural land within the site has been assessed as predominantly a mixture of Subgrade 3b (moderate quality agricultural land) and Grade 4 (poor quality agricultural land) with a small areas of Subgrade 3a (good quality agricultural land) mapped towards the west and south of the site. The limiting factors influencing the quality of the land are droughtiness which varies depending on the depth to the underlying bedrock and wetness and workability.

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					
Grid reference	N/A	SK 976071	SK 965059	SK 969053	SK 974052	SK 986062
Altitude	m, AOD	70	80	90	75	70
Accumulated temperature	day°C (Jan-June)	1378	1368	1356	1373	1379
Average Annual Rainfall	mm	623	636	642	629	622
Field Capacity Days	days	130	134	134	131	128
Moisture Deficit, Wheat	mm	105	104	103	104	104
Moisture Deficit, Potatoes	mm	97	95	93	96	96
Overall climatic grade	N/A	Grade 1	Grade 1	Grade 1	Grade 1	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 impose no overall limitation to land quality and hence the site has a climatic grade of 1.

Site

14. The site lies around the perimeter of the existing quarry predominantly to the north, west and south-west, however, a single field also lies to the east of the existing quarry. The large field in the south-west of the site is level and lies at an altitude of approximately 90 m AOD. The rest of the site consists of land which is generally gently undulating with small valley features between approximately 70 and 85 m AOD. Gradients are usually gentle to moderately sloping but occasional slopes in excess of 7° are evident. The site therefore has limited areas which would be restricted to Subgrade 3b by gradient limitations to the quality of the agricultural land.

Geology and soils

15. The published 1:50 000 scale geology map of the area, sheet 157, Stamford, (British Geol. Survey, 1978) shows the site to comprise of Upper Lincolnshire Limestone in the west and eastern area with small areas of Upper Estuarine Clays in the south-west and south. Blisworth Limestone is mapped in the centre of the southern area and this is overlain by boulder clay in the south east corner of the field adjoining the Empingham road. A thin band of Lower Lincolnshire Limestone runs alongside of the Shacklewell Spinney in the north-west of the site.

16. The 1:250 000 reconnaissance scale soil survey map for the area (Soil Survey, 1983) shows the site as comprising soils of the Elmton 1 Association in the west and the small field in the east of the site and soils of the Evesham 1 Association in the north and south of the site. A small area in the south of the field adjacent to the Empingham road is mapped as the Ragdale Association. Soils of the Elmton 1 Association are briefly described as shallow well drained brashy calcareous fine loamy soils over limestone with some similar deeper soils and some non calcareous and calcareous clayey soils. The Evesham 1 Association is briefly described as slowly permeable calcareous clayey soils associated with shallow well drained brashy calcareous soils over limestone. The Ragdale Association is described as slowly permeable seasonally waterlogged clayey and fine loamy over clayey soils with some slowly permeable calcareous clayey soils especially on slopes.

17. During the current, more detailed survey, three soil types were identified, and are described below and shown on the attached soil types map.

Soil Type I

18. This soil type is found extensively in the north and west of the site and also in the north of the eastern section of the site and comprises a shallow soil overlying limestone. The topsoil is generally heavy clay loam texture with occasional limited areas of medium clay loam or clay textured topsoil. Stone content of the topsoil varies with up to 40% small and medium sized limestone fragments present but is typically approximately 18%. This topsoil may overlie a very thin heavy clay loam or clay textured subsoil or may directly overlie limestone bedrock. The subsoil, where present, is generally very to extremely stony. This soil type is assessed as well drained.

Soil Type II

19. This soil type is found in limited areas in the north, west, south and in the eastern area of the site. Soil Type II comprises a clay, or very occasionally medium or heavy clay loam, textured topsoil which overlies a thin (typically 20 cm) permeable clay textured subsoil which in turn overlies limestone bedrock. The topsoil and subsoil are very slightly to slightly stony containing small to medium sized limestone fragments. Occasional profiles of this soil type extend to beyond the 120 cm sample depth. Soil Type II is well drained.

Soil Type III

20. This soil type is found in the north and south of the site and comprises a very slightly stony clay textured topsoil which overlies a similar textured, mottled, slowly permeable subsoil which usually becomes impenetrable at approximately 75 cm. Occasionally deeper profiles of this soil type were found in which the subsoil extended to below the 120 cm sample depth. Soil Type III is assessed as poorly drained.

AGRICULTURAL LAND CLASSIFICATION

21. 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.

22. The location of the auger borings and pits is shown on the attached sample location map.

Subgrade 3a

23. The very small area of Subgrade 3a in the west and the area adjacent to the track in the south of the site are associated with a deep well drained area of Soil Type II (paragraph 19). In these areas the profiles are well drained and assessed as Wetness Class I which together with a non-calcareous clay textured topsoil and the prevailing climate for the site result in a moderate wetness and workability limitation restricting the land to Subgrade 3a. Additionally, droughtiness of the soil profile was equally limiting and restricted the soil profile to Subgrade 3a. Further occasional profiles of Subgrade 3a quality were identified within the site, however these were limited in extent and could not be mapped separately.

Subgrade 3b

24. Land of Subgrade 3b quality is associated principally with areas of Soil Types II and III (paragraphs 19 and 20) in which the soil profiles were assessed as Wetness Class II, III or IV which together with a non-calcareous clay textured topsoil and the prevailing climatic conditions result in a significant wetness and workability limitation restricting the agricultural land quality in such areas to Subgrade 3b. Additionally, significant droughtiness of areas in the north-west and west of the site, associated with slightly deeper and less stony profiles of Soil Type I (paragraph 18), was found to restrict such areas to Subgrade 3b.

Grade 4

25. Available soil moisture within the shallow and stony profiles of the majority of areas mapped as Soil Type I (paragraph 18) was very limiting for plant growth. Even where plant roots could penetrate into the platy limestone underlying the soil a very significant droughtiness limitation restricted such areas to Grade 4 quality agricultural land.

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SOURCES OF REFERENCE

British Geological Survey (1978) *Sheet No.* 157, *Stamford. Solid and Drift Edition, scale 1:50 000.* BGS: 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* 3, *Midland and Western 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	:	Heavy clay loam, occ. clay or medium clay loam
Colour	:	10YR4/3, 7.5YR4/3, brown, occ. 7.5YR4/4, brown
Stones	:	Variable, 2 - 40%, typically 18% limestone
Roots	:	Many fine and very fine
Calcium carbonate	:	Very calcareous
Boundary	:	Abrupt, smooth
Depth	:	29 cm

Subsoil

Texture	:	Heavy clay loam or clay
Colour	:	7.5YR4/6, strong brown
Mottles	:	None
Stones	:	Typically 80% limestone
Structure	:	(Where less stony) weakly developed coarse subangular blocky
Consistence	:	Friable
Structural condition	:	Moderate
Pores	:	>0.5% biopores
Roots	:	Common fine
Calcium carbonate	:	Very calcareous
Boundary	:	Abrupt, smooth to bedrock
Depth	:	Typically 32 cm

Limestone bedrock encountered below subsoil

Wetness Class I

Appendix II continued

Soil Type II

Topsoil

Texture	:	Clay occ. heavy/medium clay loam
Colour	:	10YR5/3, 10YR4/3, brown
Stones	:	Typically 8% limestone
Roots	:	Many fine and very fine
Calcium carbonate	:	Very calcareous
Boundary	:	Abrupt, smooth
Depth	:	30 cm

Subsoil

Texture	:	Clay, occ. heavy clay loam
Colour	:	10YR5/4, yellowish brown
Mottles	:	None
Stones	:	Typically 5% limestone
Structure	:	Weakly developed medium and coarse subangular blocky
Consistence	:	Firm
Structural condition	:	Moderate
Pores	:	>0.5% biopores
Roots	:	Common fine and very fine
Calcium carbonate	:	Very calcareous
Depth	:	50 cm (occasionally to beyond sample depth)

Limestone bedrock encountered below subsoil

Wetness Class : I

Appendix II continued

Soil Type III

Topsoil

Texture	:	Clay
Colour	:	2.5Y4/3, olive brown, 10YR5/3, brown
Stones	:	Typically 4%, quartzite and limestone
Roots	:	Many fine
Calcium carbonate	:	Non-calcareous to slightly calcareous
Boundary	:	Abrupt, smooth
Depth	:	30 cm

Subsoil

Texture	:	Clay
Colour	:	5Y5/3, olive, 2.5Y5/3, light olive brown, 5Y6/3, pale olive ped faces
Mottles	:	Many ochreous and grey
Stones	:	Typically 2%
Structure	:	Weakly developed coarse angular blocky
Consistence	:	Firm
Structural condition	:	Poor
Pores	:	<0.5% biopores
Roots	:	Common fine
Calcium carbonate	:	Calcareous
Depth	:	75 cm (occasionally to beyond sample depth)

Wetness Class : IV