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Sutton Courtenay, Oxfordshire
Minerals Application
Agricultural Land Classification
ALC Map and Report
(Sites A B C E G H N R & S)
Statement of Physical Characteristics
(Sites A B E G H R & S)
April 1993

SUTTON COURTENAY, OXFORDSHIRE
MINERALS APPLICATION
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1. Introduction

1.1 This report describes the assessment of the quality of the agricultural land affected by a planning application by ARC to work and restore land north of Didcot Power Station, at Sutton Courtenay in Oxfordshire.

1.2 The work was carried out by members of the Resource Planning Team in the Guildford Statutory Group of ADAS under commission from MAFF's Land Use Planning Unit.

1.3 The planning application relates to 264 hectares of land and affects areas that are undisturbed together with land this is currently being work or land that has been restored already.

1.4 The undisturbed land, sites A, B, E, H, G, R and S were surveyed by ADAS in March, 1993.
The restored land, sites C and N, were surveyed in April, 1993. The undisturbed sections were classified using MAFF's revised guidelines and criteria for grading the quality of agricultural land. These guidelines provide a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on its use for agriculture. In the case of the disturbed land the classification has been made using internal MAFF guidelines that have been specifically drawn up to deal with such land. These guidelines are currently in draft only, but are being trialled by ADAS in the field on behalf of MAFF, prior to amendment and publication.

1.5 The results of each site, together with the details of the grades, are given separately below in Section 3 for the disturbed land and section 4 for the undisturbed land.

1.6 The distribution of the grades and sub-grades on each site is shown on the attached ALC maps at a scale of 1:10,000. The information is accurate at this scale but any enlargement may be misleading.

1.7 A general description of the ALC grades and sub-grades is given in an appendix. The main classes are described in terms of the type of limitation that can occur, the typical cropping range and the expected level and consistency of yield.

2. Climate

2.1 The climatic criteria are considered first when classifying land as climate may be overriding in the sense that severe limitations will restrict land to low grades irrespective of favourable site or soil conditions.

2.2 The main parameters used in the assessment of an overall climatic limitation are average annual rainfall, as a measure of overall wetness, and accumulated temperature, as a measure of the relative warmth of a locality.

2.3 Detailed estimates of the prevailing climate for each site have been made by interpolation from a Met Office 5km gridpoint dataset. The details are given in Section 3.

2.4 The details show that there is no overall climatic limitation affecting any of the sites.

2.5 In addition, no local climatic factors are significant.

2.6 The details also show that the high moisture deficit values and the low field capacity levels are significant elements in the assessment of soil droughtiness and soil wetness, respectively.

3. Agricultural Land Classification : Disturbed Land

3.1 Site C

3.1.1 This 28 hectare block was restored in 1977. The site was backfilled with waste and covered with pulverised fuel ash (PFA). The planning consents requested 30 cm of topsoil and overburden to be spread over the PFA.

Table 1: Climatic Interpolation

Grid Reference	SU525930	SU518937	SU523935
Altitude (m)	50	50	50
Accumulated Temperature (°days)	1462	1462	1462
Average Annual Rainfall (mm)	581	586	585
Field Capacity (days)	122	123	123
Moisture Deficit, Wheat (mm)	116	116	116
Moisture Deficit, Potatoes (mm)	110	111	110
Overall Climatic Grade	1	1	1

3.1.2 The whole of the agricultural land (27.7 ha) of this restored site has been classified as Grade 4. No one limitation is common across the whole of the site. In general, three main limitations occur either individually or in combination: soil wetness (related to differential surface settlement), soil droughtiness (related to depth to a non-rootable medium, the PFA) and soil toxicity (related to depth to anaerobism caused by landfill gas).

3.1.3 Settlement of the soil profile has occurred over a significant proportion of the site. This has not been to such an extent as to create a microrelief limitation, but has produced areas that lie wet for long portions of the year. At the time of survey, late April, large areas were still under water and the associated wet vegetation that had colonised these areas suggests that they are frequently under water for prolonged periods. Adjacent areas showed signs of having been recently waterlogged and under water. An estimate of the degree of waterlogging of these sites places this land in Wetness Class V (ie. the soil profile is wet within 40 cm depth for 211-335 days in most years). This, combined with the range of topsoil textures (SCL and HCL) places the land in Grade 4.

3.1.4 Soil profiles are typically Heavy Clay Loam topsoils overlying a subsoil mix of Clay and PFA, on top of pure PFA. Both soil pits reveal that the roots do not penetrate the PFA. The assessment of available water in the profile cuts the droughtiness calculation off at the depth to which roots are observed. This is normally in the range 36-46 cm. Given the locally high moisture deficits, there is insufficient water available in the profile to classify the land better than Grade 4.

3.1.5 The PFA layer is also compacted and acts as a very slowly permeable layer. This is particularly evident in Pit 1 where water seeps into the pit above the compacted PFA and where roots form into mats at this depth. This restriction will cause severe waterlogging above for a significant part of the year and limits the land to Grade 4 on wetness (see soil pit descriptions for details of assessment).

3.1.6 Anaerobism is common in the soils, normally between 30-50 cm. This is believed to be at least partly due to landfill gas. Gas was noted as coming out of the surface in places, causing bubbling in some of the flooded hollows. Much of the poor and uneven crop response is believed to be due to the effect of gas anaerobism. Most subsoils were bluish grey and foul smelling. This in effect causes a chemical limitation and the current internal guidelines place land in Grade 4 when gas anaerobism occurs within 30-50 cm.

3.1.7 Part of the site has been planted to trees (0.6 ha).

3.2 Site N

3.2.1 The date of restoration of this 3.5 ha site was not known at the time to survey. The site was backfilled with PFA, and the planning consent stated that the overburden and topsoil should be returned and spread to a minimum depth of 30 cm.

3.2.2 The planning consent has clearly not been adhered to on this site as the land now consists of a minimal amount of topsoil overlying PFA. In places, no topsoil exists and across the whole site there is no subsoil.

3.2.3 The classification of the site therefore verges on Non-agricultural, although the PFA may have the potential to act as a soil-making material.

3.2.4 The current guidelines suggest that where the top 25 cm of disturbed land is virtually all subsoil (ie + 90% subsoil) the land can be graded no higher than Grade 4. Site N is believed to be a degree worse than this and is classified as Grade 5.

Table 2: Climatic Interpolation, Site N

Grid Reference	SU 512932
Altitude (M.AOD)	50
Accumulated Temperature (°days Jan-June)	1462
Average Annual Rainfall (mm)	584
Field Capacity Days	123
Moisture Deficit, wheat (mm)	116
Moisture Deficit, potatoes (mm)	111
Climatic Grade	1

4. Agricultural Land Classification : Undisturbed Land

4.1 Site A

4.1.1 This site, an area of approximately 11 hectares, is located south of Appleford Road. At the time of survey the land was in a ploughed state with no crop visible.

4.1.2 The whole of this site has been classified as subgrade 3A. The main limitation is soil wetness as evidenced by slowly permeable layers present in the upper subsoil.

Table 3: Distribution of grades and subgrades

Grade	Area (ha)
Grade 3A	10.5
Woodland	0.6
Total area of site	11.1

4.1.3 Estimates of climatic variables relevant to this site are given in the table below.

Table 4: Climatic Interpolation

Grid Reference	SU 515940
Altitude (M.AOD)	50
Accumulated Temperature (°days Jan-June)	1462
Average Annual Rainfall (mm)	589
Field Capacity Days	124
Moisture Deficit, wheat (mm)	116
Moisture Deficit, potatoes (mm)	111
Climatic Grade	1

4.1.4 The site lies at an altitude of approximately 50 metres AOD, and is flat. Gradient and altitude do not represent limiting factors to agricultural land quality at this locality.

4.1.5 The published British Geological Survey, Sheet 253, shows the site, to be mapped as Cretaceous Gault Clay overlain by Drift deposits of 1st Terrace Gravels. The published Soil Survey of England and Wales map, sheet 6, shows the site to be mapped as Sutton 1 Association - "well drained fine and coarse loamy soils locally calcareous and in places shallow over limestone gravel". (SSEW, 1983).

4.1.6 The entire area is classified as subgrade 3A. It comprises soils which are slowly permeable below the topsoil. Profiles typically comprise clay topsoil (sometimes showing signs of anaerobism) over variable textures of sandy clay, clay and heavy clay loam. Lower subsoils become lighter in texture typically comprising sandy clay loam, loamy medium sand, medium sandy loam and medium sand. Profiles are typically slowly permeable from 20-38 cm depth and have been assigned to wetness class III. However, due to profiles being calcareous throughout and the clay topsoils containing less than 50% clay fraction (confirmed by laboratory analysis), land is assigned

to subgrade 3A. Some better drained profiles were found within the site but were not mapped due to their limited number and extent.

4.2 Site B

4.2.1 This site, an area of 9 hectares, is located to the east of Site A separated by a track. At the time of survey the land was in a ploughed state with no crop visible.

4.2.2 The site has been classified as subgrade 3a and grade 2. The main limitations are soil wetness and soil droughtiness.

Table 5: Distribution of grades and subgrades

Grade	Area (ha)	% Total Agricultural Land
2	6	67
3A	3	33
Total area of site	9	100 (9 ha)

4.2.3 Estimates of climatic variables relevant to this site are given in the table below.

Table 6: Climatic Interpolation

Grid reference	SU 518939
Altitude (M.AOD)	50
Accumulated Temperature (°days Jan-June)	1462
Average Annual Rainfall (mm)	589
Field Capacity Days	123
Moisture Deficit, wheat (mm)	116
Moisture Deficit, potatoes (mm)	111
Climatic Grade	1

4.2.4 See paragraph 4.1.4 for the relief on the site.

4.2.5 See paragraph 4.1.5 for the geology and soil types on the site.

4.2.6 Grade 2

Very good quality land is found in the south of the site. Soil wetness is the main limitation. Profiles typically comprise topsoils of clay, heavy clay loam and sandy clay loam containing between 0-2% flints and soft limestones by volume. Upper subsoils comprise similar textures containing between 0-10% soft limestones. Lower subsoils typically consist of sandy clay loam or medium sand with a stone volume of between 0-60% soft limestones. Profiles are calcareous throughout and typically gleyed from between 25-70 cm, though not slowly permeable, with a wetness class of I and II. Soils also suffer from a slight droughtiness limitation due to a combination of profile stone and lighter textures in the lower subsoil. Consequently land is classified as grade 2.

4.2.7 Subgrade 3A

Good quality agricultural land is found in the north of the site. Topsoils and subsoils are similar to those of site A described in paragraph 4.1.6 which is immediately to the west. However, stone content in the lower subsoil is between 10-60% soft limestone. Profiles are typically calcareous and slowly permeable in the subsoil with slowly permeable layers from between 25-30 cm depth and have been assigned to wetness class III. Land is also limited by droughtiness in places due to very high stone content in the subsoil.

4.3 Site E

4.3.1 This site, an area of 4 hectares, is located west of Appleford railway crossing. At the time of survey the land was in cereal cropping.

4.3.2 The whole of this site has been classified as Grade 2. The limitation to this land is droughtiness imperfections due to clayey textures overlying stony sandy textures.

4.3.3 Estimates of climatic variables relevant to this site are given in the table below.

Table 7: Climatic Interpolation

Grid reference	SU 524928
Altitude (M.AOD)	50
Accumulated Temperature (°days Jan-June)	1462
Average Annual Rainfall (mm)	579
Field Capacity Days	122
Moisture Deficit, wheat (mm)	116
Moisture Deficit, potatoes (mm)	111
Climatic Grade	1

4.3.4 See paragraph 4.1.4 for the relief on the site.

4.3.5 See paragraph 4.1.5 for the geology and soils on the site.

4.3.6 Grade 2

Very good quality land covers the whole site area and typically comprises topsoils of sandy clay loam or clay containing 2% flints by volume. Upper subsoils comprise sandy clay loam or occasionally clay containing between 0-5% soft limestone. Lower subsoils consist of medium sandy loam, loamy medium sand and medium sand which occasionally gives way to gravel. Stone content is between 2-20% above the gravel. Profiles are calcareous throughout and gleyed in the upper subsoil from 24-29 cm, though not slowly permeable, with a wetness class of II. The main limitation is droughtiness as evidenced by light sandy textured soils containing significant volumes of stones in the lower subsoil. Consequently land suffers from slight droughtiness limitations and is classified as Grade 2.

Within this map unit more droughty soils were found but were not mapped due to their limited number and variable extent.

4.4 Site G

4.4.1 Site G, an area of approximately 15 hectares, is located south of site E. At the time of the survey the land was in cereals.

4.4.2 The majority of the site has been classified as subgrade 3B with a small area of subgrade 3A land to the south of the survey area. The main limitation to land quality is wetness/workability.

Table 8: Distribution of grades and subgrades

Grade	Area (ha)	% of Site
3A	1.5	9.5
3B	14.3	90.5
Total area of site	15.8	100%

4.4.3 Estimates of climatic variables relevant to the site are given in the table below.

Table 9: Climatic Interpolation

Grid reference	SU 522925
Altitude (M.AOD)	50
Accumulated Temperature (°days Jan-June)	1462
Average Annual Rainfall (mm)	576
Field Capacity Days	122
Moisture Deficit, wheat (mm)	116
Moisture Deficit, potatoes (mm)	111
Climatic Grade	1

4.4.4 See paragraph 4.1.4 for the relief on the site.

4.4.5 See paragraph 4.1.5 for the geology and soils on the site.

4.4.6 Subgrade 3A

A small area of land in the south of the site is classified as subgrade 3A. Profiles typically comprise topsoils of non calcareous clay containing between 1-5% flints. Lower subsoils consist of clay which is occasionally calcareous and contains 0-2% flints and soft limestone. Lower subsoils also comprise clay with 5% soft limestone although on occasion calcareous medium sandy loam or loamy medium sand was encountered. Stone content is between 20-30% limestones. Profiles are limited by wetness/workability. Where no evidence of wetness imperfections exist soils are assigned to Wetness Class I but limited to subgrade 3A due to heavy topsoil texture. Where there is a wetness problem as evidenced by gleying and slowly permeable layers in the lower subsoil profiles are assigned to Wetness Class II and classified as subgrade 3A.

Subgrade 3B

4.4.7 The majority of the site is classified as subgrade 3B. Profiles typically comprise topsoils of non calcareous clay with 1-2% flints by volume over calcareous upper subsoils of similar texture and stone content. Lower subsoils comprise calcareous clay, sandy clay loam or heavy clay loam containing 0-10% soft limestone passing into calcareous medium sandy loam containing 10-15% soft limestone. Profiles are limited by significant wetness imperfections as evidenced by gleying and slowly permeable layers from 26-38 cm depth. Soils are assigned to Wetness Class III and a wetness grade of 3B due to the heavy nature of the topsoil. Better drained profiles were encountered in this map unit but have not been mapped separately due to their limited number and extent.

4.5 Site H

4.5.1 This site, an area of approximately 5 hectares, adjoins site H to the west and was in cereals at the time of the survey.

4.5.2 The site area has been classified as subgrade 3A and subgrade 3B. The main limitation to land quality is wetness/workability.

Table 10: Distribution of grades and subgrades

	Areas (ha)	% total agricultural land
Grade 3A	0.6	12.5
3B	4.2	87.5
Total area of site	4.8	100%(4.8 ha)

4.5.3 Estimates of climatic variables relevant to the site are given in the table below.

Table 11: Climatic Interpolation

Grid reference	SU 519914
Altitude (M.AOD)	50
Accumulated Temperature (°days Jan-June)	1462
Average Annual Rainfall (mm)	568
Field Capacity Days	121
Moisture Deficit, wheat (mm)	117
Moisture Deficit, potatoes (mm)	112
Climatic Grade	1

4.5.4 See paragraph 4.1.4 for the relief on the site.

4.5.5 See paragraph 4.1.5 for the geology and soils on the site.

Subgrade 3A

4.5.6 A small area of land in the south of the site is classified as subgrade 3A. Soils typically comprise non-calcareous clay topsoils containing 5% flints by volume. Upper subsoils consist of calcareous clay with 10% flints and soft limestone over the same texture in the lower subsoil with 5% soft limestone by volume. Land suffers from a wetness limitation as evidenced by gleying and a slowly permeable layer in the lower subsoil. The soils are assigned to Wetness Class II with a wetness grade of 3A.

Subgrade 3B

4.5.7 The majority of the site is classified as subgrade 3B. Soils typically comprise topsoils of non calcareous clay or heavy clay loam containing 1-3% flints by volume over upper subsoils of clay or sandy clay, occasionally calcareous and containing 0-2% flints and soft limestone by volume. Lower subsoils comprise calcareous heavy clay loam or clay which contains 5-20% soft limestone. This occasionally passes into calcareous sandy clay loam or medium sandy loam containing 10-30% soft limestone fragments. Profiles are limited by wetness as evidenced by gleying and slowly permeable layers in the upper subsoil between 27-35 cm depth. Soils are assigned to Wetness Class III, and wetness grade 3B due to the heavy nature of topsoils. Occasionally better quality profiles were found within the map unit.

4.6 Site R

4.6.1 This small site, an area of 0.9 hectares, is situated north of Hartwright House and to the east of site G. At the time of survey the land was under permanent grass.

4.6.2 The whole site has been classified as subgrade 3B. The main limitation is soil wetness as evidenced by the occurrence of slowly permeable clay subsoil horizons below the topsoil.

4.6.3 Estimates of climatic variables relevant to this site are given in the table below.

Table 12: Climatic Interpolation

Grid reference	SU 525915
Altitude (M.AOD)	50
Accumulated Temperature (°days Jan-June)	1462
Average Annual Rainfall (mm)	567
Field Capacity Days	120
Moisture Deficit, wheat (mm)	116
Moisture Deficit, potatoes (mm)	111
Climatic Grade	1

4.6.4 See paragraph 4.1.4 for the relief on the site.

4.6.5 See paragraph 4.1.5 for the relief on the site.

4.6.6 The whole site area is classified as subgrade 3B. Soils typically comprise non-calcareous clay topsoils with 1% flints by volume over calcareous upper subsoils of clay with similar stone contents of flint and soft limestone. Lower subsoils become lighter in texture comprising calcareous sandy clay loam, loamy medium sand and medium sand containing 0-15% soft limestone. Soils are limited by wetness as evidenced by the occurrence of gleying and slowly permeable clay upper subsoils. The soils are placed in Wetness Class III, which combines with the Clay topsoils to produce a classification of Sub-grade 3B at the prevailing Field Capacity Day level.

4.7 Site S

4.7.1 This site is bounded to the east by the railway line to Didcot power station. It comprises an area of approximately 3 hectares and at the time of survey was in cereal cropping and grass.

4.7.2 The site has been classified as subgrade 3B and grade 2. The main limitations are wetness/workability and droughtiness.

Table 1: Distribution of grades and subgrades

	Areas (ha)	% total agricultural land
Grade 2	1.1	33
3B	2.2	67
Total area of site	3.3	100%(3.3 ha)

4.7.3 See paragraph 4.6.3 and Table 12 for the climatic information for the site.

4.7.4 See paragraph 4.1.4 for the relief on the site.

4.7.5 See paragraph 4.1.5 for the geology and soil type on the site.

Grade 2

4.7.6 Very good quality land is mapped in the north of the site. Profiles typically comprise topsoils of non-calcareous heavy clay loam containing 0-1% flint by volume. Upper subsoil consists of non-calcareous clay with similar stone content over a lower subsoil of sandy clay which passes into calcareous sandy clay loam and medium sandy loam containing 5% soft limestone. Profiles suffer from slight wetness imperfections as evidenced by gleying in the lower subsoil. A wetness class of I was assigned and a wetness/workability grade of 2 due to the heavy nature of the topsoil. A droughtiness limitation also limits land to grade 2 due to the presence of lighter textured soils at depth.

Subgrade 3B

4.7.7 Moderate quality land covers the majority of the site. Profiles typically comprise topsoils of non-calcareous clay containing 0-1% flint by volume over upper subsoils of clay with similar stone contents. Lower subsoils consist of calcareous sandy clay loam or heavy clay loam passing into calcareous medium sandy loam at depth. This horizon contains 0-5% soft limestone. Soils are limited by significant wetness imperfections as evidenced by the occurrence of gleying and slowly permeable layers from below 26 cm. The soils are placed in Wetness Class III and Sub-grade 3B.

5. Soil Resources: Undisturbed Sites

5.1 This section describes the soil resources available on each of the undisturbed sites. A series of topsoil and subsoil maps are attached which illustrate the distribution of the resources across the sites.

5.2 Soils were sampled to a maximum depth of 1.2 metres. In some cases the soil resource may extend beyond this depth.

5.3 Site A

5.3.1 Topsoil

5.3.1.1 Unit 1 : This topsoil unit comprises an average thickness of 26 cm of dark grey to dark greyish brown (05Y 4/1 to 10YR 4/2) clay which was found to be calcareous and contained 0-2% stone (flints).

5.3.1.2 Unit 2 : This topsoil unit comprises an average thickness of 25 cm of dark grey (10 YR 4/1) heavy clay loam which was found to be predominantly calcareous and to contain 1-2% stone (flints).

5.3.1.3 There is a total topsoil resource available of 28,340m^3.

5.3.2 Subsoil

One upper and lower subsoil was identified across the site. It comprises an average of 27 cm of clay or sandy clay over 67 cm of sandy clay loam, occasionally heavy clay loam. Upper subsoils are typically greyish brown (2.5Y 5/2) to light yellowish brown (2.5Y 6/3) with common mottles (10YR 5/6) and contain between 0-5% stone (flint). Lower subsoils are light grey to light brownish grey in colour (2.5Y 7/2 to 2.5Y 6/2) with common mottles (10YR 4/6 and 5/6) and contain between 0-30% stones (flint and soft limestone). These subsoils are mostly calcareous, gleyed throughout and slowly permeable in the upper subsoil. Occasionally calcareous stony medium sandy loam and loamy medium sand textures were encountered at depth. This subsoil unit has poor structure in the upper subsoil (clay), it being composed of weakly developed, firm, coarse subangular blocky peds. A full structural assessment of the lower subsoil was unable to be undertaken due to the variable stone content. It was therefore assumed to be of moderate structural condition. Pit 1 is typical of this unit.

An upper subsoil resource of 29,430m^3 is available, with a lower subsoil resource of 73,030^3, providing a total Subsoil resource of 102,460m^3.

5.4 Site B

Topsoil

5.4.1 Two topsoil units were identified, providing a total topsoil resource of 24,840m^3.

Unit 1

5.4.2 This topsoil unit comprises an average thickness of 27 cm of dark grey, dark greyish brown (2.5Y 4/0 4/1) clay which was found to be calcareous and contained between 0-2% stones (flints).

Unit 2

5.4.3 The second topsoil unit comprises an average thickness of 27 cm of dark greyish brown (10YR 4/2) and dark grey (2.5Y 4/0) sandy clay loam and, occasionally, heavy clay loam. These topsoils are calcareous and contain 1% stones (flint).

Subsoil

5.4.4 One upper and lower subsoil unit was identified for the site. It comprises an average of 52 cm of clay over 41 cm of sandy clay loam. Upper subsoils are typically light grey to pale yellow (2.5Y 7/2 and 2.5Y 7/3) with common mottles (10YR 5/6 6/6 and 7.5YR 5/6) and contain 0-10% stones (flint and soft limestone). Lower subsoils are similar in colour with common mottles. Stone content is between 0-10% soft limestones. These subsoils are calcareous, gleyed and slowly permeable in the upper subsoil. Occasionally, calcareous stony loamy medium sand and sandy loam was encountered at depth. An upper subsoil resource of 47,840m^3 is available with a lower subsoil resource of 37,720m^3.

5.4.5 This subsoil unit displayed the same characteristics as that of site A of which pit 1 is typical, see paragraph 5.3.2.

5.5 Site E

Topsoil

5.5.1 One unit of topsoil was identified providing a resource of 11,340m^3. It comprises an average of 27 cm of dark greyish brown (10YR 4/2) sandy clay loam which was calcareous and was found to contain 2% stone (flint).

Subsoil

5.5.2 One upper and lower subsoil unit was identified providing an upper subsoil resource of 19,740m^3 and a lower subsoil resource of 19,320^3. The unit comprises an average of 47 cm of sandy clay loam (occasionally clay or sandy clay) over 46 cm of medium sandy loam

and loamy sand passing to medium sand at depth. Upper subsoils are typically light yellowish brown (2.5Y 6/3 and 6/4) and light olive brown (2.5Y 5/2) with common mottles (7.5YR 5/6 and 5/8) and found to contain 0-5% soft limestone. Lower subsoils are light olive brown (2.5Y 5/4 and 5/6) and yellowish brown (10YR 5/6) in colour. There are occasional mottles (7.5YR 5/8). Stone content was found to be 0-20%, soft limestone. These subsoils are calcareous and gleyed in the upper subsoil but are not slowly permeable. In the lower subsoil soils have >0.5% biopores and are well rooted.

5.5.3 This subsoil unit of which pit 4 is an example, has moderate or good structural conditions in the upper subsoil, being composed of moderately and weakly developed friable and very friable, coarse subangular blocky peds. The lower subsoil (sandy textures) has good structure. It is composed of weakly developed, friable, coarse subangular blocky peds. The textures of medium sand often contain too much stone to ascertain structure but were assumed to be of moderate structural condition. In the case of pit 1 gravel was encountered at the base of the profile though this was not the case with other soil observations.

5.6 Site G

Topsoil

5.6.1 One topsoil unit was identified providing a resource of 45,360m^3. It comprises an average of 28 cm of dark greyish brown (10YR 4/2 + 2.5Y 4/2) clay which was found to be non-calcareous and to contain 1-5% stone (flint).

Subsoil

5.6.2 3 subsoil units were identified, both with upper and lower horizons, providing a total subsoil resource of 149,040m^3.

Unit 1

5.6.3 This unit covers the central area of the site and comprises an average of 54 cm of clay over 38 cm of a variable lower subsoil of medium clay loam, sandy clay loam and occasionally medium sandy loam and medium sand. The upper subsoil is typically light olive brown (2.5Y 5/3) with common mottles (7.5Y 5/6 + 10YR 5/6) predominantly calcareous and contains 0-10% stone (soft limestone). The lower subsoil is typically light grey in colour (2.5Y 7/1 7/2) with common mottles (10YR 5/6), calcareous and contains between 0-10% limestones. Profiles are typically gleyed with slowly permeable layers in the upper subsoil.

5.6.4 This subsoil unit (of which the upper subsoil of pit 1 is typical) has an upper subsoil of poor structural condition comprising well developed coarse angular blocky peds of firm consistence. Occasionally there was found to be a thin horizon of clay of moderate structural condition lying above the clay. This comprised moderately developed coarse angular blocky peds of firm consistence which showed no evidence of wetness. Lower subsoil structure is inferred from similar soils occurring in pit 1 site E. Weakly

developed coarse subangular blocky, very friable, peds give rise to a moderate structural condition.

There is an upper subsoil resource available of 35,100m^3 and a lower subsoil resource of 27,700m^3.

Unit 2

5.6.5 This subsoil unit is mapped in the south of the site and comprises an average of 92 cm of clay providing a total resource of 59,800m^3. This is typically light olive brown and light yellowish brown (2.5Y 5/3 and 2.5Y 6/3) with common mottles (10YR 5/6), calcareous at depth and contains 0-5% limestone. Profiles are gleyed and commonly slowly permeable in the upper subsoil.

5.6.6 This subsoil has poor structure, being composed of strongly developed coarse angular blocky peds of firm consistence with <0.5% biopores. At depth the structures are moderate. These comprise moderately developed coarse subangular blocky peds of firm consistence with <0.5% biopores. Pit 1 is typical of this subsoil unit.

Unit 3

5.6.7 This subsoil unit occurs along the northern and southern boundaries. It is similar to Unit 1, but is significantly stonier in the lower subsoil. The unit comprises 28 cm of clay over 64 cm of sandy clay loam, with medium sandy loam and loamy medium sand below. Upper subsoils are typically light yellowish brown (2.5Y 6/3 and 6/4) with common mottles (7.5Y 5/6 and 5/8), occasionally calcareous and with 1-5% soft limestone. Lower subsoils are typically light olive brown (2.5Y 5/4) and light yellowish brown (2.5Y 6/2 and 6/4), occasionally with common mottles (7.5YR 5/8 and 5/6). The stone content is between 10-30% soft limestone. Profiles are gleyed and typically slowly permeable in the upper subsoil.

5.6.8 The structural condition for the upper subsoil (clay) is similar to that described in paragraph 5.4.6. The lower subsoil is significantly stonier than elsewhere over the site and, due to this, the structural condition could not be assessed, but has been treated as of moderate condition.

There is an upper subsoil resource available of 8,960m^3 and a lower subsoil resource of 20,480m^3.

5.7 Site H

Topsoil

5.7.1 One topsoil unit was identified comprising 27 cm of dark greyish brown (7.5Y 4/2 and 10YR 4/2) non-calcareous clay (occasionally heavy clay loam). This was found to contain 1-5% stone (flint).

There is a topsoil resource of 13,500m^3.

Subsoil

5.7.2 Two subsoil units were identified providing a total subsoil resource of 46,140m^3.

Unit 1

5.7.3 This unit comprises 92 cm clay, occasionally with heavy clay loam and sandy clay loam. Colours are light olive brown (05Y 6/2) with common mottles (7.5YR 5/6 and 5/8). Profiles are occasionally calcareous with variable stone content, between 0-20% limestone but typically 0-5%. These subsoils show evidence of wetness imperfections, being gleyed and often slowly permeable.

5.7.4 This subsoil unit has poor structural condition, being composed of strongly developed, firm, coarse angular blocky peds with <0.5% biopores. Pit 1, is typical of this soil unit. Occasionally with lighter more stony horizons within the unit a moderately good structural condition was inferred from surrounding pit information.

There is a subsoil resource of 33,120m^3.

Unit 2

5.7.5 This unit located to the north of the site comprises 45 cm of sandy clay over 48 cm of sandy clay loam and medium sandy loam. The upper subsoil (sandy clay) is typically light olive brown in colour (2.5Y 5/3) with common mottles (7.5YR 5/6), occasionally calcareous and contains no stone. The lower subsoil is light grey and light olive brown in colour (2.5Y 7/2 and 2.5Y 5/4) with common mottles (7.5YR 5/6), is calcareous and contains 10-20% stone (soft limestone). These subsoils show evidence of wetness imperfections, being gleyed and slowly permeable in the upper subsoil.

5.7.6 The structural condition for the upper subsoil (sandy clay) is similar to that described in paragraph 5.4.6. The lower subsoil contains significant amounts of stone, making structural assessment impossible. It was therefore assumed to be of moderate condition.

5.7.7 There is an upper subsoil resource of 6,300m^3 and a lower subsoil resource of 6,720m^3.

5.8 Site R

Topsoil

5.8.1 There is one topsoil unit comprising 29 cm of dark greyish brown (10YR 4/2) clay which was found to be non-calcareous and contained 1% stone (flint). This provides a total resource of 2,900m^3.

Subsoil

5.8.2 One subsoil unit was identified providing a total subsoil resource of 9,100m^3. This comprises 46 cm of clay occasionally with sandy clay loam lenses over 45 cm of medium sand and loamy medium sand. Upper subsoils (clay) are typically light yellowish brown (2.5Y 6/3

and 6/4) with common mottles (7.5YR 5/6), are non-calcareous and contain similar stone content to the topsoil. Lower subsoils are typically calcareous, strong brown (7.5YR 5/6) without mottles and contain between 0-15% stone (soft limestone). Profiles are gleyed and slowly permeable in the upper subsoil.

5.8.3 The upper subsoil (clay) has poor structural condition which is similar to the upper subsoil of Pit 1, Site G. The horizon exhibits strongly developed firm coarse angular blocky peds. The lower subsoil has moderate structural condition and is similar to the lower subsoil of Pit 1 site E. The medium sand and loamy medium sand layers have a moderate structure.

5.8.4 There is an upper subsoil resource of 4,600m^3 and a lower subsoil resource of 4,500m^3.

5.9 Site S

Topsoil

5.9.1 Two topsoil units were identified over the site providing a total resource of 8,980m^3.

Unit 1

5.9.2 This unit comprises 27 cm of dark greyish brown (10YR 4/2) non-calcareous heavy clay loam which was found to be stoneless. This provides a resource of 3,780m^3.

Unit 2

5.9.3 This unit comprises 26 cm of dark greyish brown (10YR 4/2) and very dark greyish brown (2.5Y 3/2) non-calcareous clay which was found to be stoneless. This provides a resource of 5,200m^3.

Subsoil

5.9.4 Two subsoil units were identified providing a total subsoil resource of 31,620m^3.

Unit 1

5.9.5 This unit occurs in the north of the site and comprises 36 cm of clay (occasionally sandy clay) overlying 57 cm of sandy clay loam and medium sandy loam. The upper subsoil is typically greyish brown and light olive brown (2.5Y 5/2 and 5/3) with common mottles (10YR 5/6 and 4/6) and occasionally calcareous. The lower subsoil is typically light brownish grey and light yellowish brown (2.5Y 6/2 and 6/3) with common mottles (10YR 5/6). Stone content is 5% (soft limestone) and the soils are calcareous. Profiles are gleyed and slowly permeable in the upper subsoil.

5.9.6 Inference from soil pit 1 site G where similar soils occur suggests the upper subsoil has a poor structural condition. This comprises weakly developed, firm, coarse subangular blocky peds. The lower

subsoil has a moderately good structural condition, comprising moderately developed, friable, coarse subangular blocky structure. This is suggested from evidence in Pit 1, site B.

The unit provides an upper subsoil resource of 9,360m^3 and a lower subsoil resource of 14,820m^3.

Unit 2

5.9.7 This unit occurs to the south of the site and comprises 28 cm of clay over 65 cm of heavy clay loam becoming sandy at depth. The upper subsoil is typically greyish brown and light olive brown (2.5Y 5/2 and 5/3) with common mottles (10YR 4/6). The lower subsoil is similar in colour as well as light brownish grey and light yellowish brown (2.5Y 6/2 and 6.3) with common mottles (10YR 5/6). These subsoils are not stony and are non-calcareous. They show evidence of wetness imperfection in the upper subsoil in the occurrence of gleying and slowly permeable layers.

5.9.8 Inference from Pit 1 site A suggests the upper subsoil has a poor structural condition. This comprises weakly developed coarse subangular blocky peds of moderately good structural condition comprising strongly developed coarse subangular blocky peds of firm consistence.

5.9.9 The unit provides an upper subsoil resource of 2,240m^3 and a lower subsoil resource of 5,200m^3.