SOIL PHYSICAL CHARACTERISTICS REPORT FOR LAND ON THE PROPOSED QUARRY AT CHURCH FARM, GRIMLEY

1. Introduction

The site of approximately 18 hectares was surveyed in August 1991 when soils were augered to 100 cm on 100 m grid intersections, to provide a density of 1 boring per hectare on the undisturbed land. Additional profiles were described as necessary to determine land quality and soil unit boundaries. Due to the extremely dry soil conditions it was not possible to auger the restored land and 5 soil pits were dug in this area to obtain information.

The site is underlain by river terrace deposits and resulting soils are medium textured and very slightly stony over most of the undisturbed land. The risk of winter floods has limited most of the land to Sub grade 3a and 3b. The disturbed land is above the flood plain. Two main soil units have been identified, which will require separate handling if the site is worked.

2. Climatic limitations

The land lies between 15 and 20 m and has an accumulated temperature (January to June) of 1483°C and an average annual rainfall of 629 mm. Climate does not impose a limitation to the agricultural use of the land.

The rain falls fairly evenly throughout the year with rainfall peaks in August and November and a relatively dry spell between February and April. The mean date of the last frost is late April.

3. Site limitations

The site lies to the north of Grimley west of the River Severn and south and east of the existing quarry.

The land is level to very gently sloping with gradients of 1-2 degrees on the undisturbed land. The restored land in the west is generally level but slopes to existing land levels in the north and south.

3.1 Flooding

The disturbed land does not flood, being above 16.3m AOD contour. However, the undisturbed land is on a lower terrace and is prone to regular floods which are often of medium or long duration. Land quality is limited by the floods to Sub grades 3a and 3b.

4. Geology and soil limitations

The undisturbed area is underlain by river terrace deposits. The resulting soils are medium textured and contain few stones within 60 cm.

Typically 30 cm of very slightly stony medium clay loam or sandy silt loam overlies medium clay loam. Heavy clay loam or silty clay loam occurs occasionally at depth. Sandy clay loam and gravel occur below 60 or 70 cm in some profiles at the southern end of the site, reducing the available water capacity of the soils and making them prone to drought.

Most of the soils are well drained and fall into Wetness Class I or II, having a slowly permeable layer at depths below 60 cm. Along the north western boundary of the undisturbed soils slowly permeable layers occur at depths between 35 and 50 cm and here the soils fall into Wetness Class III or IV.

The disturbed land consists of several different soil profiles. Part of the area is made up of clay overburden on which

coarse sandy loam to clay loam soils have been replaced to a depth of 5 to 20 cm. In the west silt ponds have been covered by 5 to 10 cm of soil.

These soils are poorly drained having massive soil structures and very dense peds close to the surface.

5. Interactive limitations

The physical limitations which result from interactions between climate, site and soil are soil wetness, droughtiness and erosion. Soil wetness expresses the extent to which excess water imposes restrictions on crop growth and cultivations, while droughtiness indicates the degree to which a shortage of soil water influences the ranges of crops which can be grown and the level of yield which may be achieved. Seasonal waterlogging affects soil workability and crop yields. Wetness is therefore an important parameter in the classification of land. It is measured by reference to climate, particularly field capacity days, soil wetness and topsoil texture. This site is at field capacity for approximately 135 days. Wetness has limited soil quality to Grade 2 and 3a in some profiles. These soils have been further downgraded by flooding.

Soil droughtiness is a limiting factor in the classification of this land. The susceptibility to drought is determined by the difference between the amount of water the soils can hold (available water capacity (AWC)) and the medium moisture deficit (MD) which has developed by the end of the critical part of the growing season. The moisture balance (MB), that is the difference between these two figures, indicates the susceptibility to drought of soils in a given area. In this area the median MD for wheat is 113 mm and for potatoes is 107 mm. In some areas where gravel occurs below 60 or 70 cm, droughtiness limits the classification to Subgrade 3a.

6. Land use

The land supports cereals.

7. Agricultural Land Classification

The land is mapped predominantly as Grade 3 on the undisturbed land and Grade 4 on the restored land.

7.1 Grade 2

This grade accounts for 0.3 ha and 1.5% of the site. It is mapped in the north over medium clay loam which overlies medium clay loam subsoil. The soils are usually gleyed and some profiles have a slowly permeable layer at depths below 60 cm. Most profiles fall into Wetness Class 2 and hence into Grade 2. The land mapped as Grade 2 lies above the floodplain.

7.1 Subgrade 3a

This subgrade accounts for 4.6 ha and 24.0% of the site. It is mapped in the south to include very slightly stony medium clay loam soils which overlie similar subsoils. The soils fall into Wetness Class II or III but are limited by occasional medium length winter floods to this Subgrade.

7.2 Subgrade 3b

This grade accounts for 6.2 ha and 32.3 % of the site. It is mapped to include medium and heavy textured soils in the central northern part of the site and medium textured soils in the south. All this land is prone to frequent medium length winter floods and the flood risk has limited its classification.

7.3 Summary of ALC Grades

Grade	Area (hectares)	Area %
2	0.3	1.5
3a	4.6	24.0
3b	6.2	32.3
4	8.1	42.2
Total	19.2	100.0

8. Soil units

Two units have been identified which will require separate handling if the site is worked.

8.1 Unit 1

This unit includes undisturbed land in the east.

Typically 30 cm of brown (10YR4/3) medium clay loam overlies light brown (7.5YR4/3) medium clay loam. Below 60 cm subsoils range from light brown (7.5YR5/3) sandy clay loam to heavy clay loam in a random pattern across the site. In some scattered profiles gravelly sand occurs within auger depth.

The structure is friable weak medium subangular blocky in the topsoils becoming moderate coarse angular blocky below 35 cm. The lower subsoil ranges from firm coarse prismatic to friable moderate coarse subangular blocky.

Most profiles are gleyed and have a slowly permeable layer somewhere within the profile but the depth to both varies greatly across the site and in some profiles no slowly permeable layer exists.

The total stone content ranges from 3 or 4% in the topsoil and upper subsoil to 50% in lower subsoils. The stones are typically rounded and angular small hard pebbles. Plant roots and worms are common to 50 cm but become less below this depth.

8.2 Unit 2

This unit is mapped over disturbed ground which has been backfilled with clay overburden and silt ponds. The restored profile consists of 10-20 cm of SL to CL topsoil over overburden or silt. Structure in the backfill material is still poorly formed, typically very coarse prismatic or massive. The overburden and silt are almost stoneless but the surface borings contain between 2 and 15% of small and medium rounded hard pebbles. Plant roots and occasional worm channels extend into the silt.

8.3 Summary of soil units

Unit	Depth	Texture	Stones
1	0-30	mCL	4%
	30-60	mCL	4%
	60-100	SCL-hCL	4-50%
2	0-10	SL-hCL	2-15%
	10-100	Silt lagoon or clay overburden	

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