

STATEMENT OF PHYSICAL CHARACTERISTICS

WARREN FARM, CHALFONT ST. PETER, BUCKINGHAMSHIRE

1. BACKGROUND

1.1 This site of approximately 12 ha was surveyed on 15 January 1992 in connection with proposals for gravel extraction under the 1981 Minerals Act. The site is situated to the immediate east of Chalfont St. Peter in Buckinghamshire, to the south of Warren Farm, between Denham Lane and the M25 motorway. It is bounded to the south by a mature hedgeline, to the west by fencing and to the north by existing mineral working. The eastern boundary is not marked by any obvious physical feature.

1.2 The land was inspected using 1.2m Dutch soil augers with samples being taken at 100m intervals across the site on an approximate grid basis. Two soil inspection pits were examined in order to obtain more detailed soil information.

Land Use

1.3 At the time of survey most of the site had been sown with winter cereals. A small strip of land along the southern boundary was under the previous seasons cereal stubble.

2. PHYSICAL FACTORS AFFECTING LAND QUALITY

Relief

2.1 The site lies at an altitude between 80 and 90m AOD, the majority being at the higher elevation. Land falls gently towards the south-east across much of the site. Slopes are generally steeper towards the south-eastern corner of the site in association with two dry valleys which run north-south and north-west, south-east and converge towards the south-eastern boundary. Nowhere on the site does gradient or altitude represent a limitation to agricultural land quality.

Climate

2.2 Estimates of climatic variables were obtained by interpolation from a 5 km grid point dataset, (Met. Office, 1989) for a representative location in the survey area. Variables are adjusted for altitude.

Climatic Variables

Grid Reference	TQ 50181905	TQ 50161906
Altitude (m, AOD)	80	90
Average Annual Rainfall (mm)	703	708
Accumulated Temperature, (° days, Jan - June)	1418	1406
Field Capacity Days	148	148
Moisture Deficit, wheat (mm)	104	102
Moisture Deficit, potatoes (mm)	96	94

- 2.3 The important parameters in assessing an overall climate limitation are average annual rainfall (which provides a measure of overall wetness), and accumulated temperature (which provides a measure of the relative warmth of a locality). At this locality average annual rainfall is relatively low in a national context, whilst accumulated temperature is high. This equates to a relatively warm, dry climatic regime relative to the national situation, but does not represent a significant limitation to land quality. The site is not expected to be frost-prone or exposed.

Geology and Soils

- 2.4 Geological Survey of England and Wales (1948) Sheet 255, Beaconsfield, shows the majority of the site to be underlain by a drift deposit of Glacial Gravels. This has been deposited over Upper Chalk which is shown to outcrop across the south-easterly parts of the site, where the drift is absent.
- 2.5 Soil Survey of England and Wales (1983), Sheet 6, Soils of South-East England, indicates that the soils on the site have been mapped as belonging to the Marlow association. These soils are described as 'typical paleo-argillic brown earths with flinty loamy upper layers over reddish and red mottled clayey soils', (SSEW, 1984). The clayey subsoils tend to be moderately permeable but the presence of a chalk substratum ensures that in most districts these soils are only occasionally waterlogged, (wetness class II or III).
- 2.6 Detailed field examination of the site indicates the presence of two broad soil groups.
- 2.7 The first group of soils are found in association with the lower lying parts of the site, principally towards the south-eastern boundary but also as localised units towards the north-west in conjunction with a couple of small hollows.

Topsoils comprise non-calcareous silt loams or medium silty clay loams which may be slightly to moderately stony having between 2 and 25% v/v angular flints > 2 cm. Topsoils overlie slightly heavier textures in the upper subsoil, such as medium or heavy silty clay loam and tend to pass to silty clay in the lower subsoil below about 45 - 60 cm. Mottling and gleying in the subsoil at variable depths greater than 30 cm provides evidence of imperfect drainage. This is caused by the slow permeability of silty clay horizons from about 55 cm and within 80 cm. Subsoils are variably stony but generally become less stony with depth. The silty clay horizons are typically not stony.

- 2.8 The second soil group occurs across the higher land on the site in association with Glacial Gravel deposits. Profiles are moderately to very stony throughout and typically become impenetrable, (to soil auger), at relatively shallow depth (ie, between 40 and 50 cm).

Profiles typically comprise non-calcareous sandy loam or sandy silt loam topsoils which contain between 20% and 40% v/v flints > 2 cm, (23% to 45% v/v flints in total). These rest over similar textures or silt loam in the subsoil which are very stony having between 35 and

50% v/v flints in total. Between about 40 and 50 cm, subsoils become extremely stony, (ie, 70% v/v flints), and are typically impenetrable to soil auger. Profiles are well drained and are thus assigned to wetness class I.

3. AGRICULTURAL LAND CLASSIFICATION

3.1 The grading of this site is determined by interactions between soil and climatic factors, namely soil wetness and droughtiness. In addition, topsoil stone contents act to influence the land quality across the higher parts of the site. ALC grades 3a and 3b have been mapped. The area and extent is given below:-

	<u>Area (ha)</u>	<u>% total agricultural land</u>
Grade		
3a	1.76	14
3b	10.58	86
Total area surveyed	<u>12.34</u>	<u>100</u>

3.2 Appendix 1 gives a general description of the grades and sub-grades identified in this survey.

Grade 3a

3.3 Land of this quality has been mapped across the south-eastern part of the site in association with two small dry valleys. In addition, land of this quality was found to occur in the small hollows towards the north-west of the site. However, the extent of the area of grade 3a associated with these hollows was not considered sufficient to delineate as separate mapping units.

Profiles assigned to this land quality are similar to those described in section 2.7. Silt loam or medium silty clay loam topsoils rest over similar textures in the upper subsoil and pass to silty clay which is slowly permeable from about 55 - 60 cm. The limitation to this land is imperfect drainage which is caused by the slow permeability of the subsoils and is evidenced by gleying directly below the topsoil.

Grade 3a land is capable of consistently producing moderate yields of a wide range of crops, or a higher yield of a narrower range of arable crops, particularly cereals.

Grade 3b

3.4 The majority of the site has been graded 3b which reflects the predominance of the soil group described in section 2.8. This land is associated with the higher land on the site where Glacial Gravel deposits occur.

Within the grade 3b mapping unit, small areas of slightly better quality land, (grade 3a), and slightly poorer quality land, (grade 4) were found to occur, but the localised extent of this variation in land quality prevent its being delineated as separate mapping units.

Profiles are generally moderately to very stony throughout, resting over non-calcareous gravel at relatively shallow depth. Sandy loam or sandy silt loam topsoils containing 20-40% v/v flints > 2 cm, pass to similar textures or silt loam in the subsoil. These horizons are moderately to very stony having 35-50% v/v flints in total. Profiles become impenetrable, (to soil auger), over extremely gravelly horizons at about 40-50 cm.

As a result of topsoil stone contents in excess of 20% v/v > 2 cm, (and reaching 40% v/v > 2 cm across localised areas) the land cannot be graded higher than sub-grade 3b. The limitation to agricultural use which results from such topsoil stone contents is likely to be most evident through the wear on agricultural implements, and the reduced establishment, growth and quality of the crop. As outlined above, the principle limitation to the agricultural use of this land is topsoil stone content. In addition, the moderate to extreme stoniness of the whole soil profile imparts a droughtiness limitation on the land as a result of much reduced reserves of available water.

4. SOIL RESOURCES

Soil units : Consideration for Restoration

- 4.1 Overlays accompanying the ALC map illustrate the pattern of topsoil and subsoil resources on the site. It should be emphasised that this is not a soil stripping map, but merely an illustration of soil resources available for restoration on the site. When considering these details it is important to remember that soils were sampled to a maximum depth of 100-120 cm during survey work. In some cases soil resources will extend below this depth.

Two topsoil units were identified across the site.

4.2 Unit 1

This unit occurs in association with the lower lying parts of the site and has also been mapped across the north-west of the site in conjunction with two small hollows. The unit typically comprises about 29 cm of brown or dark greyish brown (10YR 4/3 or 10YR 4/2), non-calcareous silt loam or medium silty clay loam. These topsoils are very slightly to moderately stony having between 1% and 25% v/v flints >2 cm, (3%-30% v/v total stone content).

4.3 Unit 2

This unit has been mapped across the higher land on the site and typically comprises an average 28 cm of dark brown, dark greyish brown or very dark greyish brown, (10YR 3/3, 10YR 4/2 or 10YR 3/2), non-calcareous, sandy silt loam or occasionally medium sandy loam. These topsoils are moderately to very stony with 20-40% v/v flints > 2 cm and 23-45% v/v flints in total.

- 4.4 The principal difference between the two topsoil units is that of texture, unit 1 comprising medium silty textures and unit 2, light loamy textures. The units can also be distinguished by stone content, unit 1 topsoils typically being less stony than those of unit 2.

Two subsoil units were identified.

4.5 Unit 1

In broad terms, this subsoil unit occurs in relation to the topsoils described in section 4.2, ie, across the lower lying parts of the site. It typically comprises an average of 91 cm of brown, yellowish brown or strong brown, (10YR 5/3, 7.5YR 5/4, 10YR 5/4 or 7.5YR 5/6), medium or heavy silty clay loam or silty clay textures. Occasional profiles are redder in colour having strong brown, (7.5YR 5/8) or yellowish red, (5YR 5/6 and 5/8) matrix colours. Upper subsoils may be slightly stony, but profiles are generally stone free below about 50-55 cm. Mottling and gleying is common to all profiles at variable depths between about 29 cm and 60 cm from the surface. Silty clay textures were found to be slowly permeable below 55-60 cm.

The subsoils in this unit have moderately good structures above about 55-60 cm, being composed of well developed coarse angular blocky peds of friable consistence. These horizons have >0.5% biopores >0.5 mm and are therefore permeable. Below 55-60 cm subsoils are poorly structured and comprise weakly developed, medium to coarse angular blocky peds of firm consistence. These lower subsoils have <0.5% biopores >0.5 mm and are thus considered to be slowly permeable.

4.6 Unit 2

This unit is associated with the Glacial gravel deposits on the site and comprises an upper subsoil of about 16 cm of brown, yellowish brown or dark yellowish brown, (10YR 5/3, 10YR 5/4 or 10YR 4/6) medium sandy loam, silt loam, or occasionally medium silty clay loam textures. These horizons which occur within about 52 cm contain between 35% and 50% v/v total flints. Profiles become impenetrable (to soil auger) over very gravelly horizons which typically contain about 70% v/v flints, from 40 to 52 cm depth.

The subsoils in this unit are loose and friable but were too stony to assess the structural condition with any certainty.

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MICHELLE LEEK
Resource Planning Group
Reading RO

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