REPORT ON ST. DONAT'S FARM, BURGHILL, HEREFORD

Introduction

This 48.2 hectare site lies at the northern end of St. Donat's farm, about 6 km north of Hereford and 1 km west of Moreton-on-Lugg. The site is part of a larger flat out-wash plain which slopes very gently from an altitude of about 70 m in the west to 60 m in the east. This out-wash plain is sandwiched between higher ground to the north and south. The northern site boundary follows a stream which flows eastwards to join the River Lugg. The site is surrounded by open countryside on all sides, most of which is under intensive agricultural and horticultural production.

The area receives an annual average rainfall of about 720 mm and has a mean accumulated temperature above $0^{o}C$, January to June (ATO) of 1445. Rainfall is relatively evenly distributed throughout the year though there is a slightly drier period from February to June. The balance between summer rainfall and evapotranspiration creates a moisture deficit of 103 mm for wheat and 94 mm for potatoes. There is a slight, but measurable trend towards warmer and drier conditions moving from west to east away from the high ground of Wormsley Hill (239 m) towards the Lugg valley at 50 m. There are no overall nor local climate restrictions to the agricultural use of this land.

The soils found on site are developed in reddish silty glacial drift and out wash deposits derived from adjoining Devonian rocks. The soils are relatively uniform in texture and colour across the site, the main differences being; (1) the depth of the stoneless silty soil over the gravel which underlies the site and, (2) slight variations in topsoil texture. In the west the gravel was not found within 100 cms of the surface though the eastern half encountered gravel within 100 cms and over sizeable areas gravel occurs within 50 cms of the surface (see soil resource map). The soils overlying the sand and gravel are stoneless, reddish brown medium silty clay loams or sandy silt loams with areas of heavy silty clay loam, particularly in the north and south east of the site. Despite the frequent presence of heavy silty clay loam subsoils the soils are generally well structured and porous and consequently well drained falling into soil wetness class I and II (see Appendix 1). The ground water table at the time of the survey was well below 100 cms from the surface.

The main limitations to the agricultural use of the land are two-fold reflecting the depth of soil overlying the gravel and the presence of heavy silty clay loam topsoils. Where the gravel is near the surface there will be less available water to sustain plant growth in dry seasons and the heavy silty clay loam topsoils are more difficult to traffic with agricultural machinery in spring and autumn without damaging the soil structure. These limitations are generally minor and this is reflected in the overall high quality of the site.

The site was visited on 2 occasions in January and February 1989 when a detailed soil survey was undertaken using 1 m Dutch soil augers. Soil borings were made on a 100 m grid and augered to 100 cms unless prevented from reaching this depth by the gravel. The average density of auger borings is 1 per hectare. In addition 6 soil pits were dug to obtain a better assessment of subsoil structure and to collect samples for analysis. The survey has been extended slightly beyond the estimated limit of gravel provided by the mineral company to give complete coverage of the fields in the west of the site.

At the time of the survey the land was growing mainly winter wheat with 2 hopyards and one ploughed field.

Agricultural Land Classification

Grade 1 Land occupies 17.9 hectares and accounts for 37.1% of the site. The soils are deep, stoneless, uniformly reddish brown sandy silt loam or medium silty clay loam in texture with occasionally heavy silty clay loam layers in the lower subsoil. In almost all cases sand and gravel was not encountered within the top 100 cms, even when sand and gravel was located within augered depth it was generally below 85 cms. These reddish soils are well structured and porous throughout with roots and worms able to penetrate to considerable depths indicating the ease with which water can move through the soil. In the rare cases where gleying is identified it is usually below 40 cms in the profile and because of the absence of slowly permeable layers the soils are generally wetness class I.

This is excellent quality agricultural land capable of growing a wide range of agricultural and horticultural crops.

Grade 2 Land occupies 25.1 hectares and accounts for 52.1% of the site. This land occurs in 3 areas where 3 types of limitation operate, namely; (1) a restricted soil depth over gravel, (2) heavy silty clay loam topsoils and (3) more prolonged subsoil waterlogging. Of these 3 the first 2 are by far the most important affecting over 90% of the Grade 2 land.

The main area of Grade 2 land towards the east of the site and the smaller area at the western part of the site are mapped as Grade 2 because the gravel is within about 60 cms of the surface thereby reducing the soil available water, and making the soils more drought prone than the deeper soils found on the Grade 1 land. Much of this land is still high in Grade 2 and in places approaches Grade 1 in quality (eg borings 16 and 45). Most of these soils are naturally well drained and belong in wetness class I. The Grade 2 land in the northern most fields is also wetness class I and has deep, uniformly coloured, stoneless, well structured silty clay loam textures. However the topsoil texture is heavy silty clay loam which makes these soils more difficult to cultivate in wetter periods and more prone to structural damage. Similar soils, where the gravel is frequently below 75 cms depth, occur along the extreme southern edge of the site from borings 43 to 46.

A small area in the western most hopyard is mapped as Grade 2 where the soils suffer from longer subsoil waterlogging and belong in soil wetness class II (borings 27 and 52 and soil pit 6). All of the remaining Grade 2 land is generally wetness class I.

This is very good quality agricultural land with minor limitations, capable of growing a wide range of agricultural and horticultural crops.

Grade 3a Land occupies 2.6 hectares and accounts for 5.4% of the site. This land occurs in 2 small areas in the north and east of the site. The soils are similar to those found on the Grade 1 and 2 land having uniformly coloured, reddish brown stoneless soil overlying gravel at depths ranging from 65 cms to in excess of 100 cms. The soils are generally wetness class II and have heavy silty clay loam topsoils. It is this combination of wetness class II and heavy topsoil which places the soils in this grade. The main limitation to the agricultural use of the land is the difficulty of trafficking the land in wet periods without damaging the soil structure.

This is good quality agricultural land capable of growing a range of agricultural crops and some of the less demanding horticultural crops.

Grade 3b Land occupies 1.2 hectares and accounts for 2.5% of the site. This small piece of land lies at the far east end of the site adjoining the plantation woodland. The soils are the heaviest located on the site having heavy silty clay loam or silty clay topsoils with silty clay subsoil below about 25 cms. Gravel is encountered at various depths from 36 cms to 80 cms. The soils are generally wetness class III or IV depending on the depth at which the silty clay layer occurs. There may be locally less heavy soils (eg pit 1a) within the area but they are too small to map.

The main limitation to the agricultural use of this land is the soil wetness allied to heavy topsoil textures which restricts the period during which satisfactory cultivations and other farming operations can be undertaken without damaging soil structure. This is moderate quality agricultural land capable of producing moderate yields of a narrow range of crops.

Non-agricultural Land occupies 1.4 hectares and accounts for 2.9% of the site. This land consists primarily of the plantation woodland at the eastern end of the site plus the small gravel pit located west of the centre of the site.

Summary

The whole site is shown as Grade 2 on the Provisional 1 inch to 1 mile ALC map (sheet 142) and this more detailed survey confirms that over half of the site is in fact Grade 2. In addition 37% is of Grade 1 quality making virtually 90% of the site in Grades 1 and 2. There are smaller areas of Grade 3a and 3b land which together total less than 8% of the site.

ALC Grade	Area (ha)	% of Total Area
1	17.9	37.1
2	25.1	52.1
3a	2.6	5.4
3b	1.2	2.5
Non-agricultural	1.4	2.9

SOIL RESOURCES REPORT

Introduction

The soil resource map identifies the main soil types on the site defined primarily in terms of soil texture and soil depth over the gravel layer. More particular attention is given to topsoil textures since these have a greater bearing on the workability of the site, ie the ease with which mechanical farm operations (ploughing, harvesting etc) can be satisfactorily carried out without damaging the soil structure. Many of the subsoils exhibit a fair degree of uniformity in colour and range of soil textures, being mainly medium and heavy silty clay loams with occasional lighter areas of sandy silt loam.

The depth to gravel identified in this report refers to the depth at which gravel and stone fragments appear in the soil profile and may not correspond to the deposits which are economically extractable from the site.

Four soil units have been identified on the site. The units are based on information collected from the soil auger boring records and details soil pit profile descriptions, the locations of which are shown on map 3.

Soil Unit I covers 11.6 hectares and accounts for 24.1% of the site. This unit is identified in 2 separate locations, the main block being in the north of the site with a smaller, linear area mapped to the east. The soils typically have a heavy silty clay loam topsoil and gravel is not encountered within about 90 cms of the surface.

The typical soil profile has a heavy silty clay loam topsoil to about 30 cms overlying an upper subsoil which varies from medium silty clay loam (borings 1, 4a, 7 and pit 1a) to heavy silty clay loam (borings 2, 3 and 12) and silty clay (borings 39, 40 and 41). Silty clay is usually encountered in the lower subsoil below about 60 cms. This silty clay lower subsoil then merges with the underlying gravel layer by about 90 cms.

Soil Pit Profile Descriptions

Pit 1

0-30 cms 5 YR 5/4 silty clay. Well developed medium to coarse angular blocky structure. Generally less than 0.1% porosity though locally more porous. Few ochreous mottles and pale colours on ped faces, common roots.

30-81 cms 5 YR 4/4 heavy silty clay loam; weakly to moderately well developed coarse prismatic structure; common distinct ochreous mottles and manganese concretions; porosity 0.1% to 0.5%; occasional worm channels to 70 cms.

81-105+ cms 5 YR 5/3 stony clay; granular soil structure; abundant manganese concretions; estimated 35-40% stone content including mainly hard sandstones and silt-stones with occasional softer sandstones.

Wetness class IV.

Pit 1a

0-28 cms 5 YR 5/4 medium silty clay loam; well developed medium and coarse angular blocky structure.

28-68 cms 5 YR 4/4 medium silty clay loam; well developed coarse angular blocky structure; common distinct ochreous mottles and few manganese concretions; 0.1 to 0.5% porosity, more porous in places.

68-100 cms 5 YR 5/3; silty clay, coarse prismatic structure breaking down to granular structure; common distinct ochreous mottles; greater than 0.5% porosity which decreases below 79 cms; estimated 35-40% stones.

Wetness class II.

Soil pits 1 and 1a are not typical of the dominant conditions but indicate the range of soils that may be found within the unit. There are few areas in the unit with a medium silty clay loam topsoil as indicated in pit 1a and equally there are few locations with a clay topsoil as found in pit 1. The topsoil pH varies from 5.2 to 6 and topsoil organic matter levels vary from 3.1% to 4.9% which is well above average for arable soils. This unit has the heaviest, least easy to work soils on site. Soil wetness class ranges from IV on the heaviest soils near boring 39 and pit 1, to wetness class I for borings 3 to 8. A comparison with the ALC map show that all the Grade 3 land, and none of the Grade 1 land occurs within the unit although the least heavy soils which are wetness class II and wetness class I are ALC Grade 2.

Soil Unit 1A

A slight modification of soil unit I is mapped where similarly textured soils overlie gravel within 100 cms and this is shown as unit IA. This unit is similar in all other respects to soil unit I.

Soil Pit Profile Description

Pit 3

0-30 cms 5 YR 4/4 heavy silty clay loam.

30-63 cms 5 YR 4/4 medium silty clay loam; well developed coarse sub-angular blocky structure; more than 0.5% porosity; common manganese concretions below 40 cms; less than 5% small stones.

63-75 cms 5 YR 4/4 silty clay; well developed coarse angular blocky structure; more than 0.5% porosity; common worm channels and roots to 75 cms.

75 cms+ 5 YR 4/4 silty clay with abundant gravel and stone fragments.

Wetness class I.

In many respects pit 3 profile description is more typical of the whole of soil unit I than that given for soil pits 1 and 1A.

The topsoil pH values range from 5.8 to 6.5 and topsoil organic matter values range from 4.2% to 5.7% which is very high for arable soils.

Soil Unit II covers 14.4 hectares and accounts for 29.9% of the site. This unit covers the western 3 fields including the 2 hopyards and the field of oilseed rape in between. The soils are characterised by having a relatively light (sandy silt loam) topsoil with gravel generally not found within the top 100 cms. There are some minor exceptions to this rule in that borings 22, 26a, 50 and 52 and pit 5 have a medium silty clay loam topsoil and borings 25,

27 and pit 6 have gravel within 100 cms. With these notable exceptions, most of which occur in the western most hopyard, the soils are relatively uniform throughout the unit.

Soil Pit Profile Description

A fairly typical soil profile is described for pit 2 with minor variants described for pits 5 and 6.

Pit 2

0-32 cms 5 YR 4/4 sandy silt loam (compacted between 10 and 30 cms).

32-46 cms 5 YR 4/4 sandy silt loam; moderately well developed medium to coarse sub-angular blocky structure; greater than 0.5% porosity.

46-110 cms 5 YR 4.5/3 medium clay loam; well developed coarse angular blocky structure; greater than 0.5% porosity; pale ped faces and locally common manganese concretions; porosity greater than 0.5%; common roots to 100 cms and worm channels to 90 cms.

110 cms+ silty clay with gravel and stones.

Wetness class I.

Pit 5

0-28 cms 5 YR 4/4 medium silty clay loam.

28-60 cms 5 YR 4/4 heavy silty clay loam; moderately to well developed coarse sub-angular blocky structure; greater than 0.5% porosity.

60-80 cms+ 5 YR 4/4 silty clay; moderately to well developed coarse sub-angular blocky structure; greater than 0.5% porosity; few manganese concretions and pale ped faces; common roots and worm channels to 80 cms; stones observed below 70 cms increasing with depth.

Wetness class I.

Pit 6

0-30 cms 5 YR 4/4 sandy silt loam.

30-50 cms 5 YR 4/4 medium silty clay loam; well developed coarse sub-angular blocky structure; greater than 0.5% porosity; common manganese concretions and pale ped faces.

50-70 cms+ 5 YR 4/4 medium silty clay loam to heavy silty clay loam below 60 cms; well developed coarse sub-angular blocky structure; greater than 0.5% porosity; common manganese and pale colours; common roots and worm channels.

Wetness class II.

Topsoil pH varies little between 5.5 and 6.6. Topsoil organic matter content varies from 1.6% to 3.9%, representing a typical range of values under arable soils. There is little evidence of gleying throughout these soils with some manganese concretions and occasional pale ped faces in the subsoil. The soil

is porous with common roots and worm channels throughout and most of the soils belong to wetness class I. In some places, eg pit 6, the soil is less well drained and belongs to soil wetness class II. The presence of the heavy silty clay loam in the subsoil in pit 6 is not uncommon, in fact it is found in about half of the borings in this unit but it is generally below 60 cms.

These are generally the deepest soils on site with the most easily worked topsoils. With the exception of the slightly shallower and heavier soils in the western most hopyard they are all wetness class I and correspond to ALC Grade 1.

Soil Unit III occupies 9.4 hectares and accounts for 19.5% of the site. This unit occurs across the centre of the site and is characterised by topsoils of medium silty clay loam texture and have between 50 and 100 cms of soil overlying the gravel layer. Borings 18, 19 and 48 have a slightly greater depth of soil over the gravel, this reflecting their proximity to soil unit II where the gravel is generally at greater depths. One other slight variation is the presence of lighter (sandy silt loam) topsoils in borings 10 and 16.

Apart from the slightly heavier topsoil textures these soils are very similar to those described for soil unit II. No soil pits were excavated within this unit though the general pattern of subsoil textures and structures can be inferred from the descriptions given for soil unit II. The topsoil pH values are typically about 6.5 and topsoil organic matter values about 3.6%, being well within the range described for soil unit II.

The gravel lies progressively nearer the surface towards the east and this is clearly illustrated in this unit as gravel is below 100 cms adjacent to soil unit II and is at approximately 50 cms adjacent to soil unit IV. The presence of the gravel layer undoubtably aids soil drainage and most of the unit is wetness class I. The deep soils correspond to ALC Grade 1 land whilst those overlying gravel at shallower depths are ALC Grade 2.

Soil Unit IV occupies 8.9 hectares and accounts for 18.4% of the site. This unit occurs to the east end of the site as an island surrounded by other soil types. It is characterised by relatively light (sandy silt loam) topsoil textures and very shallow depth over the gravel, typically less than 50 cms and in places as little as 35 cms (eg pit 4). A soil pit was excavated at boring 36 (soil pit 4) and although the topsoil texture is slightly heavier than the norm the remaining profile description is considered typical.

Soil Pit Profile Description

Pit 4

0-35 cms 5 YR 4/4 medium silty clay loam.

35-80 cms 5 YR 3/4 silty clay; breaking down to granular structure; no gleying and no SPL; stone content measured at 21%, very small, medium and occasionally large stones; common roots to 80 cms.

Wetness class I.

No soil samples were taken to analyse topsoil pH or topsoil organic matter levels. It is anticipated however that the values for these 2 parameters is likely to lie within the range exhibited by other soils on the site. The soils are generally well drained, are in wetness class I and have a fairly easily worked topsoil. The presence of the gravel within 50 cms of the surface indicates these to be the most drought prone soils on site. Most of the land within this unit is ALC Grade 2 though some of it approaches Grade 1 in quality.

Summary Table - Soil Resources

Soil Unit	Area (ha)	% Total Area
I	11.6	24.1
Ia	3.9	8.1
II	14.4	29.9
III	9.4	19.5
IV	8.9	18.4

FINAL

SOIL NOTES FOR ST DONAT'S FARM, BURGHILL, HEREFORD ON 18 JANUARY, 7 AND 8 FEBRUARY 1989

1 45 cm reddish brown heavy silty clay loam over 40 cm reddish brown medium silty clay loam over at least 15 cm reddish brown heavy silty clay loam. A few manganese concretions below 35 cm (gleyed layer), no SPL within 80 cm, wetness class II. Winter wheat. 3a

2 25 cm reddish brown heavy silty clay loam over 15 cm reddish brown heavy silty clay loam over 12 cm heavy silty clay loam/silty clay over at least 40 cm red brown clay over gravel layer, no further penetration possible. A few faint manganese concretions below 40 cm. No sign of gleying. Wetness class II/I. Level site, winter wheat. 3a

3 40 cm reddish brown heavy silty clay loam over 25 cm reddish brown heavy silty clay loam over at least 25 cm red brown silty clay over gravel layer, no further penetration possible. Numerous small gravel fragments (mainly small micaceous sandstone and siltstone fragments) below 45 cm. No mottles or manganese concretions seen. No gleying identified within 70 cm. No SPL, wetness class I. Numerous small stones (estimated at 25%) below 45 cm. Level, winter wheat. 2

4 40 cm reddish brown heavy silty clay loam over 50 cm reddish brown silty clay/heavy silty clay loam with occasional lighter lenses. No further penetration possible due to gravel layer. A few faint manganese concretions below 50 cm. Small gravel fragments composed mainly of micaceous sandstone, below 73 cm. No signs of gleying though manganese concretions present 50 cm. Wetness class I. Level, winter wheat. 2

4a 40 cm of 5YR4/4 heavy silty clay loam over 30 cm reddish brown medium silty clay loam/sandy silt loam over at least 30 cm red brown clay with gravel. Manganese concretions below 35 cm (not gleyed), no SPL within 80 cm, wetness class I. Level site, winter wheat. 2

5 60 cm reddish brown heavy silty clay loam with occasional lighter lenses over at least 40 cm reddish brown silty clay/heavy silty clay loam. A few faint manganese concretions below 28 cm with distinct manganese concretions common below 60 cm. Gleying at 60 cm, wetness class I. Numerous small gravel fragments below 75 cm. Level site, winter wheat formerly potatoes. 2

6 25 cm reddish brown medium silty clay loam over 35 cm reddish brown heavy silty clay loam/medium silty clay loam over 25 cm reddish brown sandy silt loam over 10 cm heavy silty clay loam over at least 10 cm reddish brown clay. A few faint manganese concretions below 50 cm though absent from 60-85 cm and common below 85 cm. No mottles or other signs of gleying observed. Numerous small gravel fragments below 80 cm. SPL at 85 cm? . Level site, winter wheat previously potatoes. 1

6a 50 cm reddish brown heavy silty clay loam over at least 35 cm reddish brown medium silty clay loam. A few manganese concretions below 35 cm becoming worse below 50 cm (not gleyed), no SPL observed, gleyed below 65 cm, wetness class I. Level site, winter wheat. 2

Note: Small soil pit excavated at the site to reveal no gleying within 40 cm, well developed coarse subangular blocky structure below 30 cm with very porous peds and abundant worm channels to at least 60 cm. Wetness class I. 2

7 35 cm reddish brown heavy silty clay loam (same as profile 8) over at least 65 cm reddish brown medium/heavy silty clay loam. A few manganese concretions below 35 cm but no gleying observed throughout the profile, no SPL observed, wetness class I. Level site, winter wheat. 2

8 45 cm of 5YR4/4 heavy silty clay loam over 40 cm paler brown medium silty clay loam over 10 cm reddish brown heavy silty clay loam over at least 5 cm reddish brown silty clay. Numerous gravel fragments below 85 cm. A few manganese concretions below 42 cm with paler colours and more manganese concretions below 50 cm. Gleyed layer below 40 cm, no SPL within 80 cm, wetness class I. Level, winter wheat. 2

9 0-30 cm red medium silty clay loam. 30-50 cm slightly paler red medium silty clay loam. 50-80 cm red heavy silty clay loam. 80-90 cm+ red silty clay with some weathering gravel and stones. Very little perceptible change down the profile. No gleying, no SPL, wetness class I. Level. Winter cereal. 1

10 0-30 cm red medium sandy silt loam/silty clay loam. 30-65 cm red medium silty clay loam, becoming heavy below 50 cm. Few to common ochreous mottles and manganese (gleyed). 65-80 cm+ red silty clay with gravel and stones. Wetness class II. Level. Winter cereal. 1/2

11 0-40 cm red heavy silty clay loam, becoming heavier with depth. 40-75 cm red heavy silty clay loam to silty clay, few ochreous mottles, manganese and paler colours. 75-80 cm+ red silty clay and gravel with gravel, gleyed. gleyed below 40 cms, wetness class I. Level. Winter cereal. 2

12 0-25 cm red heavy silty clay loam. 25-60 cm red silty clay, gleyed below 45 cm. Very hard to auger - stone below 60 cm. Similar to profile at pit 1, SPL at 35 cm. Wetness class III. Level. Cereal. 3b

13 0-27 cm red sandy silt loam. 27-35 cm red medium silty clay loam. 35-40 cm red silty clay, few ochreous mottles and pale colours. 40-60 cm red silty clay with weathering gravel and stones. 2

14 0-27 cm red sandy silt loam/silty clay loam. 27-40 cm red silty clay loam. 40-55 cm red silty clay with gravel and stones. Level. Winter cereal. 2

15 0-30 cm red silt loam/medium silty clay loam. 30-45 cm red medium silty clay loam. 45-60 cm red silty clay with gravel and stones. Very little change in the profile to 45 cm. Level. Winter cereal. 1/2

16 0-30 cm red sandy silt loam/medium silty clay loam. 30-40 cm red mediumsilty clay loam. 40-60 cm red heavy silty clay loam. Very gradual change in texture to 60 cm, profile uniform to this depth. 60-75 cm red silty clay with gravel and stones. Level. Winter cereal. 2/1

17 0-30 cm red medium silty clay loam. 30-60 cm red medium/heavy silty clay loam. 60-75 cm red heavy silty clay loam, some gravel, increasing below 75 cm. No gleying, no SPL. Wetness class I. Level. Cereal. 1

18 0-50 cm red medium silty clay loam, slightly heavier below 28 cm. 50-90 cm+ red heavy silty clay loam, few manganese concretions. Very uniform profile. Wetness Class I. Level. Winter cereal. 1

19 0-35 cm red medium silty clay loam/sandy silt loam. 35-50 cm paler red sandy silt loam. 50-100 cm red medium silty clay loam, becoming heavier with depth. No gleying, no SPL, uniform profile. Level. Winter cereal. 1

20 42 cm 5 YR4/4 sandy silt loam over at least 58 cm of 5 YR4/4 medium silty clay loam/sandy silt loam. A few manganese concretions below 65 cm, no SPL observed, wetness class I. Level site, hopyard. 1

21 50 cm reddish brown sandy silt loam over at least 50 cm reddish brown medium clay loam. A few faint manganese concretions and greyish colours below 50 cm not becoming worse with depth. Gleying begins at 50 cm, SPL not observed. Level site, hop field. Wetness class I. 1

21a 30 cm 5 YR4/4 sandy silt loam/medium silty clay loam over 20 cm 5 YR4/4 sandy silt loam over at least 50 cm reddish brown medium clay loam. Common manganese concretions and paler colours below 46 cm gleyed. No SPL observed, wetness class I. Level site, hopyard. 1

22 35 cm reddish brown medium silty clay loam/silt loam becoming heavier with depth over 30 cm reddish brown medium silty clay loam over at least 35 cm red brown silty clay/clay. Numerous small gravel fragments below 75 cm. A few faint manganese concretions below 60 cm. No SPL, no gleying observed (manganese concretions below 60 cm). Wetness class I. Level site, oilseed rape. 1

23 35 cm bright reddish brown silt loam over 55 cm reddish brown silt loam/medium silty clay loam becoming heavier with depth over at least 5 cm of gravel, no further penetration possible. No mottles or stones observed. No mottles or signs of gleying observed. No SPL observed. Wetness class I. level site, oilseed rape. 1

24 35 cm brown silt loam/medium silty clay loam over 25 cm brown silt loam over at least 40 cm brown medium silty clay loam, no further penetration possible due to gravel layer. Not gleyed, no SPL wetness class I. Level site at foot of very gentle slope, hops. 1

24a 20 cm of 5YR4/4 medium silty clay loam over 10 cm reddish brown sandy silt loam over 15 cm reddish brown medium silty clay loam over 25 cm reddish brown heavy silty clay loam over at least 30 cm red brown silty clay with gravel fragments. Distinct manganese concretions and pale colours below 38 cm (gleyed layer), no SPL observed, wetness class II. Very gentle slope, hopyard. 2

25 35 cm brown sandy silt loam over 25 cm brown silty clay loam/silt loam (5YR3/4 below 45 cm) no further penetration possible due to gravel layer. No stones or signs of gleying observed. No SPL observed. Wetness class I. Site on level ground in hop field. 2

26 40 cm reddish brown silt loam over 20 cm reddish brown medium silty clay loam becoming heavier with depth over at least 40 cm clay/heavy silty clay loam. A few faint rusty mottles below 70 cm. Gleying below 70 cm, wetness class I. Site on level ground in hop field. 1

26a 60 cm reddish brown medium silty clay loam over 40 cm reddish brown silty clay with gravel fragments below 85 cm. No gleying seen throughout though some manganese concretions below 60 cm. No SPL observed, wetness class I. Site at top of very gentle slop, hopyard. 1

27 40 cm brown medium clay loam over 10 cm brown clay over at least 20 cm brown clay with abundant gravel fragments, no further penetration possible due to gravel layer. No gleying observed. No SPL. Wetness class I. Site at top of gentle slope in hop field. 2

28 35 cm brown silt loam over 15 cm brown medium silty clay loam/silt loam over at least 50 cm reddish brown clay. Numerous manganese concretions (at least 20%) below 50 cm. Gleying below 50 cm. Wetness class I. Level site, oilseed rape. 1

29 30 cm 5YR4/4 sandy silt loam over 12 cm reddish brown sandy silt loam over 28 cm reddish brown medium silty clay loam becoming heavier with depth over 10 cm reddish brown heavy silty clay loam over at least 20 cm reddish brown silty clay. Distinct common manganese concretions below 70 cm. No SPL observed, wetness class I. Level site less than 2% stones, oilseed rape. 1

30 30 cm 5YR4/4 sandy silt loam over 25 cm reddish brown sandy silt loam over 25 cm medium silty clay loam becoming heavier with depth over at least 20 cm heavy silty clay loam. A few small manganese concretions below 35 cm (not gleyed). No SPL observed, wetness class I. Level, less than 2% surface stones, oilseed rape. 1

31 45-70 cm reddish brown (5YR4/4) medium silty clay loam/sandy silt loam over 30 cm reddish brown medium silty clay loam. A few manganese concretions below 90 cm, soil slightly compacted between 30 and 45 cm. No gleying observed, no SPL observed, wetness class I. Level, hopyard. 1

32 42 cm reddish brown (5YR4/4) sandy silt loam over at least 58 cm reddish brown medium silty clay loam/sandy silt loam. A few small manganese concretions below 70 cm, no gleying observed, no SPL observed, wetness class I. Level, ploughed field. 1

33 45 cm reddish brown (5YR4/4) medium silty clay loam over 30 cm reddish brown medium silty clay loam/sandy silt loam over at least 15 cm reddish brown heavy clay loam with gravel fragments. No further penetration possible due to the gravel layer. Paler colours observed below 72 cm, wetness class I. Level, less than 2% surface stones. Winter wheat. 1

34 35 cm reddish brown (5YR4/4) heavy silty clay loam over 10 cm reddish brown heavy silty clay loam/silty clay over 30 cm sandy silt loam over 15 cm reddish brown heavy silty clay loam/silty clay. Numerous manganese concretions and paler colours below 35 cm. Gleyed within 40 cm, no SPL observed, wetness class II. Level, winter wheat. 3a

35 20 cm reddish brown medium silty clay loam/sandy silt loam over 25 cm reddish brown sandy silt loam over 15 cm reddish brown (10YR4/4) clay with abundant gravel fragments. No further penetration possible due to gravel. No mottling or gleying observed, no SPL observed. Wetness class I. Level, winter wheat. 2

Note: Adjacent boring encountered clay with gravel fragments at 45 cm.

36 40 cm reddish brown medium silty clay loam over 35 cm reddish brown clay with gravel fragments over 10 cm heavy silty clay loam with gravel, no further penetration possible due to the gravel. Small gravel fragments below 30 cm. No mottling or gleying observed, no SPL observed. Wetness class I. Level site, about 5% surface stone, winter wheat. 2

37 20 cm reddish brown sandy silt loam/medium silty clay loam over 26 cm reddish brown sandy silt loam over 14 cm clay with gravel fragments, no further penetration possible due to gravel layer.

37a 45 cm reddish brown sandy silt loam/medium silty clay loam becoming lighter with depth over 15 cm medium silty clay loam over 40 cm dark reddish brown clay/heavy silty clay loam with abundant gravel fragments. No mottles seen or evidence of gleying, no SPL observed, wetness class I. Gravel fragments composed primarily of soft sandstones with occasional harder pebbles. Level, winter wheat. 1/2

38 36 cm reddish brown medium silty clay loam/sandy silt loam over at least 39 cm reddish brown clay with gravel fragments. No further penetration possible due to gravel layer. No gleying or mottles observed. No SPL observed, wetness class I. Less than 2% surface stones, level, winter wheat formerly potatoes. 2

39 20 cm of 5YR4/3 heavy silty clay loam/silty clay over 16 cm of 5YR4/3 silty clay over at least 64 cm reddish brown silty clay plus gravel. Abundant manganese concretions below 36 cm no evidence of gleying. SPL at 46 cm? (See Pit 1 profile description). Wetness class III. Level, less than 5% surface stones. Winter wheat formerly potatoes. 3b

40 0-27 cm dark greyish red medium silty clay loam, common distinct ochreous mottles. 27-45 cm greyish red silty clay, common mottles, 45-65 cm yellow silty clay, common mottles. 65-75 cm red silty clay with gravel stones. Woodland. NA

41 0-25 cm red heavy silty clay loam. 25-35 cm red silty clay. 35-65 cm pale red medium silty clay loam, common ochreous mottles and manganese. Gravel and stone at 65 cm. Gleyed below 35 cm. Wetness class II. Level, Winter cereal. 3a

42 0-30 cm red medium silty clay loam. 30-45 cm paler red sandy silt loam, common manganese concretions. 45-60 cm pale red silty clay loam, common manganese. 60-70 cm pale red heavier silty clay loam. 70 cm+ red silty clay with gravel and stones. Gleyed below 30 cm. Wetness class II. Level. Winter cereal. 2

43 0-27 cm red silty clay loam. 27-45 cm red heavy silty clay loam, common manganese below 35 cm. 45-75 cm red silty clay with gravel and stone. Gleyed below 35 cm, wetness class II. Level. Cereal. 2

44 0-27 cm red heavy silty clay loam. 27-40 cm red heavy silty clay loam. 40-50 cm red heavy silty clay loam with gravel and stone. Level. Winter cereal. 2

45 0-30 cm red heavy silty clay loam. 30-60 cm red heavy silty clay loam/silty clay, common manganese below 40 cm. 60-70 cm red silty clay with gravel and stones. Level. Winter cereal. 2

46 0-30 cm red heavy silty clay loam. 30-45 cm red silty clay loam, common manganese and pale colours below 40 cm. 45-75 cm red silty clay. 75 cm+ silty clay with gravel and stone. Gleyed below 40 cm. Wetness class I. Level. Cereal. 2

46a 55 cm of 5YR4/4 heavy silty clay loam over at least 5 cm paler brown medium silty clay loam. Distinct manganese concretions below 35 cm, gleyed below 40 cm, no SPL, wetness class I. Level, winter wheat. 2

47 28 cm 5YR4/4 medium silty clay loam over 47 cm reddish brown heavy silty clay loam over at least 5 cm reddish brown silty clay with abundant gravel fragments. Manganese concretions with paler colours below 35 cm (gleyed layer), no SPL observed, wetness class II. Level, less than 2% surface stones. Winter wheat. 2

48 0-35 cm red medium silty clay loam. 35-90 cm+ paler red medium silty clay loam, becoming slightly heavier with depth, few manganese concretions below 50 cm. Very uniform profile. No gleying, wetness class I. 1

49 45 cm of 5YR4/4 sandy silt loam over 40 cm reddish brown medium silty clay loam/sandy silt loam over 7 cm reddish brown heavy silty clay loam over clay with gravel layer, no further penetration possible. A few faint manganese concretions below 40 cm, no SPL within 80 cm, wetness class I. Level, less than 2% stones throughout, hopyard. 1

50 0-30 cm red medium silty clay loam. 30-60 cm red sandy silt loam. 60-100 cm red medium silty clay loam, slightly heavier with depth. Very uniform profile. No gleying. Wetness class I. Level. Oilseed rape. 1

51 35 cm of 5YR4/4 sandy silt loam over 15 cm reddish brown medium silty clay loam over 25 cm reddish brown sandy silt loam with alternating layers of medium silty clay loam over at least 25 cm reddish brown heavy silty clay loam. A few manganese concretions below 35 cm, not gleyed, no SPL observed, wetness class I. Site at top of a gentle slope, oilseed rape. 1

52 0-27 cm red medium silty clay loam. 27-80 cm red heavy silty clay. Common ochreous mottles and manganese. 80-90 cm+ pale red silty clay, manganese. Gleyed from 27 cm, no SPL. Wetness class II. Level. Oilseed rape. 2

Pit 1

Ditch excavated along edge of wood.

0-30 cm	Silty clay; 5YR5/4; well developed medium to coarse angular blocky structure; porosity variable less than 0.1% generally but much more porous in places; few ochreous mottles and pale colours on ped faces; common roots.
30-81 cm	Heavy silty clay loam; 5YR4/4; weakly to moderately well developed coarse prismatic structure; common distinct ochreous mottles and manganese; porosity 0.1-0.5%.
81-105 cm+	Clay (stony layer); 5YR5/3; breaking down to a granular structure; abundant manganese concretions; estimated 35-40% stone including soft sandstones and harder siltstone and quartzite; occasional worm channels to 70 cm.
	SPL and gleyed from 30 cm; wetness class IV; Grade 3b.

Pit 1a

About 2 m along trench from pit 1.

0-28 cm	Medium silty clay loam; 5YR5/4; well developed medium and coarse angular blocky structure.
28-68 cm	Medium silty clay loam; 5YR4/4; well developed coarse subangular blocky structure; common distinct ochreous mottles and few manganese concretions; 0.1-0.5% porosity but more porous in places.
68-100 cm	Silty clay; 5YR5/3; breaking down to a granular structure; common distinct ochreous mottles; >0.5% porosity but decreasing below 79 cm; 35-40% stones as above.
	No SPL; gleyed below 28 cm; wetness class II; Grade 2.

Pit 2

Land use - Hops

0-32 cm	Sandy silt loam; 5YR4/4; compacted 10-30 cm.
32-46 cm	Sandy silt loam; 5YR4/4; moderately well developed medium to coarse subangular blocky structure; >0.5% porosity.
46-110 cm	Medium clay loam; 5YR4.5/3; well developed coarse angular blocky structure; >0.5% porosity; pale ped faces and locally common manganese concretions; slightly heavier below 70 cm, porosity >0.5%. Common roots to 100 cm and worm channels to 90 cm.
110 cm+	Silty clay with gravel and stones.
	No SPL; gleyed below 46 cm; wetness class I; Grade 1.

Pit 3

Land use - winter cereals.

0-30 cm — Heavy silty clay loam; 5YR4/4.

30-63 cm — Medium silty clay loam; 5YR4/4; well developed coarse subangular blocky structure; >0.5% porosity; common manganese concretions below 40 cm; <5% small stones.

63-75 cm — Silty clay; 5YR 4/4; well developed coarse angular blocky; >0.5% porosity; common worm channels and roots to 75 cm.

75 cm+ — Silty clay with gravel and stone.

No SPL; gleyed below 40 cm; wetness class 1; Grade 2.

Pit 4

Land use - winter cereal.

0-35 cm — Medium silty clay loam; 5YR4/4.

35-75 cm+ — Silty clay; 5YR3/4; breaking down to granular structure; no gleying and no SPL; stone content (measured 21%) very small, medium and medium size stones, few large stones, soft sandstones, siltstones, occasional quartzite; common roots to 80 cm.

Grade 2

Pit 5

Land use - oilseed rape.

0-28 cm — Medium silty clay loam; 5YR4/4.

28-60 cm — Heavy silty clay loam; 5YR4/4; moderately to well developed coarse subangular blocky; >0.5% porosity.

60-80 cm+ — Silty clay; 5YR4/4; moderately to well developed coarse subangular blocky; >0.5% porosity; few manganese concretions and pale ped faces; common roots and worm channels to 80 cm; stones from 70 cm increasing with depth.

No SPL; no gleying; wetness class 1; Grade 1.

Pit 6

Land use - hops.

0-30 cm — Sandy silt loam; 5YR4/4.

30-50 cm — Medium silty clay loam; 5YR4/4; well developed coarse subangular blocky; >0.5% porosity; common manganese concretions and pale ped faces.

50-70 cm+ Medium silty clay loam to heavy silty clay loam below 60 cm; 5YR4/4; well developed coarse angular blocky; >0.5% porosity; common manganese and pale colours; common roots and worm channels.

No SPL; gleyed below 30 cm; wetness class II; Grade 1/2