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AGRICULTURAL LAND CLASSIFICATION
AND SOIL SURVEY
NORTH-EAST OPENCAST COAL SITES
SURVEY OF RESTORED LAND AT
HEDLEY LANE, SUNNISIDE
TYNE & WEAR

DECEMBER 1995

ADAS
Leeds Statutory Group

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SUMMARY

Land and soils at the restored opencast coal site at Hedley Lane, Sunniside, were surveyed in December 1995 with hand auger borings and shallow soil profile pits at a density of one per hectare. Four full profile pits were also dug.

Over the north of the site light-textured topsoils overlie compacted medium-textured subsoils, while in the south light-textured topsoils overlie light to very light-textured subsoils. At present all of the agricultural land on the site (17.8 ha) falls in Subgrade 3b, to which it is limited by soil wetness and workability. It is possible, particularly in the case of the light-textured soils in the south-west, that the subsoil structures may develop in the longer-term to such a degree that they meet the requirements for Subgrade 3a.

At present most subsoils have a massive structure although there was some evidence of platy structures developing in the medium-textured subsoils or angular/subangular blocky structures in the light-textured subsoils. The topsoils have a moderately developed medium subangular and angular blocky structure, or a moderately developed coarse angular blocky structure.

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1. INTRODUCTION AND SITE HISTORY

Hedley Lane OCCS, the restoration of which was completed in June 1994, lies just over 2km south-south-east of the village of Sunniside in Gateshead District of Tyne and Wear.

1.1 The site was operated by RJB Mining (formerly R & A Young Mining Ltd). There is no information available on the methods used to strip the soils. Soils were stored in storage mounds on site for up to 2 years. The subsoils were then replaced in two layers using crawler tractor and scraper box methods to a total depth of 900mm, after which the topsoils were replaced (also using crawler tractor and scraper box) to approximately 300mm depth. As already mentioned, the restoration was completed in June 1994 and it is proposed to install underdrainage in 1996. Currently, most of the site is in a temporary grass ley, with two ponds and an area of recently planted woodland in the south.

1.2 A pre-working ALC and soil resources report was prepared by the Resource Planning Group of ADAS Leeds in December 1989, which identified 14.2 ha of Subgrade 3a land and 4.7 ha of Subgrade 3b land on the site.

1.3 Two main soil types were identified by this survey. The first, in the west of the site, consisted of light to medium-textured soils derived from glacial drift. Both topsoils and subsoils consisted of slightly stony sandy clay loams or sandy loams, and overlay sandstone bedrock at between 70cm and 100cm depth. The second main soil type occurred in the east of the site and consisted of slightly to moderately stony sandy loam topsoils and subsoils overlying sandstone bedrock at around 55cm depth. A third soil type, which was too small to map separately, occurred in a small hollow adjoining Birkheads Lane, and consisted of about 75cm of peat loam overlying waterlogged sandy loam.

According to the available information the soils were generally returned to the same enclosures from which they had originally been stripped.

2. CLIMATE DATA

Grid Reference	: NZ 218568
Altitude (m)	: 165
Accumulated Temperature above 0°C (January - June)	: 1178 day °C
Average Annual Rainfall (mm)	: 724
Climatic Grade	: 3a
Field Capacity Days	: 179
Moisture Deficit (mm) Wheat	: 80
Moisture Deficit (mm) Potatoes	: 62

3. SURVEY METHODS

Soils on the site were examined in December 1995 using hand auger borings to 120cm depth and shallow profile pits deep enough to examine subsoil structure, at a density of one observation per hectare at locations predetermined by the O.S. National Grid. A further four full profile pits were dug to 120cm or overburden. Samples were collected for laboratory analysis of bulk density and particle size distribution.

Land quality was assessed using the methods described in "Agricultural Land Classification of England and Wales : *Revised guidelines and criteria for grading the quality of agricultural land*" MAFF (1988).

Further guidance was provided by draft unpublished MAFF guidelines for the grading of restored and disturbed land.

4. SLOPE, ASPECT AND RELIEF

The site is gently to moderately sloping (typically 2-6°) with variable aspect, although strong slopes of around 8° occur in parts of the south. Site altitude varies from approximately 174m AOD in the north-west to 151m AOD in the south-west.

5. AGRICULTURAL LAND CLASSIFICATION

The ALC grades occurring on this site are as follows:

Grade/Subgrade	Hectares	% of Total Area
1		
2		
3a		
3b	17.8	95.7
4		
5		
(Sub total)	(17.8)	(95.7)
Other Land	0.8	4.3
TOTAL	**18.6**	**100**

This site was only restored in June 1994 and has not yet completed the Statutory Aftercare period. Underdrainage has not been installed and soil structures and plant roots have not had a chance to fully develop. ALC gradings therefore only refer to soils in their present condition. A further assessment following aftercare is needed to monitor land quality on the site.

5.1 SUBGRADE 3b

All of the agricultural land on the site currently falls in this subgrade. The topsoils are very slightly to slightly stony sandy loams and over the north of the site they overlie very slightly to moderately stony sandy clay loam or medium clay loam subsoils. In the south moderately stony sandy loam and loamy sand subsoils occur. The sandy clay loam and medium clay loam subsoils are generally very poorly structured with very poor permeability and porosity, but the gentle to moderate slopes on the site will allow the run-off of excess rainfall. The sandy loam subsoils in the south are poorly to very poorly structured and slowly permeable below around 30cm depth. In both cases soil wetness restrictions are the grade limiting factor.

In parts of the south of the site, slopes of around 8° provide an additional limitation to Subgrade 3b.

5.2 OTHER LAND

Two areas of open water and some recently planted woodland are found in the south of the site.

5.3 LIKELY FUTURE ALC GRADE

Given the subsoil textures and present structural conditions, it is likely the subsoils in the north of the site will be slowly permeable even after the installation of underdrainage and at the end of the statutory five year aftercare period. It is likely, therefore, that much of the land will be limited to Subgrade 3b in the medium to long term, although it is possible that in time the upper subsoil structure may develop to such a degree that the soils meet the requirements for Subgrade 3a. The probable exception to this is the area with lighter-textured subsoils (sandy loams) found in the south where the subsoil structure may develop in the short and medium term to the point where the profiles meet the requirements for Subgrade 3a.

6. DESCRIPTION OF RESTORED SOILS

6.1 There are two main soil types on this site, full descriptions of which are given below. Topsoil and subsoil resources are also shown on the accompanying maps along with soil thickness and volume information.

Soil Type 1

This occurs in the south of the site and consists of restored light-textured material which is probably derived from weathered Coal Measures sandstones. It is characterised by light textured topsoils overlying light-textured to very light-textured subsoils.

Soil Type 2

Soil Type 2 covers the north of the site and consists of restored light to medium-textured material which is probably derived from glacial drift. It is characterised by light textured topsoils overlying compacted medium-textured subsoils.

7.2 According to the pre-working plans prepared by Young's, only approximately 35% of the site was subject to coal extraction while the remaining 65% of the area was used for soil and overburden storage. However, it is possible that some storage areas may have been used for coaling.

Of the four soil pits dug, that at boring 16 probably lies in an unworked area lying between topsoil and subsoil mounds whilst that at boring 17 lies within the former extraction area. Both of these correspond to Soil Type 1. The locations of the pits dug on Soil Type 2 were during the working of the site, overlain by a 15 m high sand stockpile (in the case of boring 3) or a 6 m high topsoil mound (in the case of boring 9).

The highest bulk density in the subsoils was found in the area subject to extraction, whilst the lowest was found on the pit dug between the sites of the two soil mounds. Pits dug on areas with soil mounds/sand stockpile had subsoils with intermediate bulk density levels of between 1.72 g/cm^3 and 1.85 g km^3.

7.3 The topsoils contain many fine and very fine fibrous roots, although generally rooting appears to be still absent below around 40cm depth. Equally, with the exception of a few worm channels in the subsoil at boring 9 (which was very close to the edge of the site, and so could be expected to be recolonised relatively quickly) there was no evidence of any macrofauna.

7.4 Evidence of severe anaerobism, such as bluish-grey colours or foul smelling soil, was absent from the pits dug on the site.

8. SOIL PROFILE DESCRIPTIONS

8.1 Table 1 Soil Type 1

Profile Pit near boring 16
Slope and Aspect: 0°
Land Use: Ley grassland
Weather: Cold and misty

Depth (cm)	Horizon Description
0-34	Very dark greyish brown (10YR3/2) medium sandy loam; no mottles but containing 5-10% subsoil contamination; very slightly stony with 4% small and medium sandstones (2% > 2cm); moist; moderately developed medium angular and subangular blocky structure, breaking down to fine subangular blocky; friable to firm; very porous, mean bulk density 1.11g/cm³; many fine and very fine fibrous roots; macrofauna absent; moderately sticky; moderately plastic; no evidence of anaerobism; non-calcareous; clear wavy boundary.
34-79	Grey (10YR6/1 and 10YR5/1) medium sandy loam with lenses of clay between 69cm and 79cm; many diffuse brownish yellow (10YR6/8) mottles; slightly stony, with 15% small to large sandstones; slightly moist; massive; firm; <0.5% pores >0.5mm; mean bulk density 1.70g/cm³; common very fine fibrous roots; macrofauna absent; slightly sticky; moderately plastic; no evidence of anaerobism; non-calcareous; abrupt smooth boundary.
79-120	Grey (10YR6/1) loamy medium sand with common distinct brownish yellow (10YR6/6) mottles; very slightly stony, with around 4% sandstones; moist; weakly developed medium and coarse subangular blocky structure; friable; very porous; mean bulk density 1.61 g/cm³; no roots; macrofauna absent; slightly sticky; slightly plastic; no evidence of anaerobism; non-calcareous.

8.2 Table 2 Soil Type 1

Profile Pit at boring 17
Slope and Aspect : 6° SE
Land Use : Ley grassland
Weather : Cold and showery

Depth (cm)	**Horizon/Description**
0-34	Very dark greyish brown (10YR3/2) medium sandy loam; no mottles; slightly stony, with around 6% total small and medium sandstones (4%>2cm); moist; moderately developed coarse angular blocky structure , breaking down to fine subangular blocky; friable; very porous; mean bulk density 1.22 g/cm^3; many very fine fibrous roots; macrofauna absent; slightly sticky; moderately plastic; no evidence of anaerobism; non-calcareous; clear smooth boundary.
34-98	Brown (10YR4/3) medium sandy loam; common yellowish brown (10YR5/6) mottles; moderately stony with around 16% very small to large sandstones; slightly moist; massive; extremely firm; slightly porous; mean bulk density 1.93 g/cm^3; no roots; macrofauna absent; moderately sticky; moderately plastic; no evidence of anaerobism; non-calcareous; clear smooth boundary.
98+	Mixed soil and overburden, with around 10% coal fragments.

8.3 Table 3 Soil Type 2

Profile Pit at boring 3
Slope and Aspect : 3° SSW
Land use : Ley grassland
Weather : Cold, overcast

Depth (cm)	**Horizon Description**
0-34	Very dark greyish brown (10YR3/2) medium sandy loam; no mottles but approximately 3% subsoil contamination; very slightly stony, with around 4% sandstones (3% > 2cm); moist; moderately developed medium and coarse angular blocky structure; firm; moderately porous; mean bulk density 1.46g/cm^3; many fine fibrous roots; macrofauna absent; moderately sticky; moderately plastic; no evidence of anaerobism; non-calcareous; abrupt smooth boundary.
34-89	Brown (10YR5/3) medium clay loam with clay lenses; common brownish yellow (10YR6/6) mottles; slightly stony, with around 15% very small to large sandstones; moist; massive; extremely firm; slightly porous; mean bulk density 1.85 gcm^3; few very fine fibrous roots to 40cm, none below 40cm; macrofauna absent; moderately sticky; moderately plastic; no evidence of anaerobism; non-calcareous; abrupt wavy boundary.
89-120	Yellowish brown (10YR5/4) medium sandy loam; no mottles; very slightly stony, with around 3% small and medium sandstones; moist; massive; firm; <0.5 pores >0.5mm; mean bulk density 1.72 g/cm^3; no roots; macrofauna absent; slightly sticky; slightly plastic; no evidence of anaerobism; non-calcareous.

8.4 Table 4 Soil Type 2

Profile Pit at boring 9
Slope and Aspect : 2° SSE
Land Use : Ley grassland
Weather : Cold and windy, with light rain

Depth (cm)	**Horizon Description**
0-45	Dark greyish brown (10YR4/2) medium sandy loam; no mottles; slightly stony, with around 6% small and medium sandstones (4% >2cm); moist; moderately developed medium and coarse angular blocky structure, becoming massive below 25cm; firm; moderately porous; mean bulk density 1.44 g/cm^3; many fine and very fine fibrous roots; macrofauna absent; moderately sticky; moderately plastic; no evidence of anaerobism; non-calcareous; abrupt irregular boundary.
45-95	Greyish brown (10YR5/2) sandy clay loam; many diffuse grey (10YR6/1) and brownish yellow (10YR6/8) mottles; moderately stony, with around 20% small and medium sandstones and few coal fragments; slightly moist; weakly developed coarse platy to massive structure; very firm; very slightly porous; mean bulk density.1.78 g/cm^3; few fine fibrous roots; rare worm channels, very sticky; very plastic; no evidence of anaerobism; non-calcareous; clear smooth boundary.
95+	Overburden with common coal and shale fragments.

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MAPS