

**AGRICULTURAL LAND
CLASSIFICATION AND
STATEMENT OF SOIL
PHYSICAL CHARACTERISTICS
AVENUE WORKS, WINGERWORTH,
CHESTERFIELD, DERBYSHIRE**

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1.0 BACKGROUND

- 1.1 ADAS Statutory Group were requested on behalf of MAFF to assess the agricultural land classification (ALC) and soil physical characteristics of the site at Wingerworth in connection with an application for opencast coal extraction.
- 1.2 The ALC survey was undertaken in May 1995 using a hand held dutch auger and soils were sampled at 100 m grid intersections to 120 cm depth or to an impenetrable layer if this occurred closer to the surface. This information was supplemented by data collected from 6 soil profile pits.
- 1.3 On the published Provisional 1:63 360 scale Agricultural Land Classification Map, sheets 111 and 112 (MAFF, 1973) the majority of the site has been shown as either urban, coinciding with the coking and chemical plant, or as non-agricultural land surrounding the works and in the north. In the east of the site the agricultural land is shown as grade 4 while in the west is a small area of grade 3 land adjacent to Derby Road. Since this map is of a reconnaissance nature designed primarily for strategic planning purposes, the current survey was undertaken to provide more detailed site specific information on land quality.
- 1.4 At the time of the survey the agricultural land at the site was either under grass or winter cereals. In the north, east and south of the site there are areas of disturbed soils believed to result from previous opencast mining operations.

2.0 PHYSICAL FACTORS AFFECTING LAND QUALITY

Climate

- 2.1 Site specific climatic information was obtained by interpolating data contained within the 5 km grid climatological datasets for ALC produced by the Meteorological Office, 1989. This information is shown in table form below.

SITE LOCATION

	Northwest	Northeast	South
Altitude	80	100	100
Annual Average Rainfall (mm)	744	751	753
Accumulated Temperature (°C)	1353	1330	1331
Field Capacity Days	184	184	183
MD Wheat (mm)	95	93	93
MD Potatoes (mm)	83	81	79

- 2.2 These characteristics do not impose any overall climatic limitation to land quality at the site. However, climatic factors specifically field capacity days and soil moisture deficits do interact with soil factors to influence soil wetness and droughtiness.

Altitude and Relief

- 2.3 The site lies on sloping land within the valley of the River Rother and ranges in height from 78 m AOD in the north of the site adjacent to the river, to 121 m AOD at Hagg Hill in the south. Typically slopes are gentle, however in the south of the site, around Hagg Hill, gradients in excess of 7° occur. These steep gradients restrict the type and range of machinery that can be effectively and safely used and therefore limit land quality to subgrade 3b. Elsewhere, where slopes are less than 7° neither gradient nor altitude constitute limitations to agricultural land quality.

Geology and Soils

- 2.4 The published 1:63 360 scale solid and drift edition geology map, sheet 112, Chesterfield (Geological Survey of Great Britain, 1971) shows the site to comprise alluvium adjacent to the River Rother while over the remainder of the site lower and middle coal measures with sandstone outcrops occur.
- 2.5 On the published 1:250 000 reconnaissance scale soils map, sheet 3 (Soil Survey of England and Wales, 1983), the site is shown as comprising mainly disturbed soils (*1), with smaller areas of the Bardsey Association (*2) occurring in the east of the site adjacent to North Wingfield Road, around Avenue Farm and east of Hagg Hill. Rivington 1 Association (*3) soils are shown in the west of the site adjacent to Derby Road. The current detailed survey also identified three main soil types.

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

- 2.6 Soil type 1 occurs in a small area in the west of the site and broadly corresponds to the coarse loamy soils of the Rivington 1 Association. Profiles typically comprise medium sandy silt loam, medium clay loam or medium sandy loam topsoils over medium sandy silt loam or medium sandy loam (occasionally sandy clay loam or medium clay loam) upper subsoils. Lower subsoils are similar or may be heavy clay loam. These soils are well drained (i.e. wetness class I or occasionally II). Profiles are typically very slightly stony throughout

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- (*1) Disturbed soils 3 - restored opencast coal workings. Slowly permeable seasonally waterlogged compacted fine loamy and clayey disturbed soils. Often stony with thin topsoils. Risk of water erosion.
- (*2) Bardsey Association - slowly permeable seasonally waterlogged loamy over clayey and fine silty soils over soft rock. Some well drained coarse loamy soils over harder rock.
- (*3) Rivington 1 Association - well drained coarse loamy soils over sandstone. Locally associated with similar soils affected by groundwater.

although sandstone may occasionally be encountered in the lower subsoils, rarely at shallow depths (40/65 cm), however more usually at 75/85 cm.

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

- 2.7 In the east of the site and in a small band in the northwest, the second soil type occurs. These soils typically comprise medium clay loam or occasionally medium silty clay loam topsoils over heavy clay loam or occasionally heavy silty clay loam upper subsoils, often becoming slowly permeable clay below 40/60 cm. These soils are moderately well to poorly drained (wetness class II to IV, rarely wetness class I where clay is only encountered below 80 cm) and very slightly stony throughout.

Soil Type 3 (refer to Appendix 1 and Soil Types Map)

- 2.8 Soil type 3 is mapped in the north and east of the site and comprises the disturbed and restored soils produced from previous opencast operations. Profiles typically consist of very slightly to slightly stony clay loam or silty clay loam topsoils over compacted, slightly to moderately stony clay or occasionally silty clay. The compacted subsoil constitutes a very slowly permeable layer which gives poor drainage resulting in a wetness class assessment of IV.

3.0 AGRICULTURAL LAND CLASSIFICATION

- 3.1 The definitions of the Agricultural Land Classification (ALC) grades are included in Appendix 2.
- 3.2 The table overleaf provides a breakdown of the ALC grades in hectares and percentage terms.

AGRICULTURAL LAND CLASSIFICATION

Grade	ha	%
2	9.8	5.8
3a	12.4	7.4
3b	21.6	12.9
3b (disturbed land)	27.3	16.3
4 (disturbed land)	24.7	14.7
Urban	70.2	41.9
Non-Agricultural	0.8	0.5
Agricultural Buildings	0.8	0.5
TOTAL	<u>167.6</u>	<u>100.0</u>

Grade 2

- 3.3 Land graded 2 occurs in a small area in the northwest of the site and mainly in conjunction with the deep, free draining, loamy and sandy soils described in paragraph 2.6 (soil type 1). Moisture balance calculations indicate that these soils are slightly droughty and therefore the land is restricted to grade 2 (very good quality agricultural land).
- 3.4 Elsewhere a very small area of grade 2 land is associated with the better drained variants of the fine loamy and fine silty over clayey soils described in paragraph 2.7 (soil type 2). The profiles are moderately well to well drained and have been assessed as wetness class II or I depending upon the depth to the clayey lower subsoils. This combines with topsoil textures to limit the land to grade 2 due to slight wetness and workability imperfections.

Subgrade 3a

- 3.5 Subgrade 3a land occurs in two situations at the site, in the northwest and the centre, and is mainly associated with the poorer drained loamy over clayey soils (paragraph 2.7 soil type 2). The soils are slowly permeable at depth and have been assessed as wetness class III or IV. This combines with topsoil textures to impose moderate wetness and workability imperfections which restrict the land to subgrade 3a (good quality agricultural land).

- 3.6 In the northwest of the site a small area of the land graded 3a occurs in conjunction with the shallower, sandier, free draining soils described in paragraph 2.6 (soil type 1). The presence of medium sandy loam in the subsoil combined with sandstone at shallow depths in the profile reduces the available water capacity for crop growth and therefore the land is graded 3a due to moderate droughtiness limitations.

Subgrade 3b

- 3.7 Land assigned to subgrade 3b occurs in the east of the site where the poorly drained (wetness class IV) loamy over clayey soils described in more detail in paragraph 2.7 are present (soil type 2). Topsoil textures combine with the poor drainage to impose significant wetness and workability imperfections which limit the land to subgrade 3b (moderate quality agricultural land).

Subgrade 3b (disturbed land)

- 3.8 Reinstated land graded 3b (disturbed) also occurs in the east of the site where previous opencast coal extraction is believed to have taken place. Profiles are poorly drained (wetness class IV) and compacted in the subsoil (see paragraph 2.8, soil type 3). Topsoils are typically medium clay loam or medium silty clay loam and these combine the wetness class of IV resulting in the land being excluded from a higher grade by significant wetness and workability imperfections.

Grade 4 (disturbed land)

- 3.9 Land mapped as grade 4 (disturbed) is also associated with the heavy textured poorly drained soils described in paragraph 2.8 (soil type 3). These profiles are poorly drained, having a wetness class of IV, and this factor in combination

with heavy topsoil textures restricts land quality to grade 4 (poor quality agricultural land) on severe wetness and workability grounds.

Urban

- 3.10 The coking and chemical plant, its buildings, associated ground and lagoons, access road, railway tracks and embankments have all been mapped as urban.

Non-Agricultural

- 3.11 A small area of non-agricultural land comprising rough ground with scrub is present in the centre of the site, around a disused shaft.

Agricultural Buildings

- 3.12 Agricultural buildings comprising Avenue Farm are mapped in the east of the site.

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Resource Planning Team

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ADAS Cambridge

REFERENCES

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Western England, scale 1:250 000.

Appendix 1

SOIL PHYSICAL CHARACTERISTICS

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SOIL TYPE 1 (9.9 hectares)

Topsoil	Texture	:	<i>medium sandy silt loam, medium clay loam or medium sandy loam.</i>
	Colour	:	<i>10YR4/3 and 2.5Y4/3 (brown), 7.5YR3/2 dark brown and 10YR4/2 (dark greyish brown).</i>
	Stone	:	<i>very slightly stony (1-5%).</i>
	Structure	:	<i>cultivation zone - not applicable.</i>
	Boundary	:	<i>abrupt, smooth.</i>
	Roots	:	<i>many fine and very fine.</i>
	Depth	:	<i>25/30 cm.</i>
Upper Subsoil	Texture	:	<i>medium sandy silt loam, medium sandy loam, occasionally sandy clay loam or medium clay loam.</i>
	Colour	:	<i>10YR4/4 (dark yellowish brown), 10YR5/4 and 10YR5/6 (yellowish brown), 2.5Y6/8 (brownish yellow) and 2.5Y6/3 (pale brown).</i>
	Stone	:	<i>typically very slightly stony (1-5%), occasionally 6-10%.</i>
	Structure	:	<i>moderately developed coarse and very coarse subangular blocky.</i>
	Consistence	:	<i>friable.</i>
	Porosity	:	<i><0.5% biopores.</i>
	Boundary	:	<i>abrupt, smooth.</i>
	Roots	:	<i>common fine and very fine.</i>
	Depth	:	<i>50/60 cm.</i>
Lower Subsoil	Texture	:	<i>medium sandy silt loam, medium clay loam, medium sandy loam or heavy clay loam.</i>
	Colour	:	<i>10YR6/8 and 10YR6/6 (brownish yellow), 10YR6/4 (light yellowish brown) and 2.5Y6/3 (pale brown).</i>
	Stone	:	<i>typically slightly stony (6-15%).</i>
	Structure	:	<i>moderately developed coarse and very coarse subangular blocky.</i>
	Consistence	:	<i>friable.</i>
	Porosity	:	<i><0.5% biopores.</i>
	Roots	:	<i>few fine and very fine.</i>
Depth	:	<i>120 cm+.</i>	

Other observations:

:

Well drained, wetness class I or occasionally II.

Sandstone may be encountered very occasionally below 40/65 cm.

SOIL TYPE 2 (33.9 hectares)

Topsoil	Texture	:	medium clay loam, occasionally medium silty clay loam.
	Colour	:	2.5Y4/2 and 10YR4/2 (dark greyish brown), 10YR3/2 (very dark greyish brown) and 2.5Y4/3 (brown).
	Stone	:	very slightly stony (1-5%).
	Structure	:	cultivation zone - not applicable.
	Boundary	:	abrupt, smooth.
	Roots	:	many fine and very fine.
	Depth	:	20/30 cm.
	Upper Subsoil	Texture	:
Colour		:	10YR5/5 and 2.5Y5/6 (yellowish brown), 10YR5/3 and 10YR4/3 (brown) and 2.5Y6/3 (pale brown).
Stone		:	typically very slightly stony (1-5%).
Structure		:	weakly to moderately developed coarse subangular blocky.
Consistence		:	firm.
Porosity		:	<0.5% biopores.
Boundary		:	abrupt, smooth.
Roots		:	many fine and very fine.
Depth		:	40/60 cm, rarely 85cm.
Lower Subsoil	Texture	:	clay.
	Colour	:	2.5Y6/3 and 10YR6/3 (pale brown), 2.5Y6/4 (light yellowish brown), 10YR6/8 (brownish yellow), 10YR5/3 (brown) and 2.5Y7/1 (light grey).
	Stone	:	very slightly stony (1-5%).
	Structure	:	weakly developed coarse angular blocky.
	Consistence	:	firm to very firm.
	Porosity	:	<0.5% biopores.
	Roots	:	few fine and very fine.
	Depth	:	120 cm+.
Other observations:	:	Ochreous mottling may occur in upper subsoil. Clay lower subsoil has common distinct ochreous mottles. Typically assessed as wetness class II to IV, rarely I.	

SOIL TYPE 3 (52.0 hectares)

Topsoil	Texture	:	medium clay loam, heavy clay loam, medium silty clay loam or heavy silty clay loam.
	Colour	:	10YR3/2 (very dark greyish brown), 2.5Y4/2 (dark yellowish brown) and 2.5Y5/2 (greyish brown).
	Stone	:	very slightly stony (1-5%).
	Structure	:	cultivation zone - not applicable.
	Boundary	:	abrupt, smooth.
	Roots	:	many fine and very fine.
	Depth	:	20/30 cm.
	Subsoil	Texture	:
Colour		:	very mixed, comprising 10YR5/3 and 10YR4/3 (brown), 10YR6/4 (light yellowish brown), 2.5Y6/3 (pale brown) and 2.5Y6/1 (light grey).
Stone		:	typically very slightly stony (1-5%), occasionally (10-20%).
Structure		:	massive.
Consistence		:	extremely firm.
Porosity		:	<0.5% biopores.
Roots		:	common fine and very fine.
Depth		:	120 cm+.
Other observations:	:	Subsoil is very mixed and compacted with prominent ochreous mottles. Shale and coal fragments may be present in profile. Assessed as wetness class IV.	

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.

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MAP 1 : AGRICULTURAL LAND CLASSIFICATION

MAP 2 : SOIL TYPES