Cambs 98/92

AGRICULTURAL LAND CLASSIFICATION AND SOIL CHARACTERISTICS
NOTTINGHAMSHIRE MINERALS PLAN
SUTTON AND LOUND, NOTTINGHAMSHIRE

1.0 BACKGROUND

1.1 The site, which is included in the Nottinghamshire Minerals Local Plan for the proposed extraction of sand and gravel, extends to an area of 448.5 ha. It is located along the low lying land adjacent to the River Idle to the east of the villages of Sutton and Lound, Nottinghamshire. MAFF surveyed the site in November/December 1992 to assess the agricultural land quality and soil physical characteristics.

1.2 The site comprises three discrete areas. At the north end, is an area of approximately 160 ha on the western side of the River Idle and to the east of Blaco Hill Farm, whilst at the south is an area of approximately 45 ha to the south west of Tiln. The remainder of the site lies to the east of the river and is crossed by Chainbridge Road which links the settlements of Lound to the west and Hayton to the east.

1.3 On the published Agricultural Land Classification (ALC) Map sheet number 103 (Provisional, scale 1:63,360, MAFF 1969), the site is shown as predominantly Grade 2 with Grade 3 at the northern and southern ends and a narrow band of Grade 4 adjacent to the river. The current survey was undertaken to provide a more detailed ALC of the site.

1.4 A total of 386 auger borings were made using a dutch auger to a depth of 1.1 m unless prevented by impenetrable material. In addition 4 soil pits were dug to assess subsoil conditions and rooting characteristics. Soil pH measurements were made on the organic soils to determine the presence or absence of acidic layers.

1.5 At the time of survey the majority of the land was bare, either having undergone autumn cultivations and sown to winter crops, or still fallow after the previous season's crops. A small area of sugar beet was still awaiting harvest. The general cropping of the area is cereals, sugar beet and potatoes.

2.0 SITE PHYSICAL FACTORS

Climate

2.1 Climatic data for the site was obtained from the published agricultural climatic dataset (Met Office, 1989). This indicates that the average annual rainfall for the site is 575 mm and that the number of days that the soils are likely to be at field capacity is 111.

2.2 The accumulated temperature for the area is approximately 1415 degrees Celsius. This parameter indicates the cumulative build-up of warmth available for crop growth and in conjunction with rainfall has an influence on the development of soil moisture deficits (SMD)* and susceptibility to drought; soil moisture deficits of 113 mm and 107 mm are recorded for wheat and potatoes respectively.

* SMD represents the balance between rainfall and potential evapotranspiration occurring during the growing season. For ALC purposes the soil moisture deficits developing under winter wheat and maincrop potato cover are considered. These 'reference crops' have been selected because they are widely grown and in terms of their susceptibility to drought are representative of a wide range of crops.

2.3 Climate therefore does not impose any limitation to the ALC grade of the site.

Altitude and Relief

2.4 The site is predominantly flat forming part of the flood plain of the River Idle. At the northern and southern ends, the land rises very gently onto the associated river terraces. The altitude of the site ranges from approximately 7 to 13 m AOD.

2.5 The site is dissected by deep drains and ditches which control the watertable of the area. The River Idle is contained within high banks and therefore flooding is not considered a problem on this low lying land.

2.6 Neither gradient nor altitude are limitations to the ALC grade.

3.0 AGRICULTURAL LAND CLASSIFICATION

3.1 The definitions of the Agricultural Land Classification (ALC) grades are included in Appendix 1.

3.2 The site has been found to comprise areas of Grades 2, 3a and 3b, with some areas classified as non agricultural. The table below shows the breakdown of ALC grades in hectares and percentage terms.

Grade	ha	%
2	71.9	16.0
3a	196.9	43.9
3b	150.0	33.5
non agricultural	29.7	6.6
Total	448.5	100

Grade 2

3.3 Two areas of Grade 2 have been mapped, the larger in the central portion of the site, with the smaller one at the north. Both areas comprise organic soils which are fully described in paragraphs 4.7 and 4.9 (Soil Types 6 and 7). The main limitation associated with these soils is one of slight droughtiness. The soils have organic loam, organic clay or peaty loam topsoils over either clayey or sandy subsoils. The subsoils however were generally only slightly acidic (pH 5 or 6) and as such did not constitute any impedance to root growth. Consequently moisture balance calculations for these soils indicate that they will only be slightly droughty in this low rainfall area, restricting them to Grade 2.

3.4 The heavier textured subsoils of Soil Type 6 also showed some impedance to drainage and were classified as wetness class II, but with organic topsoils, this does not restrict their workability and hence does not constitute any limitation to the ALC grade.

Grade 3a

3.5 Land graded 3a is associated with Soil Types 2,4,5,6,7 and 9.

3.6 Soil Types 2 and 4 which constitute the coarse loamy soils developed on the river terraces are restricted to this grade by a moderate droughtiness limitation. These soils have coarse loamy upper horizons overlying either sand in the case of Soil Type 2 or clay in Soil Type 4 and consequently have a moderately low available water capacity (AWC) which in this low rainfall area will cause drought stress to the crops.

3.7 The organic soils (Soil Types 6,7 and 9) which have been mapped as Grade 3a have been restricted to this grade as a result of droughtiness. Although organic soils generally have a high AWC, the subsoils in these areas are strongly

acidic (pH <4.5) which restricts root growth, and hence limits the AWC. This will result in a moderately severe drought stress to the crops.

3.8 The lighter textured variants of Soil Type 5 and the slightly organic phase of Soil Type 6 have been restricted to Grade 3a as a result of a wetness/workability limitation. These soils have been assessed as wetness class II which due to the heavy clay loam topsoils will impose moderate workability and wetness limitations, restricting their versatility.

Grade 3b

3.9 The heavy textured alluvial soils (Soil Types 3 and 5) have been graded 3b due to a wetness and workability restriction. These soils which have been assessed as wetness class III due to the presence of a clay topsoil overlying a slowly permeable fine loamy or clayey subsoil. These factors combine to to impose a significant limitation on the agricultural potential of this land.

3.10 A narrow band of soils has been mapped alongside the river which also has clay topsoils (Soil Type 8), although wetness and workability are not the overriding limitation. These soils have a clay topsoil over a very acid peaty subsoil which restricts the depth of rooting and therefore during the drier periods of the year will result in severe drought stress to the crops. In some profiles where the topsoil is slightly shallower profiles of Grade 4 occur locally.

3.11 The very light textured soils (Soil Type 1) which occur on the river terraces at the northern and southern ends of the site have been restricted to Grade 3b as a result of droughtiness. These sandy soils have a very low AWC and in this low rainfall area this will have a marked effect on crop yield due to severe drought stress.

Non agricultural

3.12 The area of land adjacent to the river which comprises the flood banks has been mapped as non agricultural. In addition two areas of woodland have been identified, a small area at the north of the site and a larger area, part of which is newly planted at the south.

4.0 SOIL PHYSICAL CHARACTERISTICS

4.1 The published 1:63,360 scale solid and drift edition geology sheet 101 (East Retford, Geological Survey of England and Wales 1967) shows most of the site to comprise Pleistocene and Recent peat. At the northern and southern ends of the site alluvium and first terrace recent deposits have been mapped. The current detailed inspection of the site shows nine key soil types which are derived from the above deposits.

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

4.2 These light textured sandy soils are developed on the first terrace deposits and cover 42·9ha at the northern and southern ends of the site. Topsoils are typically loamy medium sand although medium sandy loams do occur locally at the northern end of the site. Subsoils comprise medium sands and loamy medium sands. The soils are generally stoneless and free draining.

Soil Type 2 (refer to Appendix 2 and Soil Types Map)

4.3 The soils of this mapping unit comprise the coarse loamy soils developed on the first terrace deposits which again occur at the northern and southern ends of the site extending to 41·6 ha. Profiles typically comprise medium sandy loam or occasionally sandy clay loam topsoils over loamy medium sand upper subsoils becoming sandier with depth. The upper

horizons are slightly stony with small rounded quartzite pebbles and the soils are free draining.

Soil Type 3 (refer to Appendix 2 and Soil Types Map)

4.4 These heavy textured soils are developed on the alluvium at the northern and southern ends of the site (60·8ha). It was apparent during the survey that the alluvium found in the small separate part of the site at the southern end was derived from a different parent material to that mapped to the east and north of the site. The former comprised a dark grey brown clay topsoil over a strongly mottled grey brown clay subsoil with lenses of peat, whilst the latter had a dark brown clay or heavy clay loam topsoil over a reddish brown clay subsoil with grey mottling. Both soils have slowly permeable subsoils, are stoneless and non calcareous throughout.

Soil Type 4 (refer to Appendix 2 and Soil Types Map)

4.5 Soil Type 4 comprises light textured terrace deposits over reddish brown alluvial clay. These soils occur between the terrace deposits and the alluvial soils at the northern and southern ends of the site extending to 48 ha. A typical profile has a medium sandy loam or sandy clay loam topsoil over a loamy medium sand or medium sand upper subsoil, below which the slowly permeable reddish brown clay is encountered.

Soil Type 5 (refer to Appendix 2 and Soil Types Map)

4.6 Toward the southern half of the site heavy textured alluvial soils over fluvioglacial sands and gravels have been mapped extending to some 55·4 ha. These soils have a clay or heavy clay loam topsoil which in some profiles is slightly organic, over an upper subsoil that varies across the site from clay to sandy clay loam. Below about 60 cm depth the fluvioglacial sands and gravels are encountered. The

soils are generally gleyed and strongly mottled and in most cases the upper subsoil is slowly permeable.

Soil Type 6 (refer to Appendix 2 and Soil Types Map)

4.7 These organic soils have been mapped throughout the northern and central part of the site extending to 102·1 ha. They comprise organic topsoils over clays. A typical profile comprises an organic clay or peaty loam topsoil over a mottled grey clay subsoil, with occasional narrow sandy bands. In some areas the subsoil is strongly acid (pH<4.5) immediately below the topsoil. The upper subsoil is generally porous, becoming less so with depth and the soils have been assessed as wetness class II.

4.8 At the northern end of the site an area of Soil Type 6 has been delineated where the topsoils are only slightly organic. This may represent an area where the original peat depth was shallower than the surrounding area and where peat wastage has reduced the organic matter levels to below 10%.

Soil Type 7 (refer to Appendix 2 and Soil Type Map)

4.9 The soils of this unit are found in a discontinuous band down the central part of the site covering an area of 40·4 ha. These soils have an organic loam or peaty loam topsoil over a loamy medium sand or medium sand subsoil. The subsoil is generally strongly mottled and gleyed but this probably represents former drainage conditions prior to the arterial drainage of the area. These soils are similar to Soil Type 6 in that some areas have highly acidic upper subsoils.

Soil Type 8 (refer to Appendix 2 and Soil Types Map)

4.10 These soils are mapped in conjunction with the heavy textured clayey soils alongside the river and account for 24·8 ha of the site. They have a clay topsoil over a highly acidic drummy

peat layer. Below approximately 50 cm depth the underlying sands and gravels are encountered.

Soil Type 9 (refer to Appendix 2 and Soil Types Map)

4.11 Two areas of deeper organic soils were found which have been delineated as Soil Type 9 covering 32.5 ha. These soils are associated with the other organic soils and similar profiles are included in both Soil Types 6 and 7. This mapping unit comprises approximately 60 cm of peaty loam over either sands or clays. The soils generally become strongly acidic below about 40 cm depth.

December 1992

Resource Planning Team
ADAS, Cambridge

REFERENCES

GEOLOGICAL SURVEY OF ENGLAND AND WALES, 1967. Solid and Drift edition geology map Sheet 101. East Retford, 1:63,360 scale.

MAFF, 1969. Agricultural Land Classification Map Sheet 103, 1:63,360 scale.

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

METEOROLOGICAL OFFICE, 1989. Climate data extracted from the published agricultural agricultural climatic dataset.

APPENDIX I

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 of the Agricultural Land Classification of England and Wales (MAFF 1988) 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 land 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.

APPENDIX II

SOIL PHYSICAL CHARACTERISTICS

SUTTON AND LOUND, NOTTINGHAMSHIRE

SOIL TYPE 1 (42·9 ha)

Topsoil	Texture	loamy medium sand, occasionally medium sandy loam.
	Depth	30-35 cm
Subsoil	Texture	medium sand and loamy medium sand
	Structure	weakly developed coarse angular blocky
	Consistence	very friable
	Depth	120 cm

Wetness Class I

SOIL TYPE 2 (41·6 ha)

Topsoil	Texture	medium sandy loam, occasionally sandy clay loam
	Depth	30-35 cm
Upper Subsoil	Texture	loamy medium sand occasionally medium sandy loam
	Structure	weakly developed coarse angular blocky
	Consistence	very friable
	Depth	60 cm
Lower Subsoil	Texture	medium sand
	Structure	single grain
	Depth	120 cm

Wetness Class I

SOIL TYPE 3 (60·8 ha)

Topsoil	Texture	heavy clay loam or clay
	Depth	30 cm
Subsoil	Texture	clay
	Structure	strongly developed very coarse prismatic
	Consistence	very firm
	Depth	120 cm

Wetness Class III

SOIL TYPE 4 (48·0 ha)

Topsoil	Texture	medium sandy loam or sandy clay loam
	Depth	30-35 cm
Upper Subsoil	Texture	loamy medium sand or medium sand
	Structure	weakly developed coarse angular blocky
	Consistence	very friable
	Depth	60 cm
Lower Subsoil	Texture	clay
	Structure	strongly developed coarse prismatic
	Consistence	very firm
	Depth	120 cm

Wetness Class II

SOIL TYPE 5 (55·4 ha)

Topsoil	Texture	heavy clay loam or clay
	Depth	30 cm
Upper Subsoil	Texture	clay, sandy clay or sandy clay loam
	Consistence	firm or very firm
	Depth	60/70 cm
Lower Subsoil	Texture	medium sand or occasionally loamy medium sand
	Stones	variable, 5-25%
	Depth	120 cm

Wetness Class II or III

SOIL TYPE 6 (102·1 ha)

Topsoil	Texture	organic clay or peaty loam
	Organic matter	10-30%
	Depth	30-40 cm
Subsoil	Texture	clay or sandy clay, occasional thin loamy sand or sand bands
	Structure	weakly developed coarse and very coarse angular blocky
	Consistence	very firm
	pH	<4.5-6
	Roots	absent where pH <4.5 otherwise few.
	Depth	120 cm

Slightly organic phase mapped where topsoil organic matter content ranged from approximately 5-10%.

Wetness Class II

SOIL TYPE 7 (40·4 ha)

Topsoil	Texture	organic loam or peaty loam
	Organic matter	10-30%
	Depth	30-40 cm
Subsoil	Texture	loamy medium sand or medium sand
	pH	<4.5-6
	Roots	absent where pH <4.5 otherwise few
	Depth	120 cm

Wetness Class I

SOIL TYPE 8 (24·8 ha)

Topsoil	Texture	clay
	depth	35 cm
Upper Subsoil	Texture	peaty loam or loamy peat
	Structure	coarse blocky
	Consistence	hard (drummy)
	pH	<4.5
	Roots	none
	Depth	45-50 cm
Lower Subsoil	Texture	sand
	Stone	variable, 5-35%
	Structure	single grain
	Depth	120 cm

Wetness Class I

SOIL TYPE 9 (32·5 ha)

Topsoil	Texture	peaty loam
	pH	5-6 above 35-40 cm and <4.5 below
	Depth	60 cm
Subsoil	Texture	variable from sands to clays
	Depth	120 cm

Wetness class I

Additional Information

All profiles are non calcareous throughout

Rooting common in upper horizons except where restricted by acidity as described above. Few roots in lower subsoils.