FISHLEY PROPOSED OPENCAST COAL SITE - SOIL REPORT

The site is located between Bloxwich and Great Wyrley, and covers an area of approximately 145 ha. Most of the area is in agricultural use under winter cereals and grassland.

1. SITE AND SOILS

Approximately 87% of the area comprises natural soils which have mostly developed in drift over reddish till. For the purposes of soil stripping and storage, 3 undisturbed soil units have been identified, defined in terms of soil texture and depth to clay in the subsoil.

The remainder of the site comprises disturbed land with limited soil reserves.

Unit I

This covers 13% of the site (19 ha) and comprises 3 areas of disturbed land, 2 of which have been restored with a thin soil cover to low quality grassland. The area north of the golf course has 50-300 mm of sandy loam/sandy clay loam over compacted shale. The restored area north of Yieldfields Hall has slightly better soil reserves with 250-300 mm of sandy clay loam/clay loam topsoil over a variable thickness of reddish clay.

The third disturbed area is a wooded spoil mound in the centre of the site with negligible soil reserves.

Unit II

This comprises 8% of the area (12 ha) and includes the lightest soils on the site developed in sand and gravel deposits. 300 mm of sandy loam topsoil overlies subsoils of sandy loam, loam sand or sand and rounded quartzite pebbles are common. In the most northerly part of the unit, some inclusions of clay are present, particularly in the lower subsoils.

Unit III

This covers 24% of the area (35 ha) and comprises the heaviest soils on the site. Typically a slightly/moderately stony sandy clay loam or sandy loam topsoil overlies reddish gleyed clay with sand lenses. The clay always occurs within 500 mm of the surface and in most cases is present immediately below the topsoil. This soil differs from unit IV in lacking a consistent lighter upper subsoil horizon over the clay.

Unit IV

This is the dominant soil on the site, covering 55% of the area (79 ha). A typical profile has 300 mm of slightly stony sandy loam or sandy clay loam topsoil over a similar textured upper subsoil horizon. Below about 500 mm there is a distinct change to a heavier reddish clay loam or clay, with sand lenses.

2. SOIL STRIPPING

2.1 Stripping Areas

The different topsoils and subsoils from units I-IV identified in section 1 should be stripped and stored separately. Some rationalisation of stripping boundaries may be possible, taking into account the method of site working and practical stripping areas. This should be discussed with ADAS.

2.2 Stripping Depths

Stripping depths for the soil layers in each unit are listed below. Note that as the upper subsoil in unit IV is lighter textured and a better quality than the lower subsoil, the 2 subsoil layers should be stripped and stored separately.

	Units	Depth (mm)
Topsoil	I (N of golf course)	0-200*
	I (N of Yieldfields)	0-250*
	II	0-300
	III	0-300
	IV	0-300
Subsoil	I (N of Yieldfields)	250-500**
	II	300-1000
	III	300-1000
	IV	300-500
		500-1000

* Topsoil depths within this unit are very variable. The figures given are only average depths, and as much soil as possible should be recovered from the area.

** No subsoil is available from the block of unit I north of the golf course. The block north of Yieldfields Hall varies greatly in subsoil thickness over this spoil, and as much subsoil as possible should be recovered.

2.3 Equipment Movement

The movement of scrappers should take place on as low a strata of soil as possible ie the majority of movement should be on material which is not designated as either topsoil or subsoil, and no unnecessary movement should take place on the topsoil.

2.4 Soil Moisture Content for Soil Movement

Soils should not be removed when they are in a moist state, or following periods of rain. Guidelines on acceptable moisture contents for soil stripping are included in Appendix C.

2.5 Soil Making Material

If the whole site is to be restored to agriculture or woodland, sufficient soil making materials should be recovered to make up for the current shortage of soils in unit I. A likely source of soil making material would be in the sand and gravel deposits immediately beneath existing soils in unit II.

The reddish till below soils in unit IV is a further possible source of soil making materials.

Further information from British Coal geologists is required before definite recommendations can be made.

3. STORAGE

3.1 Storage of Soils, Soil Making Materials and Overburden

Topsoils and subsoils from areas previously identified for separate stripping should be stored separately. The same applies to different soil making materials.

Materials should be stored like on like so that topsoil is stripped from beneath subsoil heaps and subsoil is stripped from beneath overburden mounds.

3.2 Management

A grass/clover sward should be established and maintained on all storage heaps.

4. REINSTATEMENT

4.1 Soil Distribution and Depth

Land destined for agricultural use should be restored with 1000 mm of soil of which at least the top 250 mm is topsoil.

The soil units previously identified for separate stripping should be restored in separate areas so that different and appropriate management techniques can be applied. Note that the lower subsoil of unit IV is of poorer quality than the upper subsoil, and so should always be restored at the base of the restored soil profile.

4.2 Soil Movement

When soil is taken from the store, it is important to ensure that damage does not occur. Soil movement should conform to the criteria presented previously, and care should be taken to eliminate any unnecessary trafficking of subsoil or topsoil.

4.3 Soil Loosening

As each layer is replaced it should be thoroughly loosened under dry conditions prior to replacement of the next layer.

4.4 Soil Analysis

Samples of topsoil should be analysed after reinstatement, and lime and fertilisers applied as appropriate to correct deficiencies and promote grass establishment. On the basis of samples taken prior to stripping (Appendix A), existing topsoils in unit I are likely to be short of lime, and particular attention should be given to correcting this at restoration.

4.5 Grass Establishment and Cultivations

Grass should be established as soon as possible after restoration, and preferably in autumn to allow some growth before winter. The sward should be established according to normal agricultural practice, and particular attention should be paid to the timeliness of cultivations.

4.6 Drainage

Contouring of the site should be carried out in conjunction with ADAS, to ensure sufficient falls and outlets for drainage schemes. A comprehensive drainage system should be installed at the earliest opportunity.

5. FUTURE MANAGEMENT

In order to aid the development of the new soil profile in the reinstated soils, very careful management will be essential for a number of years.

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APPENDIX A

Chemical Analysis of Topsoils

	pH	P mg/l (index)	K mg/l (index)	Mg mg/l (index)
Soil Unit				
I	5.6	18 (2)	104 (1)	94 (2)
II	6.3	35 (3)	144 (2)	47 (1)
IV	6.7	30 (3)	104 (1)	38 (1)

Soil nutrient levels are quoted in milligrams of available nutrient per litre of soil with the equivalent ADAS nutrient indices in brackets.

There are interpreted for topsoils as follows:-

Index 0 - very low
1 - low
2 - satisfactory
3 and above - high

APPENDIX B

Particle Size Analysis

Soil Unit	Depth (mm)	% in each size class						Texture
		2000-600 μ	600-200 μ	200-60 μ	60-20 μ	20-2 μ	< 2μ	
I	0-200	4	35	30	10	10	11	SL
II	0-300	3	34	29	9	13	12	SL
	400-500	2	34	30	9	12	13	SL
	600-700	2	39	36	4	6	13	SL
IV	0-320	3	33	29	10	12	13	SL
	320-550	3	33	26	10	12	16	SL
	550-1000	3	24	24	9	14	26	CL

Soil textures are derived from the particle size analyses:

SL = sandy loam

CL = clay loam

APPENDIX C

Plastic Limit Data

Soil Unit	Depth (mm)	% on Dry Soil	
		Plastic Limit	Acceptable Moisture Content for Soil Movement
I	0-200	25	20
IV	0-320	24	19
	320-500	17	14
	550-1000	17	14

Soils are especially prone to structural damage when moved at moisture contents approaching or above their plastic limits.

The acceptable moisture contents for soil movement are included as a guide to moisture levels at or below which less damage to soil structure may be expected for soil units I and IV. There will, however, be considerable variation within each unit, and ADAS should be consulted if conditions are at all doubtful.

Values for unit III are likely to be similar to unit IV. The high sand content of soils in unit II means that they are non-plastic and guidelines cannot be given based on plastic limit tests.

STATEMENT OF PHYSICAL CHARACTERISTICS
FISHLEY OPEN CAST COAL SITE

The site, which is situated between Bloxwich and Great Wyrley, was surveyed by the Resource Planning Group in March and April 1989. It covers about 144 hectares and is bounded by Hobble End Lane to the north, Cadman's Lane and Fishley Lane to the east, Bloxwich Golf course to the south and the A34 Stafford Road to the west. Beyond the boundaries of the site there is further agricultural land to the north and east of the site. At the time of survey most of the site was in agricultural use, under permanent pasture and winter cereal.

Climate

Average annual rainfall in the vicinity of the site is 729 mm and the accumulated temperature above 0°C for January to June is 1322 day °C, thus placing the site climatically at the borderline between Grades 1 and 2. Rainfall is fairly evenly distributed throughout the year with August and November being the wettest months and with a slightly drier period from February to April. The growing season extends to about 240 days from the end of March to late November and median field capacity days for this site is 170. The balance between summer rainfall and evapotranspiration gives a moisture deficit for winter wheat of 90 mm and for potatoes of 76 mm.

Site

Altitude ranges from 135 m in the north of the site to just over 150 m around Yieldfields Hall in the south. Most of the land is level or gently undulating and there are no site limitations.

Geology & Soils

The solid geology in this area comprises Middle Coal Measures with thick grey and black clay and silty shales and occasional thin sandstones and seams of coal and ironstone. These are overlain by Pleistocene drift deposits, namely Irish Sea till and sands and gravels. These deposits give rise to reddish brown, slightly or moderately stony soils which are normally unsorted. Soil textures range from sandy loams and loamy sand on the sand and gravel deposits to sandy clay loams and compact clays on the heavier deposits.

The main limitations to the agricultural use of the land are the wetness of the heavier soils, the stone content, and susceptibility to drought of the lighter textured soils.

AGRICULTURAL LAND CLASSIFICATION

Grade 3a

Grade 3a has been mapped over 72.5 hectares, accounting for 50% of the site. It covers much of the higher land in the south and centre of the site. It includes lighter soils on the ridges in the extreme north of the site and north of the golf course where there are sandy loams over loamy sands and sands. These soils are rarely stoneless, and more commonly slightly stony, often having stony layers within the subsoil. Although some profiles were wet and gleyed within the subsoil the major limiting factor is droughtiness, restricting the soils to Grade 3a. The remaining areas of Grade 3a are heavier soils with sandy loam or sandy clay loam topsoils, which are slightly to moderately stony, over clay at depths below 35 cms. In many profiles there is an upper subsoil above the clay of sandy clay loam, sandy loam and loamy sand, often with a very stony layer at about 40-45 cms. These soils are in wetness classes III and IV and the combination of wetness and topsoil texture limits them to this Grade.

Grade 3b

Most of the remainder of the site has been mapped as Grade 3b. The soils are slightly to moderately stony with sandy clay loam/over clay and are restricted to wetness class IV, and thus Grade 3b.

Grade 4

Grade 4 has been mapped over 12.1 hectares and 8% of the site. The small area in the north near Hobble End Farm has gleyed clay to the surface and appears disturbed. The remaining two areas of Grade 4 are restored sites or old opencast coal sites and old colliery or clay-pit spoil heaps. They have approximately 30 cms (varies between 5 cm and 40 cm) of soil ranging from sandy loam to sandy clay loam to heavy clay loam over compacted clay, shale and colliery spoil. The compaction and structural instability of these soils give rise to very reduced soil permeabilty, thus limiting such disturbed areas to Grade 4.

Non-agricultural

Land shown as non-agricultural includes the drain along the northern side of the golf course, the pond and woodland in the centre of the site and the adjacent area of tipped material.

	hectares	% of total	% of agricultural area
Grade 3a	72.5	50	53
Grade 3b	51.4	36	38
Grade 4	12.1	8	9
Non-agricultural	7.8	6	-
TOTAL	143.8	100	100

SOIL UNITS

The survey of the site was undertaken using 1 m Dutch soil augers. Soil borings were made on 100 m grid and augered to 100 cms unless prevented from doing so by stones. The average density of borings is 1 per hectare. In addition soil pits were dug to obtain a better assessment of subsoil structure and to collect samples for analysis.

Four soil units have been identified, and these have been defined primarily in terms of soil texture and depth to clay in the subsoil.

Soil Unit I

This unit comprises three areas of restored and disturbed soils on old colliery or clay-pit spoil heaps and open-cast coal sites. The wooded area in the centre of the site has only a thin superficial organic layer onto black and grey compacted shale. The area north of the golf course has between 5 cm and 30 cm of reddish brown and grey sandy loam and sandy clay loam onto compacted grey and black shale and clay. The restored area north of Yieldfields Hall has slightly better reserves of soil with 25-30 cm of grey brown sandy clay loam or grey heavy clay loam, over 5-15 cm of compacted red clay over black and grey compacted clay and shale. The compacted nature and structural instability of these soils gives rise to very reduced permeability as evidenced by the surface water in these areas at the time of survey.

Soil Unit II

Unit II comprises the lightest soils on the site with stoneless and slightly stony sandy loams to 30cm over loamy sands and sands. Profiles are extremely porous, although those in the north of the site showed signs of gleying below about 35 cm. Stones are mainly small, medium and large rounded and subrounded Bunter quartzite and some profiles had stony layers at depths below 45 cms. The soils in the northernmost area of ths unit are leas well sorted than those elsewhere, and have inclusions of clay in the subsoil particularly below about 60 cm.

Pit 2

Level (ridge top) Winter cereal

0-30 cm dark brown (7.5YR3/2) sandy loam; weakly developed medium and fine subangular blocky structure; moderately to very porous; 5% small and medium rounded stones; many roots.

30-70 cm dark reddish brown (5YR3/4) sandy loam/lomay sand; weak fine granular to single grain; very porous; 5% small and medium rounded stones; mainly roots.

70-120 cm reddish brown (5YR4/3) loamy sand; single grain; very porous; one very large subrounded stone; few roots.

MB wheat = + 3 mm

MB potatoes = 0 mm

Grade 3a

Soil Unit III

Unit III comprises the heaviest soils on this site with slightly or moderately stony sandy loams or more commonly sandy clay loam over clay which occurs within 50 cm of the surface. In most profiles brown or dark greyish brown topsoil lies directly over red, gleyed clay which constitutes a slowly permeable layer within the profile. Lenses and pockets of sand do occur within the subsoil. The profile description for this unit is similar to that for Unit IV the only difference being the lack of a definable upper subsoil above the clay.

Soil Unit IV

Unit IV covers most of the site. A typical profile has a slightly stony sandy loam or sandy clay loam topsoil, to 30cm over a slightly or moderately stony, gleyed sandy loam or occasionally loamy sand with clay horizon. Below about 50 cm there is an abrupt boundary to a reddish brown, compact sandy clay loam, clay loam or clay with sand. Many profiles contain sandy pockets, usually representing weathered blocks of soft sandstone within the profile.

Pit 3

Level. Winter cereal

0-30 cm very dark greyish brown (10YR3/2) sandy loam; well developed coarse subangular blocky structure; slightly stony with medium and large rounded quartzite stones; many plant roots.

30-47 cm brown and reddish brown (7.5YR4/4) sandy clay loam; weakly developed coarse and medium subangular blocky structure; very slightly porous; common grey and ochreous mottles; slightly stony; few plant roots.

47-100 cm abrupt boundary to reddish brown (5YR4/4) sandy clay loam (hand textures as clay with sand); coarse prismatic structure; common distinct grey and ochreous mottles and grey ped faces; compact; few small and medium and stones; very few plant roots.