

## LAND CLASSIFICATION NOTES FOR MANOR FARM, LITTLE CARLTON, NEWARK

### Introduction

This 73 ha site lies about 3.5 kms north west of Newark immediately west of the small village of Little Carlton. The A616 forms the southern boundary and a minor road (Bathley Lane) forms the eastern boundary. The northern and western boundaries are composed of field boundaries and the whole site is set within open countryside. The site is generally level with some moderately steep slopes on the western edge. Most of the level area is at 12 metres OD rising to 30 metres at the highest point in the south west corner. The site receives an average annual rainfall of 570 mm with about half falling between April and September. The accumulated temperature is 1424° which indicates that the site is climatically grade 1. The inter-action of summer temperatures and rainfall produces moisture deficits of 117 mm for wheat and 112 mm for potatoes. The median number of FCD is 112.

The site is underlain by 3 contrasting parent materials. Reddish Triassic Keuper Marl outcrops down the western boundary producing heavy clay rich soils of the Worcester soil series. The remainder of the site lies on the old flood plain of the River Trent and has broad bands of relatively stoneless river alluvium with intervening areas of river gravels. The areas of alluvium and gravel found in this survey do not exactly accord with that shown on the 1 inch to mile Geological Survey map (sheet number 113 - Ollerton). The alluvium gives rise to soils of a variable texture with medium clay loam or medium sandy silt loam topsoils often with clay subsoils. The river gravels have produced soils with essentially sandy textures overlying gravel at various depths though many profiles did not encounter gravel within 120 cm of the surface.

Most of the soils on the level flood plain are affected by a high ground water table and exhibit signs of relict gleying which bears little resemblance to the current drainage status of the land. Some of the heavier soils suffer from a surface wetness limitation and

clay tile drains were observed at several locations between 60 and 75 cm depth.

The main limitations to the agricultural use of the land is broadly split between light textured gravelly soils with a drought limitation and the heavier clay rich soils which suffer from a soil wetness limitation.

At the time of survey most of the site was under arable cultivation with wheat, potatoes and sugar beet being grown. There is one small field of permanent pasture in the north east corner overlying some of the heavier clay alluvial soils. The site is regularly irrigated from a naturally filled reservoir just north of the application site with potatoes, sugar beet and fodder beet the main recipients of irrigation though winter wheat is also occasionally irrigated.

The site was surveyed during the summer and autumn of 1991 when 79 auger borings were made on a 100 m x 100 m grid using a 120 cm Dutch soil auger.

#### Agricultural Land Classification

Grade 2 land occupies 37.3 ha and accounts for 51.2% of the site. The grade 2 land occurs extensively throughout the centre of the site corresponding with the relatively stone free alluvium and the less drought prone river gravel soils. A second much smaller area of grade 2 land occurs as a narrow strip along the eastern boundary, adjoining Bathley Lane, also derived from river gravels.

The soils on grade 2 land derived from alluvium are generally much less stony than the other grade 2 soils and stony layers occur at much greater depth. Topsoils are quite variable being predominantly medium sandy loam or medium clay loam though sandy clay loam and medium sandy silt loam also occur. The subsoil is equally variable with clay or heavy clay loam sometimes occurring within 50-70 cm of the surface particularly near the Keuper Marl in the west. Further east the soils pass into the river gravels though gravelly subsoils are rarely encountered. Most of the soils exhibit signs of gleying

though much of this is relict and many of the alluvial soils fall into wetness class II or more rarely wetness class III. Most of the soils suffer from a minor soil wetness limitation though in places wetness and droughtiness may be equally limiting.

The grade II land overlying river gravels has less variable topsoil textures being predominantly medium sandy loam but the subsoils can be quite variable. Gravel is rarely encountered within auger depth, only 2 borings recording gravel and both at or below 90 cm, though in places the subsoil does become increasingly stony and sandy with depth. In all of these soils the main limitation to the agricultural use of the land is droughtiness despite the fact that most of the soils exhibit signs of waterlogging. Few of the soils possess slowly permeable layers and most are wetness class I or II.

Within the area mapped as grade II there are isolated areas of grade I land and equally small areas of sub-grade 3a land which are too small to map. Included within the grade 2 land are soils which are inherently sub-grade 3a but with irrigation are mapped as grade 2.

Sub-grade 3a land occupies 20.8 ha and accounts for 28.5% of the site. The soils are found in 2 main locations and are derived from 3 main soil types:

1. On the inter-grade of the Keuper Marl and the alluvium;
2. On the moderately stony sandy soils derived from the river gravels and
3. The intermediate textured alluvium.

The former soils occur as a narrow and intermittent skirt adjoining the much heavier sub-grade 3b land in the west and typically have a medium clay loam topsoil overlying clay subsoils within

40-55 cm. The soils are relatively stone free and are generally wetness class III. Soil wetness being the main limitation to the agricultural use of this land.

The second area of sub-grade 3a land corresponds to the stonier and/or sandier river gravel soils and is confined to an area in the northern central portion of the site. These soils have medium sandy loam topsoils passing into sand or loamy sand subsoils within 50 to 70 cm and are moderately to very stony. Drought is the main limitation to the agricultural use of these soils. Some of the soils are inherently sub-grade 3b but with irrigation are mapped as grade 3a.

The third area of sub-grade 3a land occurs through the middle of the site where alluvial soils are of intermediate texture and where the alluvium merges with the river gravels to the east. The soils typically have a medium clay loam, sandy clay loam or medium sandy silt loam topsoils which usually passes into heavy clay loam or clay subsoils. This area of fairly complex soils is generally limited in its agricultural use by soil wetness due to the moderately heavy topsoil textures and the proximity of clay to the surface making most of the soils wetness class III.

Sub-grade 3b land occupies 14.8 ha and accounts for 20.3% of the site. This land also occurs in 3 distinct locations derived from the 3 main parent materials:

1. The Keuper Marl in the west;
2. The heavier alluvium in the centre and east of the site and
3. The very sandy and more gravelly soils.

The Keuper Marl outcrops as a series of low ridges along the western boundary of the site. The soils are typically red in colour and have heavy clay loam or clay topsoils and are virtually slowly permeable to the surface. Soil wetness is the main limitation to

the agricultural use of this land though locally moderately steep slopes of 8° are equally limiting.

The heavier alluvium occurs in 2 places, the largest and most continuous being in the north east corner and supports permanent pasture. The other area of heavy alluvium comprises 2 small areas in the centre of the site. The soils typically have a heavy clay loam or more usually clay topsoil with clay in the subsoil within 30-40 cm. In places there are peaty loam lenses particularly in the alluvium found to the north east of the site.

The third and smallest area of sub-grade 3b soils occurs where the river terrace gravels are particularly sandy and/or stony. This is most notable in the north of the site in the northern part of field no 7800. The soils have a medium sandy loam topsoil usually passing into loamy sand within 40-50 cm. The soils are the stoniest on the site with total topsoil stone content of approximately 30% becoming more stony with depth. Drought is the main limitation to the agricultural use of this land. These very sandy stony soils are inherently grade 4 in quality but with irrigation they are graded 3b and at the time of survey they were growing fodder beet.

#### SUMMARY TABLE

ALC Grade	Area (ha)	% of application site
Grade 2	37.3	51.2
Sub grade 3a	20.8	28.5
Sub-grade 3b	14.8	20.3

## SOIL RESOURCES REPORT FOR MANOR FARM, LITTLE CARLTON, NEWARK

Four soil units have been identified for the site and they are described below.

Soil Unit I covers 15.4 ha and accounts for 21.1% of the site. These are the heaviest soils found on the site and occur principally along the western edge, coincidental with the Keuper Marl and in the north east where they are derived from riverine alluvium. Smaller, discontinuous pockets of these heavier soils, also derived from alluvium, occur through the middle of the site. The soils typically have a stoneless clay or more rarely heavy clay loam topsoil which quickly passes into a stoneless clay subsoil. On the west edge this clay subsoil passes into relatively unweathered Keuper Marl parent material within 75 cm. The alluvial derived soils have similar soil textures and are also stoneless, the main differences being the sporadic occurrence of peat lenses within the subsoil. These are unlikely to be extensive and do not warrant separate mapping.

The other main differences between these 2 areas is that the Keuper Marl is above the ground water table whereas the alluvial soils will be wet for much of the year below about 1 m from the surface. This will have clear implications for the stripping, storage and reinstatement of these soils.

Soil Unit II covers 10.6 ha and occupies 14.5% of the site. These soils occur as a single broad band running through the middle of the site and are derived from the alluvium. The soils have lighter textured topsoils and upper subsoils than unit I but generally pass into heavy clay loam or clay subsoil within about 35-50 cm of the surface. The soils have very slightly stony topsoils and upper subsoils rarely exceeding 5%, passing into a stoneless clay subsoil.

Two representative pits are described below:

### Soil Pit 1

0-35 cm 10 YR 43 medium sandy silt loam. Moderately developed coarse sub-angular blocky structure with some evidence of compaction between 25 and 35 cm. Common roots mainly on ped faces.

35-57 cm 5 YR 53 medium sandy silt loam. Common 2.5 YR 48 mottles. Moderately developed coarse prismatic breaking to coarse sub-angular blocky structure. Friable consistence, more than 0.5% biopores. Common roots along ped faces and throughout the soil matrix.

57-65 cm 7.5 YR 63 medium clay loam, common 7.5 YR 56 mottles. Moderately developed coarse sub-angular blocky structures. Firm consistence, more than 0.5% biopores.

65 cm + 7.5 YR 63 clay. Common 7.5 YR 58 mottles. Soil profile gleyed at 35 cm, SPL at 65 cm, wetness class 2.

### Soil Pit 2

0-30 cm 10 YR 4/3 medium sandy silt loam. Well developed medium and coarse sub-angular blocky structures. 1% rounded quartzite pebbles. Common roots. Some topsoil mixing with inclusions of 5 YR 4/4 and 5/6 clay with 2.5 YR 46 mottles confined to the clay inclusions.

30-53 cm 5 YR 46 and 56 medium clay loam common 5 YR 53 mottles. Moderately developed coarse sub-angular blocky structure. Firm consistence, less than 0.5% biopores though locally more than 0.5%. Common roots. Less than 1% rounded quartzite pebbles.

53-75 cm 5 YR 44 medium clay loam matrix colours with 5 YR 43 ped face colours. No mottles observed (due to reddish soil). Moderately developed coarse prismatic structure breaking to coarse sub-angular blocky and coarse angular blocky. Firm consistence, less than 0.5% biopores. Common roots. Depth to gleying 30 cm, depth to SPL 53 cm, wetness class III.

Soil Unit III covers 11.4 ha and accounts for 15.6% of the site. The soils occur as a broad band running down the western part of the site sandwiched between the Keuper Marl of unit I and the intermediate textures of unit II. The soils of unit III are similar in many respects to those found in unit II, the main difference being the presence of a medium sandy loam or medium sandy silt loam topsoil and the more variable depth to the clay subsoil. In about half of the borings, within the unit, clay or heavy clay loam is encountered within 60 cm of the surface whilst in the other half the clay was not found within 100 cm.

Two representative pits are described below for this soil unit:

#### Soil Pit 3

0-30 cm 7.5 YR 42 medium sandy silt loam. Few 2.5 YR 46 mottles. Moderately developed medium and coarse sub-angular blocky structure. Less than 2% medium rounded quartzite pebbles. Many roots.

30-53 cm 5 YR 44 and 56 medium clay loam with occasional sandy clay loam lenses. Common 5 YR 58 mottles with few manganese concretions. Moderately developed medium prismatic structure readily breaking down to moderately developed medium sub-angular blocky structure. Firm consistence, more than 0.5% biopores. Common fine fibrous roots.

53-120 cm 5 YR 56 clay with 5 YR 46 ped face colours. Common 2.5 YR 62 and 48 mottles. Strongly developed coarse angular blocky structures, firm consistence, less than 0.5% biopores. Depth to gleying 30 cm, depth to SPL 53 cm, wetness class III.

#### Soil Pit 4

0-28 cm 10 YR 43 medium sandy silt loam. 1% small rounded quartzite pebbles. Many roots.



28-60 cm 7.5 YR 54 medium clay loam. Common 7.5 YR 56 mottles. Moderately developed coarse sub-angular blocky structure, friable consistence, more than 1% biopores. Common roots.

60-75 cm 7.5 YR 53 medium sandy silt loam. Common 7.5 YR 56 mottles. Moderately developed coarse prismatic structure. Friable consistence, 1% biopores. Common roots.

75-120 cm 7.5 YR 53 medium sandy loam (hard and difficult to auger). Many 7.5 YR 62 and 56 mottles. Moderately developed coarse sub-angular blocky structure, friable consistence, 1% biopores. Few roots.

Soil Unit IV covers 35.6 ha and occupies 48.8% of the site. This unit occupies most of the centre of the site and a smaller strip along Bathley Lane on the north eastern boundary. The soils in this unit are all derived from the river gravels and are typically much sandier and stonier than the other soils. The topsoil texture is invariably medium sandy loam though topsoil stone content varies from less than 5% to more than 30%. The most stony topsoils are found in field no 7800, north of the Manor Farm buildings. The subsoils within the unit are quite variable as is the depth of the soil overlying the gravel. Within these essentially sandy soils are isolated lenses of heavier, sandy clay loam or even more rarely heavy clay loam material especially where the soil unit adjoins alluvial soils. Stone content usually increases with depth and in places it is difficult to accurately assess the soil/gravel boundary due to the gradual increase in stone content. In many places gravel was not encountered within 120 cm though subsoils with approximately 30-40% of stone content are quite widespread within the unit.

Three representative soil pits are described below for this soil unit.

#### Soil Pit 5

0-38 cm 10 YR 32 medium sandy loam. Moderately developed medium sub-angular blocky structures. 3% rounded quartzite and angular flint pebbles. Common roots.

38-51 cm 7.5 YR 42 and 52 sandy clay loam with 7.5 YR 52 gleyed ped faces. Moderately developed medium and coarse sub-angular blocky structures. Friable consistence, more than 0.5% biopores. 3% quartzite and flint pebbles. Few roots.

51-68 cm 7.5 YR 53 medium clay loam with occasional sandy clay loam lenses. Common 7.5 YR 46 mottles. Moderately developed medium and coarse sub-angular blocky structure. Friable consistence more than 0.5% biopores. 50% quartzite and flint pebbles.

68-120 cm 7.5 YR 43 and 63 medium sand. Common 7.5 YR 46 mottles. Weakly developed medium sub-angular blocky structure readily breaking to moderately developed medium and coarse granular structure. Very friable consistence, porosity greater than 0.5% biopores. 25% quartzite and flint pebbles.

#### Soil Pit 6

0-34 cm 10 YR 32 medium sandy loam. Moderately developed coarse sub-angular blocky structure. Less than 5% quartzite and flint pebbles. Many roots.

34-66 cm 5 YR 64 and 54 medium clay loam with gritty sandy clay loam lenses. Many 5 YR 58 mottles. Some iron staining and cemented soil particles. Strongly developed coarse angular blocky structures. Very firm consistence, more than 0.5% biopores. 54% rounded quartzite and angular flint pebbles. Common roots.

66-90 cm 5 YR 44 medium clay loam. Many 5 YR 68 and 58 mottles. Moderately developed coarse and medium sub-angular blocky structure. Firm/very firm consistence. Less than 0.5% biopores. 44% quartzite and flint pebbles. Few roots.

90-110 cm 2.5 YR 34 loamy medium sand with some medium sand lenses. Soil moist. Difficult to assess mottle colour due to red matrix colours. Moderately developed medium angular blocky structure readily breaking to medium/coarse granular structure. Firm/very firm consistence. Less than 0.5% biopores. Stone content estimated 25% quartzite and flint pebbles.

110-120 cm 5 YR 54 medium sand, soil moist. Moderately developed medium granular structure readily breaking to single grain. Friable consistence. 22% quartzite and flint pebbles.

Note field drains observed at 65 cm depth 9 metres apart.

#### Soil Pit 7

0-39 cm 10 YR 42 medium sandy loam. 15% quartzite and flint pebbles. Many roots.

39-54 cm 10 YR 43 medium sandy loam with some gravel layers. Few 7.5 YR 58 mottles. Moderately developed medium angular blocky structure. Very friable consistence, more than 0.5% biopores. 10% quartzite and flint pebbles. Many roots.

54-87 cm 7.5 YR 54 medium sandy loam. Common 5 YR 58 mottles. Moderately developed medium angular blocky structure. Very friable consistence, less than 0.5% biopores. 15% quartzite and flint pebbles. Common roots.

87-97 cm 7.5 YR 54 and 56 medium sand with loamy medium sand patches. Common 5 YR 58 mottles. Moderately well developed medium granular structure readily breaking into single grain. 45% quartzite and flint pebbles. Few roots.

97-120 cm 7.5 YR 54 and 56 medium sand becoming 10 YR 64 and 58 with depth. Common 5 YR 58 mottles. 20% quartzite and flint pebbles.