AGRICULTURAL LAND CLASSIFICATION AND STATEMENT OF SOIL PHYSICAL CHARACTERISTICS

LAND AT "DIRFT" SITE, CRICK, NORTHAMPTONSHIRE

1.0 BACKGROUND

1.1 A detailed survey was carried out over 12.7 ha of agricultural land lying 1.0 km west of Crick, Northants. The land is a proposed tip for excavated materials from the Daventry International Rail Freight Terminal (DIRFT) site.

1.2 The site is bounded on the east by the M1 motorway, on the west by a grassy track marking the line of the old Roman road, Watling Street, on the south by a bridleway from Crick and in the north by agricultural land.

1.3 On the published 1:63 360 scale Agricultural Land Classification (ALC) map (MAFF, 1972) the whole area is mapped as Grade 3. However, this map is of a reconnaissance nature and the current survey was undertaken to provide site-specific land quality and soil information. Land immediately to the west of the site has been previously surveyed by ADAS (1993) and where the boundaries coincide was mapped as Grades 3a and 4, the latter representing disturbed ground along Watling Street and at a disused pit.

1.4 A total of 13 auger borings was made using a dutch auger to a depth of 1.2 m unless stopped by impenetrable stony layers. In addition, 2 soil pits representative of the main soil types were dug to assess subsoil conditions in more detail. The fieldwork was carried out during November 1995.

1.5 At the time of the survey all the land was a grass ley used to graze sheep.

2.0 PHYSICAL FACTORS AFFECTING LAND QUALITY

Climate

2.1 Climatic criteria are considered when classifying land as these may have an overriding limitation in terms of the agricultural use of the land. The main parameters used in the assessment of the overall climatic limitation are average

annual rainfall, as a measure of overall wetness, and accumulated temperature (day °C Jan-June) as a measure of the relative warmth of an area.

2.2 A detailed assessment of the prevailing climate for the site has been made by interpolation from the 5 km grid dataset produced by the Meteorological Office (Met. Office, 1989). The details are given in Table 1 and these show that there is no overall climatic limitation affecting the site. Climatic factors do, however, interact with soil properties to influence soil wetness and droughtiness.

Table 1: Climatic Interpolation

Grid reference	SP 575 722
Altitude (m)	122
Accumulated Temperature (Day °C, Jan-June)	1343
Average Annual Rainfall (mm)	692
Moisture Deficit, Wheat (mm)	95
Moisture Deficit, Potatoes (mm)	84
Field Capacity (Days)	155
Overall Climatic Grade	1

Altitude and Relief

2.3 The site includes valley bottom land and valley side, with a small ditch running from the south-west corner north-eastwards. Hence, the south-east quadrant of the site comprises a flat valley floor at about 114 m AOD. From here the land rises gently (1° - 5°) westwards and north-westwards to a crest in the north-western corner of the site at 132 m AOD. Neither altitude nor relief impose any limitation on the agricultural quality of the site.

Geology and Soils

2.4 The published 1:50 000 scale geological map (Geol. Survey, 1980) shows a small area of Recent and Pleistocene Alluvium in the south-east corner of the site (more or less coincident with the valley floor described above) and Jurassic Lias Clays on the valley sides and crest.

2.5 There is no published detailed soil map of the site. The reconnaissance soil survey map for the area (Soil Survey, 1983) shows all of the site to comprise

soils from the Denchworth association (*), essentially clayey soils with a slowly permeable horizon and seasonal waterlogging. The aforementioned ALC survey on adjacent land largely confirmed this assessment, showing clay loam over poorly drained and slowly permeable clay profiles; soil differences related to the depth to the slowly permeable horizon.

2.6 The detailed survey carried out on the site shows the presence of two soil types and these are described in the following paragraphs. The soils conform to previous descriptions (above) and are similar to each other, but they have been differentiated because slight variations in the amount of gleying, topsoil texture and the depth to the slowly permeable layer affect the ALC grading.

Soil Type 1 (Refer to Soil Types Map and Appendix 1)

2.7 Soil Type 1 is mapped in the north-west of the site above the 120 m contour. It occurs on upper valley slopes and is somewhat better drained than Soil Type 2, which is mapped on lower slopes and in the valley bottom.

2.8 Characteristically, Soil Type 1 is a deep, non-calcareous, virtually stoneless, medium (or occasionally heavy) clay loam over clay. The topsoil and upper subsoil are brownish, unmottled or only faintly mottled, strongly structured, porous and permeable. The lower subsoil begins between 50 and 65 cm and has coarse prismatic structures, low porosity, gley colouring and slow permeability. These characteristics, under a climatic regime with 155 field capacity days, combine to put the soil in either Wetness Class II or III.

2.9 Included in the soil mapping unit in the extreme north-west corner of the site, opposite the disused pit, is a very small area of strong brown, slightly stony clay-with-sand. The ground here is uneven and lies wet and may have been disturbed in the past.

(*) Denchworth association: Deep, slowly permeable seasonally waterlogged clays and fine loamy over clayey soils, locally calcareous, developed from Jurassic and Cretaceous clay.

Soil Type 2 (Refer to Soil Types Map and Appendix 1)

2.10 This soil is mapped over the larger part of the site, on shallow lower slopes and on the flat valley floor. Like Soil Type 1, Type 2 is a deep, non-calcareous, virtually stoneless, heavy (occasionally medium) clay loam over clay, but by position it is slightly heavier textured, greyer, more mottled and more poorly drained than Type 1. Specifically and characteristically, and apart from the slightly heavier topsoil texture, it differs by having a greyish or olive brown upper subsoil with coarse prismatic structures, few pores, common distinct mottling and slow permeability. The lower subsoil occurs at 45-65 cm and is also slowly permeable, very similar to that described for Soil Type 1. The more poorly drained nature of Soil Type 2 places it at the boundary between Wetness Classes III and IV.

3.0 AGRICULTURAL LAND CLASSIFICATION

3.1 The land has been classified using the guidelines contained in the Agricultural Land Classification of England and Wales (MAFF, 1988). A breakdown of the individual grades found on the site is given in Table 2 and a description of each grade is given in Appendix 2. At this site the factors which primarily determine grading are the soil Wetness Class (itself a function of climate and soil permeability) and topsoil texture. Droughtiness is not a consideration here, given the fine soil textures (and hence high available water capacity) and only moderate potential moisture deficits.

Table 2: Distribution of Grades and Subgrades

Grade	Area (ha)	%
3a	3.9	31
3b	8.8	69
Total	12.7	100

Subgrade 3a

3.2 The area shown as Soil Type 1 (paragraph 2.7) is mapped as Subgrade 3a. Subgrade 3a land has soils which are Wetness Class II with a heavy clay loam topsoil or are Wetness Class III but with a medium clay loam topsoil. Under the prevailing climatic conditions Subgrade 3a land will have a moderate wetness and workability limitation. Any cultivations and harvesting will need to be carefully controlled to avoid structural damage to the soils during the wetter periods of the year.

Subgrade 3b

3.3 Land with Soil Type 2 is mapped as Subgrade 3b on account of a moderately severe wetness and workability restriction. The soils have predominantly heavy clay loam topsoils and are either Wetness Class III or IV. The land will lie wet for long periods and soil management will require careful control to avoid serious structural damage.

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REFERENCES

ADAS EASTERN STATUTORY CENTRE, 1993. Agricultural Land Classification, Land at Crick, Northamptonshire. RPT Cambridge, File 131/93.

GEOLOGICAL SURVEY OF GREAT BRITAIN, 1980. Sheet 185, Northampton, Solid and Drift Edition, Scale 1:50 000.

MAFF, 1972. Agricultural Land Classification Map. Provisional. Scale 1:63 360, Sheet 132.

MAFF, 1988. Agricultural Land Classification of England and Wales (Revised Guidelines and Criteria for grading the quality of agricultural land). Alnwick.

METEOROLOGICAL OFFICE, 1989. Climatological Data for Agricultural Land Classification.

SOIL SURVEY OF ENGLAND AND WALES, 1983. Sheet 4, "Soils of Eastern England". Scale 1:250 000 .

Appendix 1

DESCRIPTION OF SOIL PHYSICAL CHARACTERISTICS

SOIL TYPE 1

Topsoil

Depth	: 25/30 cm
Texture	: Medium clay loam, occasionally heavy clay loam
Colour	: Dark greyish brown (10YR4/2)
Mottles	: None
Stones	: < 1% small, hard, subrounded
$CaCO^3$	: Non-calcareous
Boundary	: Abrupt smooth

Upper Subsoil

Depth	: 50/65 cm
Texture	: Clay
Colour	: Brown (10YR4.5/3), yellowish brown (10YR5/4, 5/5)
Mottles	: *None, or few faint yellowish brown (10YR5/6)*
Concretions	: Few, fine manganiferrous
Stones	: 1% small and medium, hard, subangular flint
Structure	: Strongly developed coarse subangular blocky
Consistence	: Very firm
Structural condition	: Moderate
Pores	: 1%
Roots	: Common fine and very fine
$CaCO^3$	: Non-calcareous
Boundary	: Clear smooth

Lower Subsoil

Depth	: 120 + cm
Texture	: Clay
Colour	: Brown (10YR5/3), greyish brown (2.5Y5/2), light yellowish brown (2.5Y6/3), light olive grey (5Y6/2) and grey (5Y5/1)

Mottles	: Common distinct fine and medium dark yellowish brown (10YR4/6), yellowish brown (10YR5/6), brownish yellow (10YR6/6)
Concretions	: None, or few fine manganiferrous
Stones	: None
Structure	: Strongly developed coarse prismatic breaking to coarse subangular blocky
Consistence	: Very firm
Structural condition	: Poor
Pores	: < 0.5%
Roots	: Common, fine and very fine
$CaCO^3$	: Non-calcareous

Wetness Class : II / III boundary

SOIL TYPE 2

Topsoil

Depth	: 25/30 cm
Texture	: Heavy clay loam, occasionally medium clay loam
Colour	: Brown (10YR4/3), dark greyish brown (10YR4/2), very dark greyish brown (10YR3/2)
Mottles	: None
Stones	: < 1% small, hard, subrounded
$CaCO^3$	: Non-calcareous
Boundary	: Abrupt smooth

Upper Subsoil

Depth	: 45/65 cm
Texture	: Clay
Colour	: Greyish brown (10YR5/2), light olive brown (2.5Y5/3, 5/4), yellowish brown (10YR5/4, 5/5), light yellowish brown (2.5Y6/3)
Mottles	: Common, fine and medium, distinct yellowish brown (10YR5/6), brownish yellow (10YR6/6), greyish brown (10YR5/2), light brownish grey (2.5Y6/2)
Concretions	: Few, fine manganiferrous

Stones	: 1% small and medium, hard, subrounded quartzite
Structure	: Moderately developed coarse prismatic, breaking to coarse subangular blocky
Consistence	: Very firm
Structural condition	: Poor
Pores	: <0.5%
Roots	: Common fine and very fine
$CaCO^3$	: Non-calcareous
Boundary	: Clear smooth

Lower Subsoil

Depth	: 120 + cm
Texture	: Clay
Colour	: Brown (10YR5/3), greyish brown (2.5Y5/2, 10YR5/2), light yellowish brown (2.5Y6/3), light olive grey (5Y6/2)
Mottles	: Common to many distinct fine and medium strong brown (7.5YR4/6, 5/6), dark yellowish brown (10YR4/6), brownish yellow (10YR6/6, 6/8); few prominent grey (5Y6/1, N5/) and greenish grey (5BG5/1)
Concretions	: None, or few fine manganiferrous
Stones	: None
Structure	: Strongly developed very coarse prismatic breaking to very coarse angular blocky
Consistence	: Very firm
Structural condition	: Poor
Pores	: < 0.5%
Roots	: Common, fine and very fine
$CaCO^3$	: Non-calcareous

Wetness Class : III / IV boundary

Appendix 2

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 include 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 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 levels of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yield of which are variable. In most 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.

AGRICULTURAL LAND CLASSIFICATION

LAND AT SOUTHERN END OF RADIO STATION B, WATLING STREET, CRICK, NORTHAMPTONSHIRE

1.0 INTRODUCTION

1.1 An Agricultural Land Classification (ALC) survey was undertaken on behalf of MAFF in November 1995 of a site at the southern end of Radio Station B, Watling Street, Crick, Northamptonshire.

1.2 The site, which extends to 15.2 ha, lies immediately on the eastern side of the A5 road (Watling Street) to the south of the British Telecommunications Radio Station and is bounded on three sides by open agricultural land albeit that on land to the north, there are a number of radio masts.

1.3 A total of 16 auger borings was made over the entire site using a dutch auger to a depth of 1.2 m unless prevented by impenetrable material. In addition, 2 soil pits were dug to help assess subsoil conditions in greater detail.

1.4 At the time of survey the majority of the site was in permanent grass, with the exception of the middle field which was in winter cereals, although previously it also had been in permanent grass.

1.5 On the published 1:63,360 scale provisional ALC map (MAFF, 1972) the site has been mapped as Grade 4. However, this map is of a reconnaissance nature and the current survey was undertaken to provide site specific information. Land on the other side of the A5 road was the subject of a previous ADAS study (ADAS, 1993) which showed the area immediately adjacent to the present site to be Subgrade 3b.

2.0 PHYSICAL FACTORS AFFECTING LAND QUALITY

Climate

2.1 Climatic criteria are considered when classifying land as these may have an overriding limitation in terms of the agricultural use. The main parameters used in the assessment of the overall climatic limitation are average annual rainfall, as a measure of overall wetness, and accumulated temperature (day °C Jan-June) as a measure of the relative warmth of an area.

2.2 A detailed assessment of the prevailing climate for the site has been made by interpolation from the 5 km grid dataset produced by the Meteorological Office (Met Office 1989). The details are given in Table 1 and show that there is no overall climatic limitation affecting this site.

Table 1: Climatic Interpolation

Grid Reference	SP568 739
Altitude (m)	105
Accumulated Temperature (Day °C, Jan-June)	1363
Average Annual Rainfall (mm)	700
Moisture Deficit, Wheat (mm)	98
Moisture Deficit, Potatoes (mm)	87
Field Capacity (Days)	157
Overall Climatic Grade	1

2.3 Climatic factors do however interact with soil properties to influence soil wetness and droughtiness.

Altitude and Relief

2.4 The majority of the site is relatively flat, rising slightly toward the east. Slopes range from 0-2° and the altitude ranges from approximately 106 m AOD on the eastern boundary to 101 m AOD alongside the A5. Altitude and relief, therefore, do not impose any limitation to the agricultural quality of the site.

Geology and Soils

2.5 The published 1:50,000 scale geology map (Geol. Survey, 1980) indicates that the western half of the site is Recent and Pleistocene Alluvium, whilst the east is underlain by Jurassic Lias Clays.

2.6 There is no detailed published soil map of this district. The reconnaissance soil survey map for the area (Soil Survey, 1983) however, shows the presence of two soil associations, namely Fladbury 1* and Denchworth**. The former is mapped on the lower lying land adjacent to the A5, with the latter occupying land to the east.

2.7 The current survey indicates that there are two soil types on the site, with the majority of the area comprising deep, stoneless, fine loamy over clayey soils. On the lower lying land at the south west corner of the site, the soils are broadly similar although the upper subsoil is moderately stony overlying the stoneless clay.

2.8 A typical profile over the majority of the site has a dark brown heavy clay loam topsoil, although on the slightly higher land to the east of the site the topsoil texture is invariably clay, overlying a yellowish brown slightly mottled clay upper subsoil. The lower subsoil is typically a light olive brown clay with many ochreous and grey mottles, becoming greyer and less prominently mottled with depth. The soils are generally stoneless throughout and the upper subsoil structure is coarse subangular blocky, with the lower subsoil becoming coarse prismatic breaking to coarse angular blocky. The soils generally become slowly permeable below 40-60 cm depth and have therefore been assessed as Wetness Class III, or occasionally IV.

(*) Fladbury 1 association: Stoneless clayey soils, locally calcareous, occurring on flat land and variably affected by groundwater.

(**) Denchworth association: Deep, slowly permeable seasonally waterlogged clays and fine loamy over clayey soils, locally calcareous, developed from Jurassic and Cretaceous clay.

2.9 On the flat land at the south west corner of the site, the soils typically have a mottled heavy clay loam topsoil over a greyish brown, strongly mottled clay upper subsoil with few small angular flint fragments. Stone content generally increases markedly with depth, with abundant manganese staining and the texture is typically a sandy clay, before the deeper stoneless grey clay is encountered below approximately 80 cm depth. The marked gleying throughout the profile indicates that these soils are waterlogged for long periods of the year and have therefore been assessed as Wetness Class IV.

3.0 AGRICULTURAL LAND CLASSIFICATION

3.1 The land has been classified using the guidelines contained in the Agricultural Land Classification of England and Wales (MAFF, 1988). A definition of each grade is given in an Appendix at the end of the report.

3.2 At this site the factors which primarily determine grading are the soil wetness class (itself a function of climate and soil permeability) and topsoil texture. The whole site is classified as Subgrade 3b.

Subgrade 3b

3.3 The site has been classified as Subgrade 3b due to the presence of heavy textured soils with impeded drainage. All the soils have been assessed as either Wetness Class III or IV and under the prevailing climatic conditions, the presence of heavy clay loam or clay topsoil textures will result in a moderately severe workability limitation. The land will tend to lie wet for prolonged periods during the year and hence soil management will need to be carefully controlled to avoid structural damage to the soils.

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REFERENCES

ADAS EASTERN STATUTORY CENTRE, 1993. Agricultural Land Classification, Land at Crick, Northamptonshire. RPT Cambridge, File 131/93.

GEOLOGICAL SURVEY OF GREAT BRITAIN, 1980. Sheet 185 , Northampton, 1:50,000 scale, Solid and Drift Edition.

MAFF, 1972. Agricultural Land Classification Map. Provisional. Scale 1:63,360 Sheet 132.

MAFF,1988. Agricultural Land Classification of England and Wales (Revised Guidelines and Criteria for grading the quality of agricultural land). Alnwick.

METEOROLOGICAL OFFICE, 1989. Climatological Data for Agricultural Land Classification.

SOIL SURVEY OF ENGLAND AND WALES, 1983. Sheet 3, "Soils of Eastern England". 1:250,000 scale.

Appendix 1

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 include 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 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 levels of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yield of which are variable. In most 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.