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SOILS OF SHEET SP 30 (WITNEY)

PART II

LARGE AND MEDIUM SCALE SURVEY OF THREE SAMPLE AREAS

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PREFACE

Following the description of the reconnaisance survey (scale 1 : 250 000) of sheet SP 30 (Witney) this is the second contribution from the Netherlands Soil Survey Institute to the Oxfordshire project.

The medium (1:50 000) and the large scale (1:10 000) maps of three sample areas are described in this report.

This report is focussed on the research project, and thus contains more information on survey procedure and general survey problems than a normal survey report. On the other hand less care was taken in the final editing compared to a printed report.

The survey procedure used reflects the position of the surveyor, who was unfamiliar with the soils and environment of the area. For this reason the large scale survey was executed first in order to gain knowledge on soils and soil patterns and their relation to the environment in this area. This knowledge formed the initial base for the medium scale survey. During this survey the additional information gained gave rise to additions and changes of the understanding of soils and landscape. Doing a soil survey is not only the making of an inventory, but a research effort as well.

This contribution is to a project on soil survey methedology, but it also suggests two subjects that in our opinion are promising topics for further soil research.

The first is the study of the depositional systems of the Thames. In the Great Brook sample area the soil pattern could not be comprehended even during the large scale survey. We have the impression that several depositional systems may occur in the Thames valley; these are related to changes in the general geomorphological situation. Research on this subject would be very valuable for soil survey and interpretation.

A second subject, where our personal experience is insufficient, is covered by the local terms "drift" and "head". A better knowledge of the systems of downslope movement of material in relation to the geology would certainly be of considerable importance for survey of this and similar areas.

With respect to the soil classification and the soil characteristics used two different courses could have been taken. The easiest for the surveyor would have been to use the terminology that was most familiar to him. This would, on the other hand, have given very serious complications for the comparison of different survey results. For this reason Marsman tried to follow, as far as possible, the U.K. classification. Since definitions were not so exact in several cases that they could be applied unambiguously, they have been defined as they were applied in this survey. This may facilitate comparisons.

The relations between soil maps at different scales and their legends are complicated. In chapters 6 and 7 these are described for this contribution to the project. Although outlined for this survey only, this description contains many aspects of general application. To incorporate these aspects in the Oxfordshire project may cause considerable complications.

It is the hope of Marsman and myself that this report will not only be a contribution to an important research subject, but also a contribution to the scientific exchange between the soil scientists of the U.K. and the Netherlands.

Dr.Ir.J.Schelling

1. INTRODUCTION

This report deals with the results of the large and medium scale soil survey of three sample areas, situated on sheet SP 30. It is a supplement to the report: Soils of sheet SP 30 (Witney). Part I: Reconnaissance Survey.

The survey period was from May 26th till July 7th; 1972. Knowledge and familiarization with the area and choice of sample areas were based on experience gained during the reconnaissance survey in April 1972.

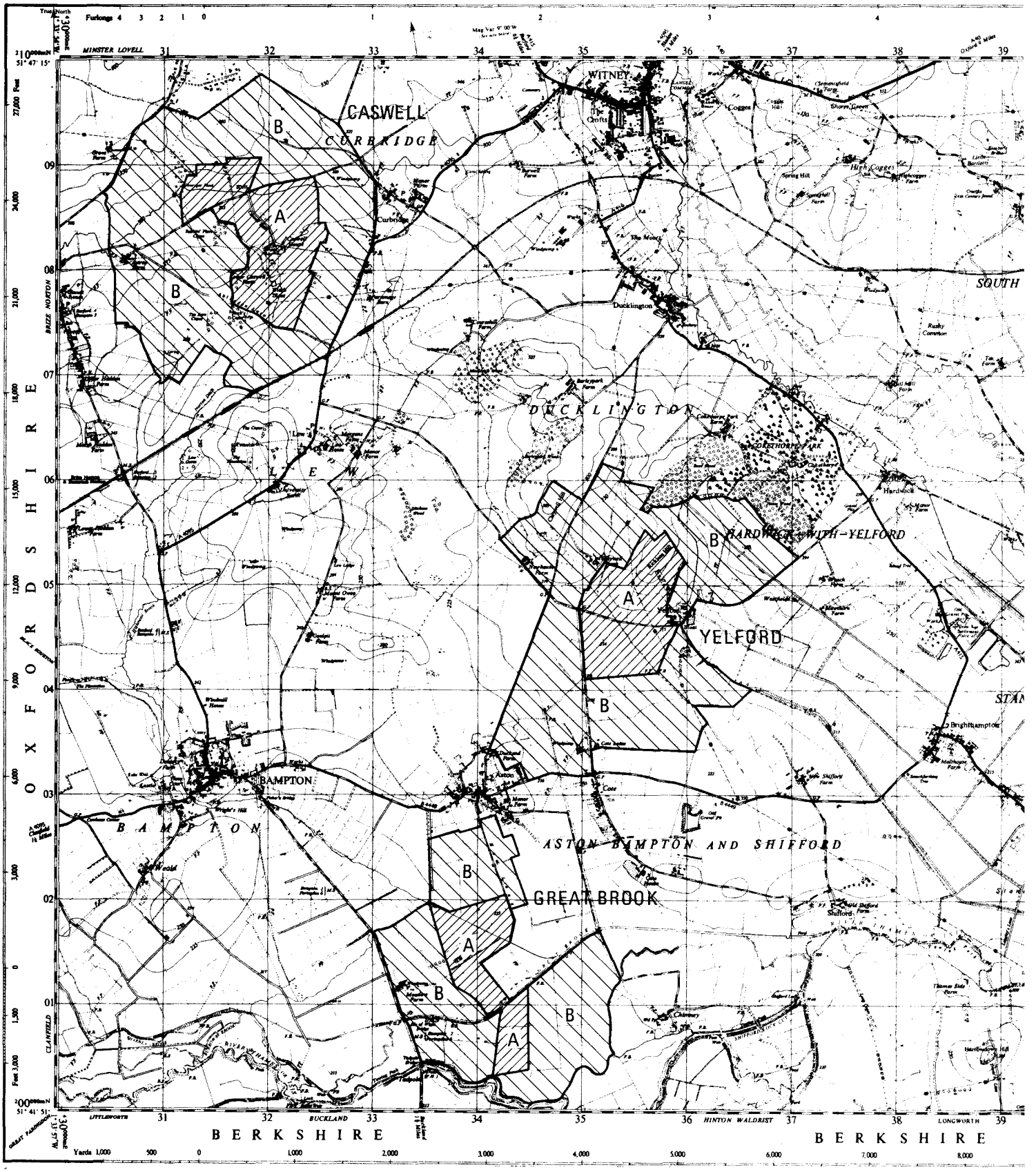
Except for the last week all the time was spent on surveying the three sample areas on large and medium scale. The last week was spent on talks with farmers and describing and sampling a few representative profile pits.

ORDNANCE SURVEY

Scale 1:50 000

Provisional Edition

SHEET SP 30



A soil maps scale 1:10 000

B soil maps scale 1:50 000

Fig. 1 Surveyed areas

2. CHOICE OF SAMPLE AREAS

The choice of a sample area is decided on whether or not a certain area is typical of as large a part of sheet SP 30 as possible. The knowledge about distribution of soils, soil pattern, and soil conditions were obtained from the previous reconnaissance survey. Beyond this, the choice is influenced by standing crops, accessibility of an area, permission of land owners, and farm boundaries.

The bigger the number of sample areas, the better is the coverage of the range of soil conditions of sheet SP 30. Although a large number of sample areas is desirable, in practice the number of areas is restricted by a minimum size of a sample area and the time available. For these reasons it was decided to survey three sample areas of approximately 500 ha each for medium scale survey (1:50 000). A large scale survey (1:10 000) of approximately 100 ha has been nested in each of the three sample areas.

The locations of the surveyed areas are shown in fig. 1. A indicates areas for large scale surveys (1:10 000) and B indicates areas for medium scale surveys (1:50 000).

Sample area Caswell (A+B = 572 ha; B = 126 ha).

The sample area is situated in the north-west of sheet SP 30 on the transition of the limestone landscape and the Oxford Clay landscape.

This sample area represents two quite different landscapes. The northern part is typical for the limestone landscape. The southern part is thought to be typical for the more level parts of the Oxford Clay landscape.

Sample area Yelford (A+B = 520 ha; B = 97 ha).

The sample area is situated in the centre of sheet SP 30. It is also on the transition of two different landscapes. The northern part is typical for the undulating landscape of Oxford Clay with scattered remnants of the oldest river terraces.

The southern part represents one special type of the Thames valley landscape, namely one bordering the Oxford Clay landscape and with relatively large remnants of the youngest river terraces.

Sample area Great Brook (A+B = 347 ha; B = 75 ha).

This area is situated in the south of sheet SP 30 and is typical for that kind of Thames valley landscape which is characterized by ancient river courses.

As there was only time to survey three sample areas, two of these were chosen on the transition of two landscapes. If more time were available, more sample areas would be surveyed and all sample areas would be located within the boundaries of one landscape. Most probably the sample areas should than be less influenced by deviating circumstances, which occur near the landscape boundaries.

Apart from this a few sample areas should be chosen in other areas of SP 30. The next one should be located south east of Witney. In this area the landscape is characterized by undulating Oxford Clay, scattered remnants of river terraces and other higher parts consisting of glacial drift. Here the distribution of soils and the soil pattern were not sufficiently understood during the reconnaissance survey.

More detailed information about the soil pattern and the distribution of the alluvial soils in the Thames Valley is also desirable. The soil pattern in sample area Great Brook is insufficiently understood. It is also expected that the soil pattern will vary in different parts of the Thames Valley.

3. SURVEY PROCEDURE

3.1 General.

The survey procedure was the same for all sample areas. Surveying started with large scale mapping of an area of about 100 ha. After this an area of about 400 ha, surrounding the area mapped on large scale, was surveyed on medium scale. This made it possible to use the knowledge about distribution of soils, soil pattern and soil conditions, obtained during large scale mapping, over the whole sample area.

The descriptions of sites, both for large and medium scale maps, were based on augerings with Edelman auger only. Not all augerings were completely described. The percentage of completely described augerings varies with map scale and sample area and ranges from 48 tot 76 (see Appendix 5, table 1). For this kind of descriptions a spade was also used to examine the surface horizon. They are recorded in a format standard for the Oxfordshire project. The other augerings are recorded in code only and no special attention is paid to the surface horizon. The codes always indicate profile class, drainage class, soil depth, soil texture and deviating material or rock in subsoil. In some cases also slope or organic matter content of surface horizon is recorded. After the survey period a few pits were described and from these samples were taken for standard analyses.

3.2 Medium scale maps

For the medium scale map a normal free survey procedure was used Sites of augerings are mainly decided by the existence of certain terrain features. The most important are: differences in surface morphology (elevation, slope, depressions, gullies), surface colour, surface stones, rock outcrops, mole heaps, copses or woods. But the results of previous augerings also influence the choice of sites. The direction of successive augerings is perpendicular to the expected soil boundaries.

The intensity of augering depends on the intricacy of the soil pattern. A discrepancy between the actual soil pattern and the expected soil pattern had a big influence on augering intensity. The expectations about soil pattern were mainly based on the knowledge about soil pattern obtained from the previous large scale survey within that sample area.

For the three sample areas as a whole, there are no big differences in augering intensity. On an average one augering per 5,3 ha was made. Bigger differences in augering intensity occur within different parts of one sample area. E.g. Yelford: the differences between the gently sloping parts of Oxford Clay, with a relatively high augering intensity and the level soils in alluvium. The same is true for Caswell: the shallow soils over limestone in southwest and the more complicated pattern of shallow and deep soils over limestone in the north and northeast.

But high augering intensity is not always associated with a complicated soil pattern. In Great Brook the soil pattern north of the river Thames is very complicated, caused by alternating erosion and deposition, acting in the same period over short distances. Nevertheless augering intensity in this part is normal. From the large scale map it was evident that even a high augering intensity would make little progress towards the understanding of such soil patterns.

Apart from augering intensity the relation between the intricacy of the soil pattern and survey effort is indicated by the speed of surveying. In table 1 (Appendix 5) this is recorded by "surveyed area per effective hour" and "number of augerings per effective hour". In Great Brook relatively low values are recorded for both criteria. This is caused by the poor accessibility in general and the intricacy of the soil pattern in the southern part of the area. Especially large areas with standing crops and the existence of brooks and ditches made access difficult.

In Yelford the "number of augerings per effective hour" is moderate and the "surveyed area per effective hour" is high. Here parts with a complicated soil pattern are relatively small. Accessibility is also better than in Great Brook.

Sample area Caswell has the highest score for "number of augerings per effective hour". This is caused by shallowness of soils and a very good accessibility. "Surveyed area per effective hour" is only a little bit higher as in Yelford. Although the intricacy of soil pattern in general is simple, here a number of small parts with complicated soil pattern occur, lacking clear external soil features. Especially patches of deep clay soils in areas with shallow loamy soils over limestone and elsewhere outcrops of Kellaways Beds with loamy texture in the Oxford Clay region are considered to be difficult to delineate.

3.3 Large scale maps

Those parts of the sample areas, surveyed at large scale are shown in fig. 1 (areas A).

Survey procedure for the large scale maps cannot be considered a "normal" free survey. Due to the large size of the fields, locating sites for large scale mapping was difficult. For this reason surveying along marked traverses was necessary in nearly all places. In all cases the direction of the traverses was chosen perpendicular to expected soil boundaries. The distance between traverses and between augerings within a certain traverse varies, depending on the variation in soil profile on short distances and the existence of external soil features. In some parts of a sample area distances are fixed, in others they vary and then mainly with a much higher augering intensity.

E.g. Yelford: the intensity for Ground-water gley soils in the south is lower than those near Ricklesshill in the north. So survey proceduce can be considered intermediate between free survey and grid survey.

Of all the sample areas, the survey procedure of Great Brook is most similar to a grid survey. In most parts distances between both traverses and augerings are 100 meter. In many places here external soil features are weak or absent and standing crops made small differences in elevation invisible. The intricacy of the soil pattern also leads to the adoption of a grid-type survey procedure. Especially in the southern part of Great Brook the soil pattern is very complicated and it appeared that increasing augering intensity gave little help to the understanding of all differences in soils over short distances.

From table I (Appendix 5) it is clear that there are differences in survey effort and intricacy of soil pattern between the three sample areas, mapped on large scale. These differences are more or less similar to those between the total sample areas, surveyed on medium scale. But for some aspects there are small differences.

For Great Brook the percentage with standing crops is higher for the area surveyed at large scale, than within the sample area as a whole.

In Yelford distribution of soils, intricacity of soil pattern and accessibility of terrain are fairly similar between area A and B (fig. 1). For sample area Caswell the same is true except for the percentage of soils lacking clear external soil features. These are more common in area A, mapped on large scale.

The quality of soil maps of areas, under cereals, must be considered inferior, if surveyed in June or July. This is the case for big parts of sample area Great Brook and for smaller parts of Yelford.

From all sample areas, air photographs (1:8000; June 1961) were available. No photo interpretation maps were made. Air photographs were only used to discover the course of shallow gullies, small mounds and to study sites, where ancient settlements were found.

4. SOIL CLASSIFICATION AND LEGEND

4.1 General

During the survey an attempt was made to continuously develop and improve a classification system. Map and classification system grew simultaneously and each profile description had some influence on limits and contents of the differentiating criteria.

To facilitate comparisons with other maps, an attempt was made to create a system with the terminology used by the Soil Survey of England and Wales. Therefore a number of differentiating criteria were developed, defining the soil groups (table II; Appendix 6). Because of this author's low level of previous knowledge about soils and soil formation in England, the differentiating criteria are general and simple.

Most probably contents and limits deviate from those in common use in England.

It appears that they are useful for the sample areas and it is expected that they are useful for the whole sheet SP 30, too.

The classification system consists of three levels. The first level divides soils into those with a weathered B horizon and Gley soils. As the soils of the sample areas show no clear evidence of clay illuviation, there was no need to distinguish an argillic horizon. As chemical analyses were lacking the weathered B horizon is only defined by colour. Its limits are evaluated against the criterion for Gley soils, and meet each other in clayey textured soils with slightly brown sub-surface horizons (sloping Oxford Clay).

The second level distinguishes soils with weathered B horizon without gleying (B) and with gleying (Bg). On the same level Gley soils are divided into Surface-water gley soils (SG) and Ground-water gley soils (GG). Besides characteristics for colour, mottling and groundwater-level, the use of an external landscape feature was necessary.

For the third level every classification unit is devided into a calcareous and non-calcareous group. Non-ripened subsoil is also defined. This criterion is introduced in the legends, because it does not occur in the English classification system.

For the Reconnaissance Survey (part I of this report) the same soil groups are used for the description of the mapping units. But there the soil groups are not defined by differentiating criteria. Therefore range of soils of the mapping units of the Reconnaissance Survey will be somewhat different from those of the large and medium scale survey.

4.2 Differentiating criteria

The soil classification used for this survey consists of eight soil groups (Appendix 6; table 2). These are defined on a number of differentiating criteria which were developed during the survey. The contents and limits of these criteria are decided by some soil properties observed in the surveyed area. The criteria represent a choice from many possibilities. They are thought to be useful for the surveyed areas at least.

The following differentiating criteria are distinguished:

Weathered B-horizon

A brown homogeneous subsurface horizon extending to at least 10 cm below an A1 or Ap-horizon or to at least 30 cm depth and which meets the following criteria:

no mottles within 60 cm depth
hue 10YR or redder
value 5 or 6 and chroma 4 or more, or
value 4 and chroma 3 or more.

Very shallow soils with an Ap-horizon directly underlain by limestone or terraced gravels are considered soils with a weathered B-horizon if hue is 10YR or redder, value 4 or more and chroma 3 or more.

Weathered B-horizon with gleying

A brown subsurface horizon extending to at least 10 cm below an A1 or Ap-horizon or to at least 30 cm depth which meet the criteria listed below

and

ferrugenous and/or grey mottles starting within 60 cm depth.

If imperfectly or moderately well drained

a. mottles start between 30 and 60 cm depth and
b. the same colour criteria as the weathered B-horizon, or if texture is clay or clayloam and value 5, chroma has to be 3 or more.

If poorly drained

a. ferrugenous mottles are allowed within 30 cm depth but no greyish mottles and
b. the same colour criteria as the weathered B-horizon or if texture is clay or clayloam hue of $2\frac{1}{2}Y$ is allowed and if value is 5 or 6, chroma has to be 3 or more.

Calcareous soils

Soils are considered calcareous soils if within 80 cm depth or, if shallower, down to consolidated rock or gravel, more than half of this thickness has a $CaCO_3$-content of at least 1%, and

If the A1 or Ap horizon

has a lower $CaCO_3$-content, it requires a $CaCO_3$-content of at least 1% within 35 cm depth, and

If only the layer just below an A1 or Ap horizon

has a lower $CaCO_3$-content, the thickness of this layer may not exceed 20 cm.

Non-calcareous soils

Soils which do not meet the criteria for calcareous soils.

Gley soils

Soils with dominantly greyish colours and mottling, which meet one of the following criteria within 10 cm below an A1 or Ap horizon or within 30 cm depth, except for horizons dominated by ferrugenous segregation, buried A1 horizons or peat layers.

if hue is yellower than $2\frac{1}{2}Y$

Value 5 or more and chroma 2 or less or

if hue is $2\frac{1}{2}Y$ or 10YR

Value 5 or more and chroma 2 or less and with ferrugenous and/or grey mottles, or
value 5 or more and chroma of 3 and with both ferrugenous and grey mottles.

Surface-water gley soils

A gley soil is considered a surface-water gley soil if it has the following properties:

a. deep solum with clay texture, starting within 60 cm depth, or other characteristics indicating impeded drainage
b. clearly elevated above the level of nearest flood-plain or valley bottom
c. groundwater-level within 1 meter during relatively short periods in a wet seazon and a rapid drop of groundwater-level after such a wet period
d. absence of intensively gleyed horizons (G-horizon), buried A1-horizons, peaty horizons and non-ripened subsoil within 1 meter depth.

Groundwater-gley soils

A gley soil is considered a groundwater-gley soil if it has the following properties:

a. within 1 meter depth one or more of the following horizons; intensively gleyed horizon (G-horizon), buried A1-horizon, peaty horizon, non-ripened subsoil and/or
b. groundwater-level within 1 meter depth during relatively long periods in the wet season of most years, and relatively slow drop of groundwater-level after such a wet period, and
c. if it has a deep solum with clay texture starting within 60 cm depth or other characteristics indicating impeded drainage, the surface is not clearly elevated above the level of nearest floodplain or valley bottom.

Non-ripened subsoil

Under a ripened topsoil there is a nearly ripened horizon within a depth of 50 cm and/or a halfripened or lesser ripened horizon within 80 cm depth.

Ripened horizon

It has a n-value of less than 0,7. A sample will not pass through the fingers when squeezed in the hand.

Nearly ripened horizon

It has a n-value 0,7 - 1,0. A sample will, but not easily, pass through the fingers when squeezed in the hand.

Half-ripened horizon

It has a n-value 1,0-1,4. A sample will pass through the fingers easily, when squeezed in the hand.

4.3 The legend

The legend is based on eight soil groups (Appendix 6; table 2). As Brown earths without gleying are virtually absent in the surveyed areas, only seven soil groups remain for mapping purposes.

Mapping units which are described mainly by one soil group are considered "pure mapping units". All mapping units contain an amount of impurities. If the propertion of the impurities is thought to be

more than 30%, the mapping units are considered "soil complexes".

Most of the delineated mapping units are pure but, except for the large scale map of Yelford, all soil maps contain one or more soil complexes.

On the medium scale map of Caswell, a mapping unit "Calcareous undifferentiated gley soils" is distinguished. This unit is considered a pure mapping unit, but these gley soils do not meet the requirements of either Ground-water gley soils, or Surface-water gley soils.

The legend contains a further subdivision of soil groups. The following aspects are concerned:
drainage classes, or range of drainage classes
soil depth
soil texture, and texture differences with depth
slope
parent material
other material (not parent material) or consolidated rock within 1 meter depth
organic matter content.

Terminology and class limits are according to those used in the Oxfordshire Project; except for the following properties:

Soil depth. Soil depth refers to depth of augering (1 meter). In this survey augering depth is only restricted by limestone or terrace gravels. The following classes are distinguished;
0-40 cm shallow
40-100 cm moderately deep
> 100 cm deep
Rooting depth was thought to be more important than augering depth. But auger examinations are incapable of determining rooting depth. For some soils there will be a close relationship between augering depth and rooting depth, for instance Brown calcareous loamy soils over terrace gravels. But for shallow Brown calcareous loamy soils over limestone, rooting depth exceeds the measured soil depth, because of a weathered and broken limestone layer in the upper part of the limestone. In Oxford Clay soils are deep, but in many cases rooting depth seems to be limited.

Slope. As distinct from the reconnaissance survey, slope classes refer to single slopes. Slopes are measured in degrees.
0-1 level
1-2 nearly level
2-5 gently sloping.

Soil drainage. Five drainage classes are used, according to the Oxfordshire terminology, except for drainage class 1. Soils with non-ripened subsoil are also considered very poorly drained.

Texture profile. Texture is applied to 1 meter depth or if soils are shallower, to soil depth. The precise depth of textural changes are not shown in the legend but only indicated in the description of mapping units. Also textural differences, only extending over the A1- or Ap-horizon are indicated in the description of mapping units only.

In the legend abbreviations are used for the names of textural classes. They are similar to those used in the Soil Survey Manual. E.g.: "l; l/cl" means loam or loam over clay loam.
Textural changes in the subsoil are also recorded and indicate that there is a textural change at a depth of more than 50 cm (mainly about 70 or 80 cm).

Organic matter. As distinct from the reconnaissance survey the following classes are distinguished:
0-8% non humose
8-13% slightly humose
13-25% humose
25-40% very humose.

During the survey information was also collected about stoniness, surface stones, structure, consistence and groundwater level. In the legend these properties are not distinguished. They are recorded in the description of the mapping units only.

Parent material

Alluvium: In this report and in the legends, alluvium represents the finer texture classes of riverborne material. Riverborne material, consisting of gravels are here called river gravels.

Oxford clay. The Kellaways Beds are included in the Oxford Clay, except for the loamy textured phase of the Kellaways Beds. Kellaways Beds with loamy sand, sandy loam and sandy clay loam textures are distinguished separately and only these are mentioned as soils developed in Kellaways Beds.

Forest Marble. Delineation of soils developed in Forest Marble is based on the lithologic character of soil material. Mapping units with (silty) clay textures are delineated and considered as soils developed in Forest Marble, if marl is present in the subsoil of at least some of the sites.

Limestone. Most soils in the limestone area are recorded as soils over limestone. Here the differences between Great Oolite, Forest Marble and Cornbrash are not distinguished. Mapping units, where marly subsoils are observed, are considered to be developed in Forest Marble only.

Drift. In this report the name "drift" is used for superficial deposits:
a. transported by solifluction during the Pleistocene
b. younger deposits accumulated by downslope transfer.

Horizon notation: The following notation is used for the discription of the representatise profiles and the description of mapping units.

A1 Mineral horizon with relatively high organic matter content, developed near the surface
Bs Weathered B-horizon, differentiated by brownish colours, indicating pedological re-organisation
C Little altered horizons (except by gleying and structure)
G Intensively gleyed horizon without ochreous mottles.

Suffixes:
g gleyed horizons, indicated by grey or ochreous mottles or both
(g) weakly gleyed horizons
b A1-horizons, buried by younger sediments
p ploughed A1-horizons
anb anthropic and buried A1-horizons
II horizons with distinctive properties, derived from stratified parent materials

5. DESCRIPTION OF MAPS AND MAPPING UNITS

5.1 Sample area Caswell

Sample area Caswell covers an area of 572 ha. It is situated west of the village Curbridge. Two roads traverse the area; in the centre the rood from Curbridge to Brize Norton, in the south the Abingdon Lane. The area consists of two different landscapes. The limestone landscape in the north and east, and the Oxford Clay landscape in the south-eastern part. Altitude ranges from 360 ft (OD) in the north to 250 ft (OD) in the south.

The limestone landscape.

The solid formations outcropping in the limestone landscape are Great Oolite, Forest Marble and Cornbrash, all of middle Jurassic age. The regularity of these formations has partly been disturbed by a fault running from East to West across the sample area. In the field this is marked by a short gentle slope, of about 4 degrees. Except for the gentle slope near the fault and the sides of two narrow valleys, surface is level or nearly level. Near the boundary of outcropping Oxford Clay a number of springs occur. The running water is thrown out by the underlying Oxford Clay or clayey sediments of Forest Marble. Both the moat of Caswell House and Black Moat are fed by such springs. After leaving the moat, the running streams join together and leave the area in the south, where it is named Norton Ditch.

On the soil map the three formations are only distinguished as far as they give rise to clear differences in soil texture and soil depth. For this area this is only the case for parts of the Forest Marble. The delineation of soils developed in Forest Marble is based on the lithologic character of soil material. Mapping units with (silty) clay texture were delineated and considered to be developed in Forest Marble, if marl was observed in the subsoil of some sites. If marl was absent in all sites of an area, the differences in parent material (Great Oolite, Forest Marble and Cornbrash) are not distinguished. Then all soils are regarded as soils over limestone. In this case the soils have usually loam or clayloam textures.

The Oxford Clay landscape

The Oxford Clay and Kellaways Beds are marine sediments of upper Jurassic age. Oxford Clay is partly covered with a Drift layer, especially near the boundary with outcropping limestone. Kellaways Beds are exposed in small patches, mainly in very gently sloping valley sides. The landscape is level or nearly level with very gentle slopes. Near Caswell farm a shallow valley starts in which the water of the Norton Ditch is running to the south. This valley has a flat alluvial floor with very gently sloping valley sides.

Land use

Both pasture and arable farming occur but the proportion of grassland is high. Ley farming is widespread but on Caswell farm fields are in permanent grass. Grassland is used for both dairying and beef cattle and to a lesser extent for sheep.

Most farms are between 100 and 200 ha. In the Oxford Clay area, the landscape is also characterized by a number of copses.

The area surveyed at large scale (fig. 1; area A)

The soil map covers an area of 126 ha and all fields belong to Caswell farm. Range of soils and soil distribution are nearly similar to those of the sample area as a whole. Except for a few fields, the area is in pasture and permanent grassland predominates. At present the land is only used for fattening of cattle.

5.2 Large scale map Caswell (Appendix 1)

Brown calcareous soils over limestone (BCL)
Four mapping units are distinguished.
BCL1-5 Well drained, shallow soils with loam and clayloam textures.
BCL2-5 Well drained, shallow soils with clay and clayloam textures.
BCL3-5 Well drained, moderately deep soils with loam and clay loam textures
BCL3-3/5 Well drained and imperfectly drained; moderately deep soils with loam and clayloam textures.

BCL1-5. Well drained, Brown calcareous soils over limestone. Shallow, with loam and clayloam textures.

These soils are widespread in the limestone area. In general the surface is level or nearly level. A fault, running East-West across the area is accompanied by a gentle slope of 2 to 4 degrees.

Soils are developed in limestone or in drift over limestone. Especially for the very shallow soils, parent material is limestone.

The A1p-horizon is dark brown (7½YR4/3) and non-humose. Texture is loam or clayloam and mainly slightly stony, partly stony (small limestones), with friable consistence . If soils are very shallow (less than 20 cm), Ap-horizon is stony and stone size is small and medium. Structure is mainly subangular blocky, but if texture is loamy crumb structure also occurs.

Except for the very shallow soils, there is a weathered B-horizon (Bs-horizon) below the surface horizon. The colour is mainly brown (7½YR5/4) but also reddish brown colours (5YR5/5) and strong brown colours (7½YR5/6) exist. Soil texture is clayloam, partly loam with friable consistence. Especially for the finer textured Bs-horizons, consistence can be firm, if dry. The B-horizon is mainly stony, with small and medium size limestones.

Propertions of profiles with different textures can be roughly indicated: one third loam texture; one third loam over clayloam and one third clayloam texture.

Impurities.

Texture: Locally Bs-horizon has clay texture. Organic matter content: South of the road to Brize Norton, the organic matter content of the Ap-horizon exceeds 8%. Probably this is due to land use, which is permanent grassland. Soil depth: Soil depth (augering depth) of shallow soils over limestones is often poorly related to rooting depth. In a few pits it was obvious that roots penetrate easily into the limestone if this consists of weathered and broken rock. A rooting depth exceeding soil depth with 20-50 cm was observed. A small number of moderately deep profiles also occur.

Description of a representative profile

A1p 0-15 cm dark brown (7½YR4/3) non-humose, slightly stony, friable, calcareous loam; small limestones, subangular blocky structure

Bs 15-35 cm brown (7½YR5/4) stony, friable, calcareous clayloam; small and medium size limestones

IIC >35 cm weathered limestone.

BCL2-5 Well drained, Brown calcareous soils over limestone. Shallow with clay and clayloam textures.

Only one small area occurs as a narrow strip, very gently sloping towards a dry and shallow valley. In this valley, just south of this area , a well exists, from which a permanent flow of water is running southwards to the moat of Caswell farm.

Soils are developed in drift over limestone. Probably the drift originates from Forest Marble (mapping unit BCFg-3/4), which is outcropping east of this mapping unit. Soils are well drained, mainly with clay textures, but surface horizon has occasionally clayloam texture. The A1-horizon is dark brown (7½YR4/2-4/3), non-humose, very slightly or slightly calcareous and partly slightly stony.
Below the surface horizon there is a weathered B-horizon with brown or reddish brown colours. The texture is stoneless, calcareous or slightly calcareous clay with firm consistence when dry. Limestone starts between 30 and 50 cm depth.
Impurities.
Soil depth: Locally soils are moderately deep. Human influence: In the south of this mapping unit surface is irregular and soils are disturbed, caused by digging in former times (⟼▷).

BCL3-5 Well drained, Brown calcareous soils over limestone. Moderately deep with loam and clayloam textures.

This mapping unit occupies the area south of the road to Brize Norton. The terrain is gently dipping towards the south-east. Surface is level with slopes up to 1 degree.

Soils are developed in drift over limestone, partly in limestone. Texture is mainly loam or loam over clay loam, but also profiles with clayloam textures occur.

The A1-horizon is non-humose with a calcareous or slightly calcareous loam or clayloam texture; slightly stony and subangular structure with friable consistence. The Bs-horizon is reddish brown (5YR-7½YR5/5) to yellowish brown (10YR5/4) with calcareous loam or clayloam texture, mainly stony with limestone gravel or small limestones.

Limestone rock starts between 40 and 80 cm depth, but 50 cm depth is common.

Impurities.

Soil drainage: Near the small mapping unit BCFg-3/4, moderately well drained soils occur, which have a mottled clay layer in the subsoil.

Human influence: Locally soils are disturbed by digging (⟷).

Stoniness: Surface horizon is sometimes stoneless. In subsoil very stony layers occur with a high content of limestone gravel.

Organic matter content: Locally surface horizon is slightly humose.

Description of a representative profile

A1p	0-20 cm	Dark brown (7½YR4/3), non-humose, slightly calcareous loam. Strong subangular blocky with friable consistence; slightly stony, with small angular limestones.
Bs	20-65 cm	Reddish brown (5YR4/4), calcareous firm clayloam; stony with small angular limestones.
IIC	>65 cm	Weathered limestone.

BCL3-5/3. Well drained and imperfectly drained, Brown calcareous soils over limestone. Moderately deep with loam and clayloam textures.

This unit is bordering the area where the limestone dips under the Oxford Clay. Soils are developed in drift over limestone, and surface is level. Also alluvial influence is evident. This is caused by a small brook, which orginates from a spring nearby. The water runs across the area towards the south into the ditches of Black Moat.

The A1-horizon is dark greyish brown or brown, non-humose with slightly calcareous or calcareous loam texture. Structure is subangular blocky with friable consistence. The surface horizon is stoneless. The weathered B-horizon is brown ($7\frac{1}{2}$YR5/4), with gravelly loam or clayloam texture.

In the northern part soils are well drained. To the south imperfectly drained soils with distinct gleying in subsoil are common.

Alluvial influence is characterised by high quantities of limestone gravels in subsoil for some of these soils.

Impurities.

$CaCO_3$-content: Non-calcareous surface or sub-surface layers. Some soils are classified as Brown earths or are integrades to Brown earths.

Brown calcareous soils, partly with gleying (BC(g))

Mottling depth of these soils starts between 30 and 80 cm. In chapter 4.2 weathered B-horizon with gleying is defined by mottling starting within 60 cm depth. For this reason, this mapping-unit is characterized by Brown calcareous soils, partly with gleying.

BC(g)-3/4 Imperfectly drained and moderately well drained Brown calcareous soils, partly with gleying. Deep, with clayloam over clay or clay texture.

Soils are situated in a narrow strip, bordering the limestone landscape. The terrain is very gently dipping towards the south-east. The surface is level with slopes up to 1 degree.
The soils are developed in drift, partly underlain by Oxford Clay within one meter depth.

Surface horizon is dark greyish brown (10YR4/2) to very dark grey (10YR3/1), and non humose or slightly humose. Texture is clayloam or clay, slightly calcareous with subangular blocky structure.

The weathered B-horizon is yellowish brown (10YR5/4) to brown (10YR5/3) and slightly calcareous or calcareous, with clayloam or clay texture. The imperfectly drained soils have a mottled B-horizon. In general, soils with mottling, starting below the Bs-horizon are moderately well drained.

In the subsoil, starting between 40 and 80 cm depth, there is a mottled, light olive grey (5Y6/2), Cg-horizon, partly consisting of Oxford Clay.

Soils are stoneless, except for some surface horizons, which are slightly stony. Mainly surface horizons are non-humose. Near the boundary with Ground-water gley soils, organic matter content is approximately 10-12%. In subsoil, locally white spots or strikes are observed, indicating accumulations of secondary calcium carbonate.

The soil boundary between Brown calcareous soils with gleying and Groundwater gley soils was difficult to delineate because of a gradual change from weathered B-horizon with gleying into a gleyed Cg-horizon.

Impurities.
Texture: Some sites have loam texture in the surface horizon. Subsoil: Near the Groundwater-gley soils, locally limestone gravels are observed within 1 meter depth.

Description of a representative profile.

A1	0-15 cm	Very dark greyish brown (10YR3/2), slightly humose, slightly calcareous clayloam. Subangular blocky, with friable consistence
Bs	15-50 cm	Yellowish brown (10YR5/4), calcareous and firm clay
Bsg	50-70 cm	Brown (10YR5/3), slightly stony and slightly plastic clay with ochreous mottles
Cg	70-100 cm	Light olive grey, very plastic calcareous clay; stoneless with ochreous mottles. Oxford clay.

Brown calcareous soils with gleying (BCg)

BCFg-3/4 Imperfectly drained and moderately well drained soils. Deep and moderately deep with (silty) clay or clayloam over (silty) clay textures.

BCg-2/3 Poorly and imperfectly drained soils. Moderately deep with loam or loam over clayloam textures.

BCFg-3/4. Imperfectly drained and moderately well drained Brown calcareous soils with gleying. Deep and moderately deep with (silty) clay or clayloam over (silty) clay textures.

These soils are mapped north of the road to Brize Norton and in two small areas south of this road. The soils are characterized by (silty) clay textures and in the subsoil a strongly weathered marl has frequently been observed, with light grey to pale yellow colours (10YR7/2-5Y7/3). The medium scale survey has shown that these soils only occur north of the fault on slightly elevated parts of the limestone landscape or in valley sides. The small area north-west of Caswell-farm is south of this fault and is not elevated above the surrounding soils. Here deep clayey soils occur but strongly weathered marl was not observed. Probably the soils of this small area are developed in drift derived from Forest Marble.

In the main soils are developed in Forest Marble or drift over Forest Marble. The terrain is level or nearly level, except near the fault where gentle slopes occur. Soil depth sometimes changes over short distances. The moderately deep soils are underlain by Forest Marble or limestone, usually at 40 to 80 cm depth.

The A1-horizon is dark brown to dark greyish brown (7½YR-10YR4/2), non-humose, with calcareous or slightly calcareous clay or clayloam texture. Structure is mainly strong subangular blocky with firm consistence, when dry.

The Bs-horizon is brown (7½YR5/5-10YR5/3) with firm or slightly pastic, calcareous clay or silty clay, mainly stoneless. Mottling occurs between 40 and 70 cm depth. In the subsoil large white spots of secondary calcium carbonate are common and horizons are often highly calcareous. The moderately deep soils are underlain by a light grey to pale yellow (10YR7/2-5Y7/3) strongly weathered marl, or by limestone. The subsoil of the deep soils consists of calcareous or highly calcareous clay or silty clay, but accumulations of secondary calcium carbonate are less common.

Impurities.

Parent material: Soils of the mapping unit northwest of Caswell farm, are possibly not derived from Forest Marble. Organic matter content: Locally surface horizons are slightly humose.

Description of a representative profile

A1 0-15 cm Dark brown (7½YR4/2) non-humose, slightly calcareous clay; slightly stony with small angular limestones. Strong subangular blocky structure.

Bs 15-40 cm Brown (7½YR5/4) calcareous, slightly plastic silty clay; stoneless

Cg 40-70 cm Light olive grey (5Y6/2), highly calcareous and strongly weathered marl with ochreous mottles; large white spots of secondary calcium carbonate

IIC >70 cm Limestone.

BCg-2/3 Poorly and imperfectly drained Brown calcareous soils with gleying. Moderately deep with loam or loam over clayloam texture, underlain by gravels, partly by limestone.

This area is located south of the boundary of the limestone landscape, near Caswell farm. The terrain is level, but slightly elevated above the surface of the Ground-water gley soils, which are lying east and west of this area. The morphology can be considered an alluvial fan. On both sides of this alluvial fan, a brooklet is traversing the Ground-water gley soils towards the south.

Soils are developed in drift or alluvium. Texture is loam and clayloam, often gravelly in the subsoil. The soils are usually underlain by limestone gravels, starting between 50 and 100 cm depth. In the northern part near Caswell farm, limestone is observed between 80 and 100 cm depth.

In many places soils are strongly influenced by human activity in recent and ancient times. In the north there are the moat and gardens of Caswell farm. In the South within the ditches of Black Moat, foundations, a floor and remnants of a wall are present. North of Black Moat remnants of a more or less oval shaped moat are observed. Also an ancient buried floor is found here. North of this moat two small mounds and probably a carriage-drive towards the moat are observed.

The A1-horizon is very dark grey to very dark greyish brown (10YR3/1-3/2); slightly humose or non-humose; slightly stony with calcareous or slightly calcareous loam texture. Ochreous mottles, along roots or root-channels are sometimes present.

Below the surface horizon colours are brownish with ochreous mottles and soils just meet the requirements for "weathered B-horizon with gleying". This Bs-horizon is brown (10YR5/3), with calcareous gravelly loam or clayloam texture.

In the subsoil there is a light greyish brown or grey and mottled horizon; slightly stony or stony with small limestones and gravels. Texture is mainly clayloam; calcareous or highly calcareous.

Groundwater appeared only in one augerhole 65 cm below the surface.

Impurities.

Human influence: At many sites soils are disturbed by human influence; Soil texture: Horizons with deviating texture are common, especially in subsoil; e.g. sandy clayloam and clay; Soil depth: Locally soils are deep; Limestone in subsoil: It is possible that the limestone in subsoil is not a consolidated rock, but consists of large stones.

Brown earths with gleying (BEg)

BEg-3 Imperfectly drained soils. Deep, with clay or clayloam over clay texture.
BEg-3/2 Imperfectly and poorly drained soils. Deep, with clayloam over clay texture.

BEg-3 Imperfectly drained Brown Earths with gleying. Deep with clay or clayloam over clay texture.

These level soils are located south of the limestone landscape and are developed in drift over Oxford Clay, which usually starts between 40 and 100 cm depth. The soils are imperfectly drained and non-calcareous. In many places the subsoil is slightly calcareous below 50 cm depth.

The A1-horizon is dark greyish brown (10YR4/2) but also very dark grey (10YR3/1) colours occur. Texture is clay or clayloam; non-humose and non-calcareous. Structure is angular and subangular blocky with friable and slightly plastic consistence.

The Bs-horizon is yellowish brown to brown (10YR5/4-5/3) with non-calcareous clay or clayloam texture and plastic consistence. Mottles start in or below the Bs-horizon and mainly between 30 and 60 cm depth. In subsoil there is a plastic or very plastic Oxford Clay, grey or light brownish grey (5Y5/1-6/1-6/2 and 2½Y-10YR6/2), with distinct ochreous mottles.

In the lower part of the Bs-horizon, dark fine spots of secondary manganese are sometimes present. Locally concentrations of gypsum crystals were observed in the Oxford Clay between 70 and 100 cm depth.

Impurities.

Calcium content: Slightly or very slightly calcareous surface horizons are common, partly due to added lime. Locally soils are slightly calcareous over the whole soil depth and are classified as Brown calcareous soils. Drainage class: Moderately well drained soils are observed, especially in the northern part towards the Brown calcareous soils. Organic matter content: surface horizons are in part slightly humose. Colours are then mainly darker (10YR3/1-3/2). Stoniness: Soils are stoneless, except for a few sites with thin gravelly (limestone) horizons.

Description of a representative profile.

A1 0-15 cm Dark greyish brown (10YR4/2) non-humose and non-calcareous clay. Weak angular blocky with hightly plastic consistence.
Bs 15-35 cm Brown (10YR5/3) non-calcareous, plastic clay. Few small limestones. No mottles.
Bsg 35-60 cm Pale brown (10YR6/3), slightly calcareous and very plastic clay. Oxford Clay with grey mottles (5Y6/1).
Cg 60-100 cm Grey (5Y5/1) very plastic clay, partly very slightly calcareous, with few ochreous mottles. Below 80 cm depth large gypsum crystals are abundant.

BEg-3/2 Imperfectly and poorly drained Brown earths with gleying. Deep with clayloam over clay texture.

These soils are laying in a narrow strip between Surface-water gley soils and Ground-water gley soils. Terrain is level, but very gently sloping toward the alluvium of the Ground-water gley soils.

Soils are developed in Oxford Clay and Kellaways Beds, partly with a drift layer superimposed. Soils on Kellaways Beds have different textures; ranging from fine sandy loam to clay and are characterized by their content of fine sand. In this survey soils over Kellaways Beds are only delineated if texture is fine sandy loam or fine sandy loam and sandy clay loam, and if these texture classes continue from the surface to more than 40 cm depth. The soils of this mapping unit have only thin loamy textured horizons near the surface or in the subsoil. Therefore they are not mapped separately.

The soils are imperfectly or poorly drained, non-calcareous in the upper part of the profile and have in general clayloam over clay texture. Subsoils are often slightly calcareous.

The surface horizon has dark brown to very dark greyish brown (10YR4/3-4/2-3/2) colours, non-humose and slightly humose, with clayloam or sandy clayloam texture. Structure is mainly subangular blocky with friable consistence.

The weathered B-horizon with brown and yellowish brown colours (10YR5/4-5/3) extends to 40-60 cm depth. Texture is mainly non-calcareous clayloam,with ochreous mottles starting in or just below this horizon. Consistence is slightly pastic or firm when dry.

The subsoil consists of grey (5Y6/1) and plastic or very plastic clay (Oxford Clay or Kellaways Beds), with ochreous mottles. Below 80 cm depth soils are sometimes calcareous or hightly calcareous with fine sandy loam texture (Kellaways Beds).

In the lower part of the B-horizon, besides ochreous mottles, there are fine dark spots of secondary manganese present.
Accumulations of secondary iron are observed in a subsoil with fine sandy loam texture.

Impurities.

Drainage class: Locally soils with fine sandy loam texture or limestone below 80 cm depth are moderately well drained. $CaCO_3$-content: In the northern part of this mapping unit, near the limestone, a few soils are calcareous.

Non-calcareous Surface-water gley soils (NSG)

NSG-2 Poorly drained, Non-calcareous Surface-water gley soils. Deep, mainly with clay texture.

The soils are located on both sides of the shallow valley with Ground-water gley soils. They are developed partly in Oxford Clay, partly in drift over Oxford Clay. The terrain is level to very gently sloping (up to 1 degree).

The soils are poorly drained, non-humose and stoneless, have clay texture with distinct ochreous and grey mottles starting immediately below the surface-horizon.

The A1-horizon is dark greyish brown (10YR4/2), non-humose and non-calcareous. Texture is clay or clayloam, locally with ochreous mottles around roots or root channels. Structure is angular or sub-angular blocky and consistence is often plastic, or firm when dry.

Below the surface horizon, there is a Cg-horizon with greyish brown to light brownish grey or pale brown colours (10YR-2½Y5/2-6/2; 10YR6/3) with ochreous and grey mottles. This horizon consists of non-calcareous plastic clay, but locally there is clayloam texture to a depth of 40 cm. With depth, gleying increases and colours change to grey (5Y-2½Y6/1; N6/0) with distinct ochreous and grey mottles.

A shallow-gully traverses the area east of the alluvial soils and runs into the Norton Ditch. Here darker coloured (10YR3/2-3/1) surface horizons occur.

Impurities.

Weathered B-horizon: Especially near the boundary with Ground-water gley soils, but also elsewhere, Brown earths with gleying exist. Texture: Near the boundary with soils developed in coarser-textured Kellaways Beds, the surface horizon consists locally of sandy clay loam. In subsoil below 80 cm depth sandy loam and sandy clayloam textures are also observed (Kellaways Beds).

Description of a representative profile.

A1g 0-15 cm Dark greyish brown (10YR4/2), non-humose and very slightly calcareous clayloam. Strong angular blocky with firm consistence. Strong brown (7½YR5/6) mottles along roots.

C1g 15-45 cm Pale brown (10YR6/3), non-calcareous plastic clay with ochreous and grey mottles

C2g 45-100 cm Grey (N6) non-calcareous and very plastic clay with yellowish red (5YR5/8) mottles; Oxford Clay.

Non-calcareous Ground-water gley soils (NGG)

NGG-2 Poorly drained Non-calcareous Ground-water gley soils. Deep, with clayloam and clay texture.

This area is located in the southern part of the valley with a flat alluvial floor. Also Non-calcareous Ground-water gley soils occur in the northern part of this valley, but there they are mapped together with Calcareous Ground-water gley soils as a soil complex.

Soils are developed in alluvium and poorly drained. Locally they suffer flooding, evident from a dense vegetation of rushes, e.g. where the Abingdon Lane traverses the Norton Ditch and in the poplar plantation south of Black Moat. Soil texture is more changeable with depth than for other soils, but in general clayloam and clay dominate in surface and sub-surface horizons, where as below 50 cm depth clay is dominant.

The A1-horizon ranges in colour from dark greyish brown to very dark brown (10YR4/2-3/2-2/2); and is non-calcareous, slightly humose or partly non-humose with clay or clayloam texture. Structure is subangular blocky or crumb. Consistence is strongly related to the organic matter content and ranges from friable to plastic. Ochreous mottles are often observed in the surface horizon.

Below the surface horizon there is a light brownish grey to greyish brown or pale brown (10YR-2½Y; 5/2-6/2-6/3) horizon, with grey and ochreous mottles and with a plastic clay or clayloam texture. In the subsoil gleying increases with depth and the colour changes into grey (5Y5/1-N.5). Locally below 80 cm depth, there is a intensively gleyed horizon (G-horizon) and ochreous mottles are absent. The subsoil usually consists of non-calcareous plastic clay. But thin layers of calcareous clayloam or loam, which contain a high proportion of limestone gravels, are also common.

Approximately 5 minutes after augering the ground-water level was observed in the auger holes. In many of them the groundwater-level was measured between 40 and 100 cm depth but others were dry.

Impurities.

Organic matter content: Locally, e.g. in the poplar plantation south of Black Moat, the organic matter content of the surface horizon exceeds 20%. Other material in subsoil: Some soils are moderately deep and limestone gravels occur between 80 and 100 cm depth. $CaCO_3$-content: In a few sites surface horizon is very slightly calcareous. One site has a calcareous surface and sub-surface horizon and this profile has to be classified "Calcareous ground-water gley soil".

Description of a representative profile.

A1g	0-15 cm	Dark greyish brown (10YR4/2), slightly humose and very slightly calcareous clay. Weak subangular blocky with plastic consistence. Ochreous mottles along root channels.
C1g	15-50 cm	Light brownish grey (2½Y6/2) non-calcareous plastic clay with ochreous mottles
C2g	50-90 cm	Grey (2½Y6/1) plastic clay, with some limestone gravels, partly calcareous. Ochreous and grey mottles are common.
G	90-100 cm	Grey (5Y5/1) very plastic non-calcareous clay. Intensively gleyed without ochreous mottles.

Soil complexes

Mapping units are considered pure, if they are occupied by profiles belonging to only one soil group. Nevertheless nearly all of them contain a small amount of impurities, but their proportions are thought to be less than 30%.

For the large scale map of Caswell two soil-complexes are distinguished.
The first refers to the coarse-textured phase of Kellaways Beds, characterized by a complicated pattern of Brown earths with gleying and Non-calcareous ground-water gley soils, which could not be mapped separately with the effort available. The second is located in the northern part of the shallow valley near the limestone. Here Calcareous- and Non-calcareous ground-water gley soils occur. Their distribution within the mapping unit is approximately known, but here, the soil complex is a result of the inadequate map scale.

BEg/NGG Soil complex of:
Poorly drained or poorly and imperfectly drained Brown earths with gleying;
and
Poorly drained, Non-calcareous ground-water gley soils. Deep, with fine sandy loam and/or sandy clay loam texture.

The soils of this soil complex are developed in the coarse-textured phase of the Kellaways Beds. They are located in narrow strips on very gentle slopes, where Kellaways Beds outcrop in the Oxford Clay (see fig. 2). These outcrops of Kellaways Beds lack clear external terrain features. But concentrations of mole heaps facilitate the prediction and delineation of these soils. In the north the outcrops are present in slightly higher parts of the landscape. To the south they are located on lower parts of the landscape, where Kellaways Beds outcrop in the very gently sloping sides of the valley. This change in relative position is caused by the general slope of the surface, which is less than the dip of the underlying rock (fig. 1: part I Reconnaissance Survey).

The soils are poorly and imperfectly drained and have fine sandy loam and sandy clayloam textures, partly over sandy clay or clay. Apart from profiles with fine sandy loam texture over the whole depth, many profiles are strongly stratified, with alternating layers of sandy clay loam and fine sandy loam and occasionally very thin layers of loamy sand. Soils are also characterized by scattered pebbles of quartzite of small size. The quantities of these pebbles are always very low, but at nearly every site some pebbles are present.

The Brown earths with gleying mainly occupy the slightly higher parts of the landscape and are poorly or imperfectly drained.

The soils, lacking a weathered B-horizon, meet the criteria for Gley soils. According to the differentiating criteria (chapter 4.2) they are classified as Ground-water gley soils. Although their position in the landscape is similar to the surrounding Surface water gley soils, they cannot be considered soils with impeded drainage. Due to soil texture, the pore size distribution and moisture retention data will be quite different. As compared the Surface-water gley soils developed in Oxford Clay, the differences in water content between field capacity and wilting point will be much higher. Also high groundwater level will be observed more frequently and lowering of this level after wet periods will be slower.

The Ground-water gley soils are non-calcareous and all poorly drained.

Non-calcareous ground-water gley soils cover approximately 60% of the mapping units and Brown earths with gleying 40%. All soils of the area in the south-east corner of the surveyed area are poorly drained and the proportions of Non-calcareous ground-water gley soils are higher.

The surface horizon has very dark greyish brown to dark brown (10YR3/2-7½YR4/3) colours with non-calcareous fine sandy loam or sandy clayloam texture. Structure is subangular blocky with friable or very friable consistence. Organic matter content is non-humose or locally slightly humose.

The sub-surface horizon of Brown earths is brown to dark brown (7½YR5/4-4/3) with non-calcareous fine sandy loam or sandy clayloam and mottling start between 20-50 cm depth. Structure varies from single grain tot subangular blocky.

The subsurface of Non-calcareous ground-water gley soils is a light greyish brown to pale brown (10YR6/2-6/3) horizon with non-calcareous fine sandy loam or sandy clayloam texture. There is a distinct mottling starting in, or just below, the surface-horizon. Single grain structure is common for fine sandy loam texture, others show subangular blocky structure.

The subsoil is similar for both soils. Light grey, grey and light brownish grey (2½Y-5Y; 6/1, 6/2, 7/1) horizons with ochreous and grey mottles. The texture is non-calcareous fine sandy loam, locally with thin layers of (sandy) clayloam or predominantly sandy clayloam. In part, the subsoils have a sandy clay or clay texture, usually starting below 60 cm depth.

Sites with secondary manganese have been observed in the lower part of the weathered B-horizons.

Impurities.

$CaCO_3$-content: Locally surface horizons are very slightly calcareous or slightly calcareous. A few soils also have slightly calcareous subsurface horizons and belong to the soil groups Brown calcareous soils or Calcareous ground-water gley soils.

Description of representative profiles.

Imperfectly drained Brown earth with gleying:

A1p	0-20 cm	Very dark greyish brown (10YR3/2) non-humose, slightly calcareous fine sandy loam, with few small limestones. Weak subangular blocky with very friable consistence.
Bs	20-35 cm	Dark brown (7½YR4/3) very slightly calcareous fine sandy loam with a few small pebbles of quartzite; single grain; very friable.
C1g	35-50 cm	Light brownish grey (10YR6/2) non-calcareous fine sandy loam with a few small pebbles of quartzite; single grain, friable; with ochreous mottles.
C2g	50-100 cm	Strong brown (7½YR5/8 non-calcareous strongly stratified horizon. Fine sandy loam alternating with thin layers of sandy clayloam and loamy sand. Matrix colour dominated by ochreous mottling. Consistence ranging from slightly plastic to loose.

Poorly drained Non-calcareous ground-water gley soil:

A1g 0-20 cm Very dark greyish brown (10YR3/2), very slightly calcareous, slightly humose, fine sandy loam; weak sub-angular blocky, very friable, with few ochreous mottles.

C1g 20-50 cm Light brownish grey (10YR6/2) non-calcareous fine sandy loam, with few pebbles of quartzite, ochreous and grey mottles.

C2g 50-70 cm Light brownish grey (2½Y6/2) non-calcareous sandy clay-loam, slightly plastic; strongly mottled

C3g 70-100 cm Grey (5Y5/1) non-calcareous, very plastic clay, with ochreous and grey mottles.

CGG/NGG Soil complex of:
Poorly drained, Calcareous ground-water gley soils and
Poorly drained, Non-calcareous ground-water gley soils; Deep with clayloam and clay textures.

The soils are located in the northern part of the shallow valley. They have clayloam and clay textures and are developed in alluvium. In the north soils are locally underlain by Oxford Clay, towards the south, they are partly underlain by limestone gravels.
In general the soils north of Caswell House are non-calcareous. South of Caswell House soils are calcareous. Both are poorly drained.

The Non-calcareous ground-water gley soils have clay or clayloam over clay textures. Locally Oxford Clay or fine sandy loam occur below 80 cm depth.

The surface horizon is very dark greyish brown te very dark grey (10YR3/2-3/1), slightly humose or humose with clay or clayloam texture. Structure is subangular blocky or crumb. Consistence is friable or very friable. Ochreous mottles along roots or rootchannels are common.

Below the surface horizon there is a light brownish grey ($2\frac{1}{2}$Y6/2) and mottled horizon mainly with clay texture with plastic or slightly plastic consistence. With depth gleying increases and matrix colours change into grey ($2\frac{1}{2}$Y6/1, N6). Soil texture is mainly clay, plastic or very plastic and non-calcareous. Slightly or very slightly calcareous horizons in surface or in subsoil are common.

In the north Brown earths with gleying change gradually into the Non-calcareous ground-water gley soils without external terrain features, which makes delineation difficult.

The Calcareous ground-water gley soils have a bigger range of texture classes and profiles are more stratified.

The surface horizon is very dark greyish brown (10YR3/2), slightly humose or humose, with calcareous or slightly calcareous loam or clayloam texture.

Below the surface horizon there is a Cg-horizon with brownish grey colours. With depth colour changes into grey and gleying increases. Texture is mainly clayloam, but thin layers with loam or clay also exist. In the subsoil many horizons contain some limestone gravels.

The soils are partly underlain by limestone gravels, starting between 80 and 100 cm depth.

Most auger holes contain groundwater and their levels were usually measured, between 60 and 100 cm depth.

5.3 Medium scale map Caswell (Appendix 4)

The sample area Caswell covers an area of 572 ha. But only 446 ha are mapped on scale 1:50 000. An area of 126 ha has only been surveyed on large scale. This part of the soil map is generalized from the large scale soil map (see chapter 7).

The description of the mapping units of the medium scale soil map will not be complete. The soils, soil conditions and properties are described as far as they deviate from those recorded for the large scale map.

BCL-5 Well drained, Brown calcareous soils over limestone. Shallow with loam and clayloam textures.

This mapping unit covers a large part of the limestone landscape. The soils are well drained and developed from limestone or drift over limestone. The terrain is mainly level but gentle slopes are observed near the fault and near valleys. Three valleys are indicated on the map. Two of them are dry valleys. From the valley in the north-east, water is periodically running south-east-wards.

The soils are nearly similar to those described for the large scale mapping unit BCL1-5 (see p.p. 16-17). Only the following will be added. The proportion of very shallow soils (soil depth 15-20 cm) is about 50% of the mapping unit. They have mainly loam texture and are dominant south of the road to Brize Norton. The colour of the surface horizon is locally reddish brown (5YR4/4-4/3). North of this road and north of Caswell House clayloam and loam over clayloam textures are also important and soil depth is more variable.

The organic matter content of the surface horizons is less than 8% (non-humose). Slightly humose A1-horizons are only observed in the area, mapped at large scale.

Outcrops of limestone are observed in small scattered patches, mainly on slopes near the fault and on sloping valley sides. Here large and very large shaly stones are found.

Impurities.

Soil depth: North of the road to Brize Norton and North of Caswell House moderately deep soils occur (mainly 40-70 cm). Their proportions are less than 20%. Texture: Scattered within the area soils with clay texture and angular blocky structure are observed, but their proportions are less than 10%. $CaCO_3$-content: Some soils have non-calcareous or very slightly calcareous surface horizons and a few very shallow soils are non-calcareous over the whole soil depth. Drainage class: South of Astrop farm, where limestone dips under the Oxford Clay, two springs occur. The shallow soils over limestone, just north of these springs, have gleyed horizons and soils are considered imperfectly drained.

BC(g)-3/4 Imperfectly and moderately well drained Brown calcareous soils, partly with gleying within 60 cm depth. Deep, with clayloam over clay or clay textures.

Only one area is delineated, which is described for the large sale map with the same legend code BC(g)-3/4 (see p. 21).
The soils are similar except for organic matter content. Outside the large scale area no sites with slightly humose surface horizons are observed. Therefore, slightly humose surface horizons are disregarded for the mapping unit as a whole.

BCFg-3 Imperfectly drained Brown calcareous soils with gleying. Deep and moderately deep with (silty) clay or clayloam over (silty) clay textures.

The soils are developed in Forest Marble or in drift and are located on slightly elevated parts. They are fine textured, imperfectly drained and in many places underlain by a strongly weathered marl. Five occurrences of this mapping unit are delineated, scattered over the limestone area, mainly north of the fault. Two small areas are located just south of it and are also fine textured, but here the weathered marl was not observed. Probably these soils are developed in drift, derived from Forest Marble.
It should be stated that delineation of soils developed in Forest Marble is mainly based on the lithologic character of soil material.
Areas with (silty) clay textures were delineated, but marl was only observed in some of the sites. On the other hand soils with loam and clayloam textures are called: "soils over limestone". In this case differences in parent material (Great Oolite, Forest Marble and Cornbrash) are not distinguished.
In general the soils of the delineated areas are similar to those described for the large scale map BCFg-3/4 (see p. 22). The following differences are observed:
Drainage class: Soils are imperfectly drained and mottling usually starts between 30 and 50 cm depth. Moderately well drained soils are locally observed but are considered impurities. Structure: The surface horizon has angular or subangular structure. Weathered B-horizon: The colour ranges from brown to light yellowish brown (7½YR5/4-10YR6/4). Subsoil: The deep soils have a grey (2½Y-5Y6/1) subsoil with plastic clay or silty clay texture. This horizon is calcareous or highly calcareous. There is a distinct gleying of ochreous and grey mottles and white spots of secondary calcium carbonate are common.
Impurities.
Drainage class: Moderately well drained soils, some of them with a deep weathered B-horizon are observed. They cover less than 20% of the delineated areas. $CaCO_3$-content: Locally soils are non-calcareous or very slightly calcareous in the surface horizons. The area north of Astrop Farm partly consists of Brown earths and some of these are non-calcareous over the whole soil depth. In subsoil secondary iron and manganese are here observed.

Description of a representative profile.

Alp 0-20 cm Dark brown (7½YR4/2) non-humose, slightly calcareous clayloam. Weak angular blocky.
Bs 20-35 cm Brown (7½YR5/4), slightly calcareous and firm clay; not mottled
Cg 35-75 cm Light grey (10YR7/1) highly calcareous and strongly weathered marl with ochreous mottling
IIC 75-100 cm Grey (5Y6/1) highly calcareous silty clay; intensively gleyed with few light yellowish brown mottles and white spots of secondary calcium carbonate; plastic consistence.

BEg-3 Imperfectly drained Brown earths with gleying. Deep, with clay or clayloam over clay texture.

Two occurrences of this mapping unit are delineated but the area of the large scale map covers most of both areas. For the large scale map they are described as BEg-3 and BEg-3/2 (see p.p.24-25). In addition to this description a few remarks have to be made.

For the large scale map, the soils in the southern area are considered poorly and imperfectly drained. For the medium scale map only imperfectly drained soils are distinguished.

Because of the lower observation density, it was impossible to estimate the proportion of the poorly drained area. For this reason the poorly drained soils are considered impurities for the medium scale soil map.

As distinct from the large scale map, the subsoils of both mapping units have locally fine sandy loam or sandy clayloam texture (Kellaways Beds), usually starting below 80 cm depth.

Impurities.

Drainage class: Moderately well drained soils are observed near the boundary with the limestone landscape. Poorly drained soils are met in the southern occurrence of this mapping unit. Slope: Nearly level slopes up to 2 degrees are locally measured near the boundary with the limestone.

NSG-2 Non-calcareous Surface-water gley soils. Deep, mainly with clay texture.

The soils of this mapping unit are widespread in the Oxford Clay landscape. They are located south of the limestone on both sides of the alluvial valley.
For the large scale map only small areas are surveyed. In spite of this, the description of these soils for the medium scale soil map hardly deviate from those of the large scale map (see p. 26) (mapping unit NSG-2).

The Oxford Clay landscape in this area is characterized by long narrow strips of outcropping Kellaways Beds (coarse-textured phase). The coarse-textured phase is underlain by a heavy clay. Soils developed in outcrops of this clay are mapped together with the nominal Oxford Clay.

In a long shallow depression eroded in this clay, groundwater was measured in a few auger holes and surface horizons are slightly humose.

Slightly calcareous surface horizons or subsoil horizons (below 80 cm depth) are found at scattered sites.

Some of the slopes are steeper than in the area surveyed at large scale. Especially in the western part of the map, north of Abingdon Lane, slopes up to 2 degrees are measured.

For both maps the structure of the surface horizon is recorded subangular or angular blocky. But at the end of the survey period, cracks were visible near the surface, owing to a pattern of very coarse prismatic structure elements.

Large concentrations of gypsum crystals are observed in a slightly calcareous profile, below 60 cm depth.

In the south-western part of the mapped area the limestone dips very gently under the Oxford Clay, without distinct external features. Near this boundary, the Oxford Clay is underlain by limestone, mainly between 80 and 100 cm depth.

Poorly drained Brown earths with gleying are observed, scattered over the delineated areas. Their proportion is estimated less than 10%.

NGG-2 Poorly drained Non-calcareous ground-water gley soils. Deep with clayloam and clay textures.

A large part of this mapping unit is also surveyed for the large sale map. There two mapping units are distinguished: a soil complex, consisting of Calcareous - and Non-calcareous ground-water gley soils (CGG/NGG) and a pure mapping unit of Non-calcareous ground-water gley soils (NGG-2). For the medium scale map they are mapped together as Non-calcareous ground-water gley soils, and Calcareous ground-water gley soils are considered impurities.

The soils are developed in alluvium and located in the flat and shallow valley of the Norton Ditch. They are poorly drained and have predominantly clay and clayloam textures.

The colour of the surface horizon ranges between dark greyish brown and very dark brown (10YR4/2-2/2) and organic matter content is slightly humose or non-humose, but locally organic matter content exceeds 25%. Clay and clayloam textures are common, soils are mainly non-calcareous, and with subangular blocky or crumb structure.

Below the surface horizon there is a mottled horizon with light brownish grey to greyish brown (10YR-2½Y5/2-6/2) colours, with non-calcareous clay or clayloam texture. In subsoil gleying intensifies and colour changes into grey (5Y-2½Y5/1-6/1-6/2) with mainly clay texture and plastic consistence.

Many sites show thin clayloam or lighter textured calcareous horizons, usually containing a certain amount of limestone gravels.

Impurities.

Calcareous groundwater gley soils: South of Caswell House, the water of two brooklets originate from the limestone , enter the valley. Here soils are calcareous and more stratified. Besides clay and clayloam, loam texture is common. Further to the south, Calcareous ground-water gley soils are also observed, but are less common. Approximately 25 - 30% of the area are occupied by Calcareous ground-water gley soils. Subsoil: In the north Oxford Clay occurs locally. Mainly south of Caswell House, but also elsewhere, limestone gravels are found between 80 and 100 cm depth.

COG-2/3 Poorly and imperfectly drained Calcareous gley soils: Undifferentiated. Moderately deep and deep, with clay or clayloam over clay texture.

Only one occurrence of this mapping unit is delineated and represents soils of a valley, located norths-west of Curbridge in the limestone landscape. The soils are developed in alluvium and are partly underlain by limestone within 1 meter depth.

The distinction between "surface-water gley" and "ground-water gley" is not made because the differentiating criteria (chapter 4.2) for Ground-water gley soils and Surface-water gley soils do not appear useful here. Although soils are developed in alluvium with clay texture and groundwater was measured within 1 meter depth, the soils cannot be considered Ground-water gley soils, because they are underlain by limestone. The influence of groundwater in the subsoil will therefore be absent during most of the summer. The soils are mapped as Undifferentiated Gley soils.

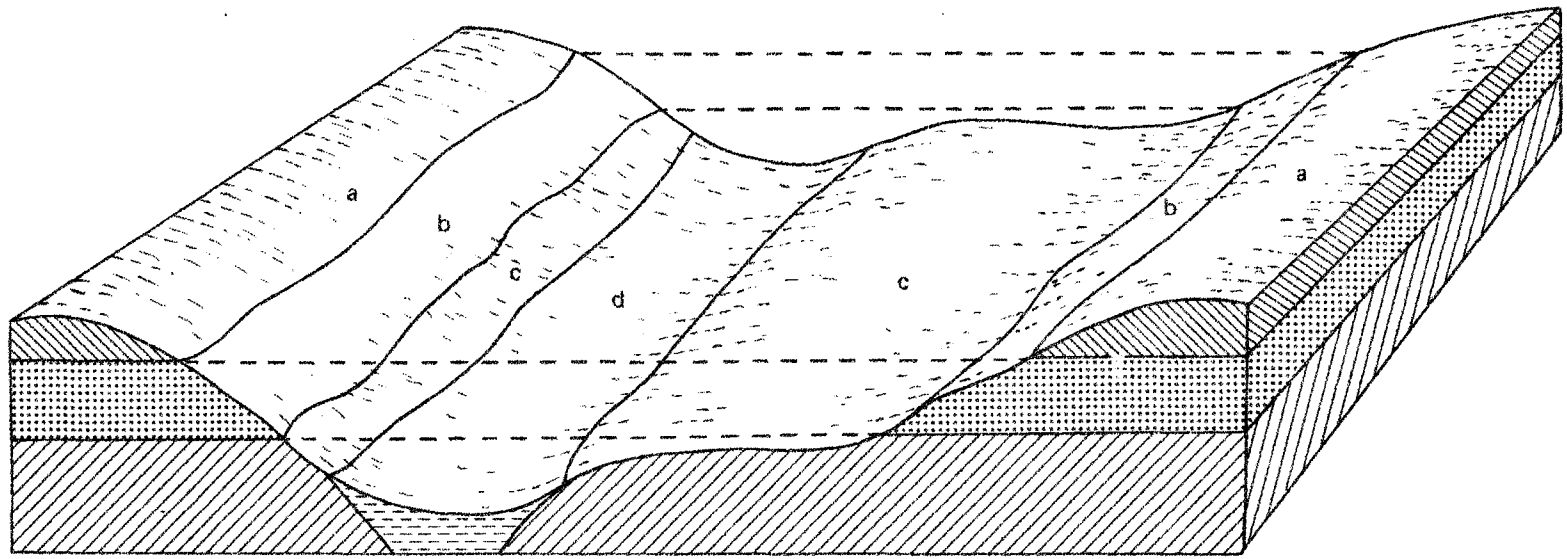
The soils are poorly or imperfectly drained and are developed in alluvium. They are deep or moderately deep and have mainly clay textures, partly underlain by limestone within 1 meter depth. Locally there is a light grey and weathered marl in the subsoil (Forest Marble).

The surface horizon is non-humose, dark greyish brown (10YR4/2) with calcareous clay or clayloam texture. The sub-surface horizon is light brownish grey (10YR-2½Y6/2), mottled, with calcareous clay texture.

The soils are underlain by limestone between 60-100 cm depth, or have deep clay texture.

Impurities.

Shallow soils: They are common on valley sides with convex slopes up to 3 degrees. The surface horizon is calcareous or highly calcareous with clay texture. Below the surface horizon a thin layer of light greyish marl (Forest Marble) is common. Most soils are underlain by limestone within 40 cm depth.



Oxford Clay

Kellaways Beds (loamy phase)

Kellaways Beds (clayey phase)

alluvium

a soils developed in Oxford Clay

b soils developed in the loamy phase of the Kellawaways Beds

c soils developed in the clayey phase of the Kellaways Beds

d soils developed in alluvium

FIG. 2 IDEALIZED BLOCK DIAGRAM, INDICATING INFLUENCE OF LOAMY PHASE OF KELLAWAYS BEDS ON THE LANDSCAPE AND THE DISTRIBUTION OF SOILS

BEg/NGG Soil complex of:
Poorly drained and imperfectly drained Brown earths with gleying and
Poorly drained Non-calcareous ground-water gley soils.
Deep with fine sandy loam, and/or sandy clayloam textures.

A large part of these soils are described for the large scale map. The description of soil properties, soil pattern, landscape morphology and classification, is similar to that of the large scale map (see p.p. 28 - 30). Only a few additions will be made here.

In addition to subangular blocky structures in the surface horizon, single grain and very coarse platy structures are observed.

The colours of the subsurface horizons have a wider range than those described for the large scale map. Light grey (2½-10YR7/1-7/2) colours are frequently observed.

Sites with disturbed surface and subsurface horizons are relatively common as compared to other mapping units.

The Oxford Clay and Kellaways Bed are marine sediments of Upper-Jurassic age. The knowledge about those sediments is rather limited. As described in Geology of the country around Witney: "The lowest zones of the Oxford Clay and the Kellaways Beds, although they undoubtedly pass across the district and floor a considerable area, are known only from wells , borings and chance exposures "(Arkell and Dynes, 1946).

The fine sandy texture and their stratification in thin or very thin layers, may indicate that these Kellaways Beds are probably deposited in a shallow sea under tidal marsh conditions. Pebbles of quartzite are common but coarse sand is absent. This indicates that the pebbles do not belong to the Kellaways Beds. Maybe the pebbles originate from a nearly coast. Transportation by running water and simultaneous deposition in a shallow sea, during sedimentation of the Kellaways Beds are possible explanations.

The occurrences of Kellaways Beds seem to have had great influence on the actual landscape. The soils developed in the loamy-textured phase of the Kellaways Beds are delineated in narrow strips (see fig. 2, p. 38). It appears that outcrops of these loamy beds will only remain in narrow strips, mainly on very gentle slopes. This indicates that the loamy-textured phase of the Kellaways Beds are particularly susceptible to erosion. Generally, the soft clays above and below the loamy-textured phase of the Kellaways Beds would be expected to be more erosion-prone than these coarser beds. Here the opposite appears to be the case. One explanation may be that where the loamy beds are exposed to the surface, they will be saturated with water for relatively long periods, due to the very low permeability of the underlying clay. As a result rapid erosion may take place and outcrops will only remain in narrow strips. In such a case the location of valleys will be determined by the occurrence of coarse textured sediments near the surface. In this area the valley of the Norton Ditch and the shallow valley just east of the large scale area have been developed as a consequence of the fine sandy loam texture (the coarse phase) of the Kellaways Beds.

5.4 Sample area Yelford

Sample area Yelford covers 520 ha. It is situated north-east of the village of Aston. This area also consists o f two different landscapes. The northern part is typical for the undulating landscape of the Oxford Clay, characterized by scattered remnants of the oldest river terrace (Hanborough Terrace).

The southern part represents the oldest stage of Thames valley landscape, with slightly elevated remnants of the youngest river terraces (Summertown-Radley and Flood Plain Terraces).

The undulating character of the landscape is caused by a number of remnants of the Hanborough Terrace, which protects the underlying Oxford Clay against erosion. Where Oxford Clay is exposed to the surface erosion has taken place and valleys traverse the landscape towards the Thames valley in the south. Near terrace remnants, valleys are deeply incised. The terrace remnants are nearly level and range in altitude between 270 and 300 ft. The Oxford Clay shows more differences in altitude. The highest parts are outcropping just below the level of the terrace remnants and have sloping surfaces. Parts where terrace remnants are absent have lower altitude and surfaces are more level.

The landscape of the Thames alluvium in this area is flat and altitude ranges from 210 to 220 ft. Here, villages and farms are only situated on the slightly elevated Summertown - Radley terrace and Flood Plain terrace. The natural drainage pattern of the alluvial soils in this area is towards the south-east.

Land use

In the Oxford Clay landscape both pasture and arable farming occur but on the terraces arable farming is common. Grassland is used for both dairying and beef production. A large proportion of the alluvial soils of the Thames Valley landscape in this area is subjected to arable or ley farming.

Only a few fields near Claywell Farm and one field just West of the Rectory of Yelford have been in permanent grassland for long periods. This is indicated by darker coloured A1-horizons, which contain a relatively high amount of organic matter. The horizons have a good structure and are also characterized by dark reddish brown or brown mottles, which are usually absent in the surface horizons elsewhere.

The area surveyed at large scale (fig. 1; area A)

The soil map covers an area of 97 ha, and the fields belong to three different farms. The range of soils and the soil distribution of this area are fairly similar to those of the whole sample area. But the more level parts of the Oxford Clay landscape with Non-calcareous Surface water gley soils are poorly represented in the area surveyed at large scale.

Also terraces surrounded by alluvial soils, which are accompanied by some special soil features, are absent in this area.

5.5 Large scale map Yelford (Appendix 2)

Brown calcareous soils (BC)

BCT-5 Well drained soils over terraced gravels. Moderately deep and shallow soils with loam or loam over clayloam texture.

BC(g)-3/4 Moderately well drained and imperfectly drained soils with gleying. Deep soils with loam and/or clayloam texture, underlain by clay

BCg-2/3 Imperfectly and poorly drained soils with gleying. Deep with clayloam over clay or clay textures.

BCT-5 Well drained Brown calcareous soils over terraced river gravels. Moderately deep and shallow with loam or loam over clayloam texture.

This mapping unit represents the soils located on top of Rickless Hill. The soils are well drained and developed in drift over river gravels or in river gravels. The surface of the southern part of the mapped area is level, the northern part is situated on slightly lower level and is slightly sloping up to 1 degree towards the north-east. The soils are moderately deep or shallow with loam or loam over clayloam texture underlain by river gravels, usually starting between 30-90 cm depth.

The surface horizon is dark brown to dark greyish brown (7½YR-10YR3/2-4/2) and has non-humose and calcareous loam texture; subangular blocky structure and friable consistence. Most surface horizons are stony, with predominantly small stones and gravels (limestone, flint, quartzite).

Below the surface horizon there is a brown to dark brown (7½YR5/4-4/4) weathered B-horizon, mainly stony, with calcareous loam or clayloam texture. If soils are underlain by gravels within 30 or 40 cm depth texture is mainly loam and subsurface horizon is sometimes very stony. In the subsoil of the moderately deep soils, clayloam texture with plastic consistence is more common and colours change into light brown or reddish yellow.

Impurities

Soil depth: Locally soils are deep. Drainage class: Near the boundary of the mapping unit some soils are mottled in subsoil and soils are considered moderately well drained. Soil texture: Some sites have a thin horizon with sandy texture. Instead of gravel, soils are locally underlain by sand.

Description of a representative profile.

A1p 0-25 cm Very dark greyish brown (10YR3/2), non-humose, slightly calcareous loam; stony with small stones (limestone and flints); weak subangular blocky structure; friable.

Bs 25-70 cm Dark brown (7½YR4/4) changing with depth into light brown (7½YR6/4), calcareous clayloam; stony with small stones and limestone gravels; slightly pastic, no mottles

IIC >70 cm Limestone gravels.

BC(g)-3/4 Moderately well-drained and imperfectly drained Brown calcareous soils with gleying starting between 40 and 80 cm depth. Deep soils with loam and/or clayloam textures, underlain by clay.

The soils of this mapping unit are located in a narrow strip, surrounding the mapping unit (BCT-5) with soils underlain by terrace gravels. The terrain is slightly sloping with convex slopes up to 3 degrees.
The soils are developed in drift (Head) over Oxford Clay, starting within 40-80 cm depth.

The surface horizon is dark brown to dark greyish brown (10YR-7½YR 3/2-4/2) non-humose, and has calcareous loam or clayloam texture. It has subangular blocky structure, friable or slightly plastic consistence and is slightly stony or stony with small stones (limestone, flint, quartzite).

The weathered B-horizon is yellowish brown or dark yellowish brown (10YR5/4-4/4) slightly stony or stony with mainly calcareous clayloam texture. Some soils are mottled in the lower part of the B-horizon, but mottling mainly starts in the underlying Oxofrd Clay.

The Oxford Clay has plastic or very plastic consistence and starts within 40-80 cm depth. Colours are grey or olive (2½Y-5Y5/1-6/1 or 5Y5/5) with ochreous and grey mottles. It is a calcareous or highly calcareous and stoneless clay. White spots of secondary calcium carbonate are common. Large accumulations of secondary iron-oxides are only observed at one site.

In a few auger holes groundwater was measured between 80 and 100 cm depth. Obviously, here the groundwater present in the terraced gravels is thown out by the underlaying Oxford Clay and seems to be responsible for the existence of secondary minerals.

Impurities

Subsoil: Instead of Oxford Clay, locally soils are underlain by gravels.

Description of a representative profile.

A1p	0-20 cm	Dark greyish brown (10YR4/2) non-humose, slightly calcareous loam, stony with small flints and limestone; subangular blocky structure with slightly plastic consistence.
Bs	20-65 cm	Yellowish brown (10YR5/4), gravelly and calcareous clayloam; slightly plastic.
Bsg	70-80 cm	Yellowish brown (10YR5/6), calcareous clayloam, slightly plastic, with ochreous mottles.
IICg	80-100 cm	Olive (5Y5/5), highly calcareous and very plastic clay (Oxford Clay). Large spots of white (2½Y8/1) secondary calcium carbonate are common.

BCg-2/3 Imperfectly and poorly drained Brown calcareous soils with gleying. Deep soils with clayloam over clay or clay textures.

These soils are developed in outcropping Oxford Clay and are located on the sloping sides of Rickless Hill. The terrain is gently sloping with convex and straight slopes of 2 to 5 degrees. Mainly the Oxford Clay is overlain by a thin drift layer, consisting of a slightly stony clayloam.

The surface horizon is dark greyish brown (10YR4/2), non-humose, slightly calcareous or calcareous with clayloam or clay texture and slightly plastic consistence, or firm when dry. The structure is angular or subangular blocky.

The weathered B-horizon has calcareous clay or clayloam texture, but clay texture is more common than in the surface horizons. As compared with other Brown calcareous soils, the colours of the B-horizons are less bright and range from brown to pale brown and light yellowish brown (10YR-2½Y5/3-5/4-6/3-6/4).

Mottling starts within 20-50 cm depth. The horizon is slightly stony and has plastic or firm consistence.

Cg-horizons start between 40 on 70 cm depth and have grey colours (2½Y-5Y5/1-6/1) and distinct ochreous mottling. Soil texture is clay with plastic and very plastic consistence. In subsoil, and locally over the whole depths of the Cg-horizon, white spots of secondary calcium carbonate are common.

Very thin layers of gravel are locally observed just below or in the drift layer.

Impurities.

CaCO3-content: A few soils have non-calcareous and very slightly calcareous horizons and are considered Brown earths with gleying.

Description of a representative profile.

A1p	0-15 cm	Dark greyish brown (10YR4/2), non-humose, calcareous clayloam. Weak angular blocky structure with slightly plastic consistence, slightly stony (small flints and limestones).
Bs	15-30 cm	Pale brown (10YR6/3), calcareous and plastic clay; slightly stony (limestone gravels); no mottles.
Bsg	30-40 cm	Light yellowish brown (2½Y6/3), calcareous and plastic clay with ochreous mottles; few spots of secondary calcium carbonate.
IICg	40-100 cm	Grey (5Y6/1), highly calcareous and very plastic clay with ochreous mottles; many white spots of secondary calcium carbonate; stoneless.

BEg-3 Imperfectly drained Brown earths with gleying. Deep soils with clayloam texture, partly underlain by clay or loam textures.

These soils are located on the boundary of Oxford Clay landscape and Thames valley landscape. In this area, they are always bordering mapping units with Ground-water gley soils. They are partly developed in drift over Oxford Clay and partly in alluvium.

The soils are imperfectly drained and have non-calcareous clayloam texture. In general the terrain is level but near the boundary with Surface-water gley soils, nearly level and gentle slopes up to 3 degrees occur.

The soils developed in drift are slightly stony (small flints), the others are stoneless.

The A1-horizon is dark greyish brown to dark brown (7½YR-10YR4/2), non humose, with non-calcareous clayloam texture. The structure is subangular blocky, with friable or slightly plastic consistence.

The weathered B-horizon has brown to (light) yellowish brown colours (10YR5/3-5/4-5/5-6/4) and has non-calcareous and usually slightly plastic clayloam texture. The lower part of this horizon, below 40 cm depth, is mottled and dark fine spots of secondary manganese are common.

A light brownish grey (2½Y6/2) and mottled C-horizon starts between 40 and 80 cm depth. Clayloam texture is common but near the boundary with Surface-water gley soils, subsoils have clay texture. The soils developed in alluvium are more stratified in the subsoil and loam or sandy loam textures are often observed below 70 cm depth.

Many soils have calcareous subsoils below 70 cm depth. If developed in alluvium, these subsoils usually contain small or large quantities of limestone gravels.

Impurities

Moderately deep soils: Some soils developed in alluvium are underlain by limestone gravels starting below 80 cm depth. Poorly drained: Poorly drained Brown earths are observed near the boundary with Surface-water gley soils and also near the boundary with Ground-water gley soils.. Their proportion is less than 10%. Organic matter content: One field in the eastern part of the map is under permanent grass. Here organic matter content range from 7 to 10% and colours are usually darker (very dark greyish brown-10YR3/2). The consistence is friable. Also, the texture of surface horizons is often considered loam. It is possible that the estimate of clay content is influenced by the relatively high organic matter content and the more friable consistence.

Description of a representative profile.

A1p	0-20 cm	Dark brown (7½YR4/3), non-humose, non-calcareous clayloam; subangular blocky with friable consistence.
Bs	20-45 cm	Yellowish brown (10YR5/4), non-calcareous clayloam, slightly plastic; few small stones (flint and limestone)
Bsg	45-80 cm	Yellowish brown (10YR5/4), very slightly calcareous clayloam with ochreous mottles; few small stones.
C1g	80-90 cm	Yellowish brown (10YR5/5), calcareous loam; mottled, with a large quantity of limestone gravels.
C2g	90-100 cm	Brown (7½YR5/5), calcareous clay with grey mottles.

CSG-2 Poorly drained Calcareous Surface-water gley soils. Deep soils with clay or clayloam over clay textures.

In common with the Brown Calcareous soils with gleying (BCg-2/3) these soils are also located on the sloping sides of Rickless Hill, but further downslope. They are also developed in Oxford Clay or drift over Oxford Clay.
Although the permeability of Oxford Clay is very low, the flow of groundwater, which originates from the highly calcareous terraced gravels, seemes to be sufficient to prevent decalcification of these soils. Even in the subsoils, enrichment with secondary calcium carbonate is obvious.

The soils are poorly drained and have clay or clayloam over clay textures. They are located on convex and straight slopes of 3 to 5 degrees. The soils are stoneless, except for the drift layer, which is slightly stony (small angular flints).

The surface horizon is dark greyish brown (10YR4/2), non-humose with calcareous or slightly calcareous clay or clayloam texture. Structure is angular or subangular blocky with slightly plastic or plastic consistence.

Below the surface horizon there is a light brownish grey to light olive brown (2½Y6/2-5/3), gleyed horizon, usually with plastic clay texture.

In the subsoil gleying intensifies and colours change into grey (5Y5/1-6/1). The texture is a very plastic and stoneless clay, calcareous, partly with large white spots of secondary calcium carbonate.

Description of a representative profile.

A1	0-25 cm	Dark greyish brown (10YR4/2), non-humose, calcareous clayloam, angular blocky with slightly plastic consistence.
Cg	25-60 cm	Light olive brown (2½Y5/3), calcareous and plastic clay; gleyed horizon with small flints.
IICg	60-100 cm	Grey (5Y5/1), calcareous, very plastic clay; gleyed horizon with white spots of secondary calcium carbonate ; belemnites (Oxford Clay).

NSG-2 Poorly drained Non-calcareous Surface-water gley soils. Deep soils with clay or clayloam over clay textures.

The Non-calcareous Surface-water gley soils delineated on the large scale map, are only located on the lowest parts of the sloping sides of Rickless Hill. Three very small areas are delineated.

The soils are developed in Oxford Clay or drift over Oxford Clay. The thickness of the driftlayer varies from 20-80 cm
The terrain has gentle slopes up to 4 degrees. The soils are poorly drained and have clay or clayloam over clay texture.

The surface horizon is dark greyish brown (10YR4/2), non-humose and has non-calcareous clay or clayloam texture, with subangular blocky structure.

Below the surface horizon, there is a gleyed horizon with light brownish grey to light yellowish brown ($2\frac{1}{2}$Y6/2-6/3) colours. The texture is usually clay; plastic and non-calcareous. The subsoil has grey colours and a very plastic clay texture. The subsoils are partly calcareous or slightly calcareous below 50 cm depth.

Non-calcareous ground-water gley soils (NGG)

NGG1-2 Poorly drained soils. Deep, with clayloam over loam texture
NGG2-2 Poorly drained soils. Deep, with clay over clayloam texture and usually loam in subsoil.

NGG1-2 Poorly drained, Non-calcareous ground-water gley soils. Deep soils with clayloam over loam texture, partly loam over clay texture.

The soils are developed in the alluvium of the Thames Valley and have usually clayloam texture and are underlain by calcareous fine sandy loam or loam.

South of the road the soils differ less from eachother and no pattern of ancient river courses was observed. Probably the soils are developed in "basin-like" deposits. The soils of this mapping unit, located north of the road, have more stratified subsoils and alluvial influences are obvious. Also the surface-horizons show more differences. Partly, they are slightly humose or humose and have loam texture. This is especially the case for the soils near Claywell Farm, where a valley from the Oxford Clay runs into the Thames Valley.

The surface horizons are dark greyish brown (10YR4/2), non-humose and have non-calcareous clayloam texture. The structure is usually subangular or angular blocky and they have slightly plastic consistence.

The subsurface horizon is light to greyish brown or pale brown (10YR-2½Y5/2-6/2-6/3) with distinct mottling and has non-calcareous clayloam texture. Staining with fine spots of secondary manganese is common. The consistence is slightly plastic or plastic. At many sites the upper part of this horizon was dry and had firm consistence.

Usually below 70 cm depth, the soils are underlain by light brownish grey or greyish brown to grey (2½Y-10YR5/2-6/2-6/1), calcareous or hightly calcareous fine sandy loam or loam, with distinct ochreous mottles. In part this layer has reddish yellow or strong brown colours (7½YR4/6-5/6-6/6) without, or only a few grey mottles. These colours are probably caused by enrichment of secondary iron. Calcium-carbonate concretions are common (puppets). They have an irregular rounded shape and are often from 1 to 3 cm across.

The alluvial soils of this sample area represent an older stage of the Thames deposits. As compared with the alluvial soils of the younger stage (sample area Great Brook), soils are strongly decalcified and below the surface horizon colours are more dull and stained by fine spots of secondary manganese.

The groundwater level is often measured between 80 and 100 cm depth. North of the road all auger holes show groundwater. Groundwater levels between 50 and 70 cm depth are observed in the valley near Claywell Farm.

Impurities.

Most impurities belong to the soils located north of the road. The soils located south of the road can be considered "pure". Organic matter content: The field in the valley near CLaywell Farm and the one in the eastern part of the map, north of the road, are under permanent grass. Here, the surface horizons are darker coloured (10YR3/2-3/1) and organic matter content ranges from 8-13%. Near Claywell Farm humose surface horizons also occur. Texture: North of the road, surface horizons with loam texture are common. Calcareous soils: A slightly Calcareous groundwater gley soils is observed near the eastern boundary of this sample area (valley influence). Subsoils: Locally soils are underlain by limestone gravels below 80 cm depth. Stones: Generally soils are stoneless.

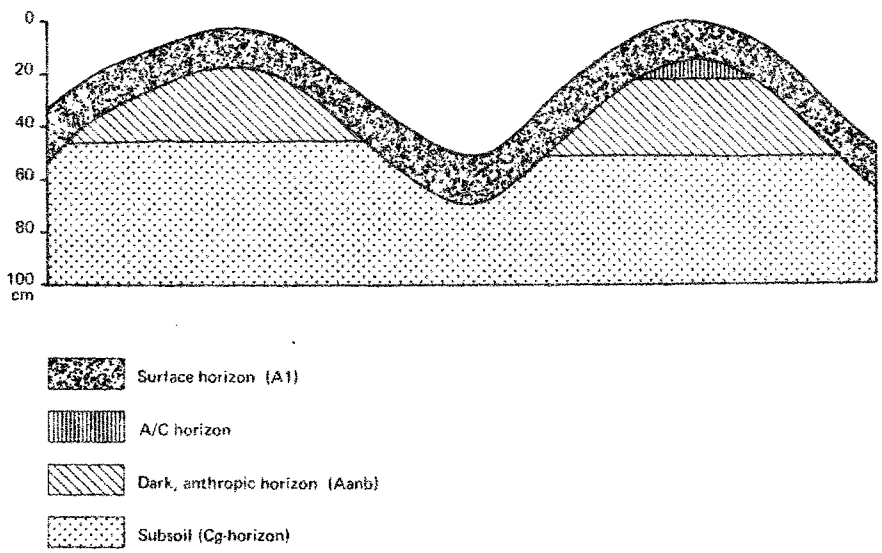


FIG. 3 CROSS-SECTION

Position of an anthropic and buried A-horizon in a field with a ridge and furrow system near Yelford

But in the valley near Claywell Farm, the subsoils are slightly stony (small flints and quartzites). Subsoils with a certain amount of limestone gravels below 80 cm depth are scattered all over the mapping unit. Human influence: Just west of the Rectory of Yelford, dark grey (2½Y4/1) buried A1-horizons are observed below the surface horizon (see fig. 3). They have a thickness of about 35 cm and contain ancient pottery fragments, charcoal and phosphorous spots. Here the surface has an irregular pattern of ridge and furrow. This A1b-horizon does not exist in the middle of the furrows. Problably this indicates that this settlements period is older than the ridge and furrow system. Very thin buried horizons are also observed more to the west. Here they occur deeper in the subsoil.

Description of a representative profile.

A1g	0-20 cm	Dark greyish brown (10YR4/2), non-humose and non-calcareous clayloam; subangular blocky and slightly plastic consistence.
C1g	20-75 cm	Light brownish grey (2½Y6/2), non-calcareous clayloam. Mottled horizon with ochreous mottles and dark fine spots of secondary manganese. Firm consistence in the upper part, slightly plastic in the lower part.
C2g	75-100 cm	Reddish yellow (7½YR5/6), highly calcareous loam with a few grey mottles. Slightly plastic consistence. Many irregular rounded concretions of secondary calcium-carbonate (puppets).

NGG2-2 Poorly drained, Non-calcareous ground-water gley soils. Deep soils with clay over clayloam texture and usually underlain by calcareous loam in the subsoil.

Two occurences of this mapping unit are delineated which are located within mapping unit NGG1-2. The soils differ from these of mapping unit NGG1-2 only by clay content of the surface-and subsurface horizon.

The soils are poorly drained and have non-calcareous clay over clayloam texture. They are usually underlain by calcareous fine sandy loam or loam. The soils are also developed in the alluvium of an older stage of Thames deposits.

The surface horizon is dark greyish brown (10YR4/2), non-humose and has non-calcareous clay texture with plastic consistence. The structure is angular or subangular blocky, but many surface horizons are also slaked and structureless.

The subsurface horizon is grey to light brownish grey or greyish brown (2½Y6/1-6/2-5/2), and have non-calcareous clay texture with plastic consistence or firm when dry. The horizon is distinctly gleyed and also fine spots of secondary manganese are common. Between 40 and 80 cm depth, the texture changes into non-calcareous clayloam.

Most soils are underlain by calcareous or highly calcareous fine sandy loam or loam, below 80 cm depth. Partly the colour is grey to light brownish grey or grey brown (2½Y6/1-6/2-5/2). Also,many subsoils have reddish yellow or strong brown (7½YR4/6-5/6-6/6-6/5) colours, without mottles, indicating enrichtment of secondary iron. Also concretions of calcium carbonate are common (see p. 46).

In many auger holes groundwater is measured between 80 and 100 cm depth.

Impurities. (less than 10%).
A few soils are underlain by gravel below 80 cm depth. Locally clayloam texture is observed in the surface horizon.

Description of a representative profile.

A1p	0-20 cm	Dark greyish brown (10YR4/2), non-humose and non-calcareous clay. Structureless and slaked horizon with plastic consistence.
C1g	20-65 cm	Light brownish grey (2½Y6/2) non-calcareous clay. Gleyed horizon with plastic consistence.
C2g	65-85 cm	Light yellowish brown (2½Y6/3), non-calcareous clayloam. Gleyed horizon with fine spots of secondary manganese and with plastic consistence. Groundwater level at 80 cm depth.
C3g	85-100 cm	Reddish yellow (7½YR6/6), highly calcareous loam with grey mottles. Some large concretions of calcium carbonate (puppets).

5.6 Medium scale map Yelford (Appendix 4)

This sample area covers 520 ha. Only 423 ha are mapped on scale 1:50 000. 97 ha have only been surveyed for the large scale map. This part of the soil map is generalized from the large scale soil map (see chapter 7).

The description of the mapping units of this medium scale map will not be complete. The soils, soil conditions and soil properties are here described in as far as they deviate from these recorded for the large scale map.

Where important, references are made to the description of similar mapping units of the large scale map.

Brown calcareous soils over terraced river gravels (BCT)

BCT-5 Well drained shallow soils with loam and loam over clayloam textures.

BCT-4/5 Well drained and moderately well drained, moderately deep and shallow soils. Predominantly loam and clayloam textures.

BCT-5 Well drained, Brown calcareous soils over terraced river gravels. Shallow, with loam and loam over clayloam textures.

Only one occurrence of this mapping unit is delineated. The soils are developed in terraced river gravels of Hanbourough stage, locally in drift over river gravels. They are shallow, soil depth ranges from 20 to 40 cm. The landscape is level except for a few small ridges, usually less than 1 meter high.

The surface horizon is dark brown (7½YR4/3-4/2-3/2), non-humose and has calcareous loam texture, which is stony or very stony (small flints, quartzites and limestones). The structure is subangular blocky or single grain and consistence is friable or very friable.

Many soils are underlain by terraced river gravels, directly below the surface horizon. Others have a brown subsurface horizon with calcareous and stony loam or clayloam texture. Usually the soils are underlain by terraced river gravels within 40 cm depth.

Impurities.

Soil depth: Near the boundary of this delineated area moderately deep soils are observed.

Description of a representative profile.

A/Bp 0-25 cm Dark brown (7½YR3/2), non-humose, calcareous loam. Subangular blocky structure and friable consistence. Stony with small flints, quartzites and limestones.

IIc >25 cm Highly calcareous limestone gravels.

BCT-4/5 Well drained and moderately well drained Brown Calcareous soils over terraced river gravels. Moderately deep and shallow, with predominantly loam and clayloam textures.

Five occurrences of this mapping unit are delineated. Three of these are located in the Oxford Clay landscape on terraces of Hanbourough stage. Two others are located in the Thames Valley landscape on terraces of Summertown-Radley and Flood Plain stage. The landscape is level, except for a few small ridges, which are slightly elevated up to 1 meter.

For the medium scale map, two mapping units (BCT-5 and BC(g)-3/4) of the large scale map, are mapped together (see p.p.40- 41). Generally it means that the medium scale mapping unit BCT-4/5 consists of soils located on the central parts and the very slightly sloping sides of the terraces.

The surface horizon of the shallow soils is dark brown to dark greyish brown (7½YR-10YR3/2-4/2-4/3), non-humose, with slightly calcareous or calcareous loam texture. The soils have subangular blocky structure and friable consistence. They are usually stony and underlain by gravels starting within 40 cm depth. The surface horizons of moderately deep soils have loam or clayloam textures and are usually slightly stony.

The weathered B-horizon is dark yellowish brown or brown to dark brown (7½YR-10YR4/4-4/5-5/4) and has calcareous loam or clayloam texture which is slightly stony or stony (small flints, quartzites and limestones). Some of the soils with a soil depth of more than 60 cm are gleyed in the lower part of the subsoil. Near the very slightly sloping sides of most terraces, deep soils are observed underlain by Oxford Clay. The Oxford Clay is calcareous or highly calcareous and enrichment with secondary calcium carbonate is common.

The well drained soils are common on the central parts of the terraces, and their proportion is estimated to be 60%. The moderately well drained soils are concentrated near the boundaries of the delineated areas, but also scattered over all occurrences some moderately well drained soils are observed.

Impurities.

Drainage class: Imperfectly drained soils are observed near the boundary of the delineated areas and locally in the central parts if soils are deep and have clayloam or clay texture. Soil depth: Terrace gravel within one meter is absent where soils are deep. This is the case where soils are developed in a thick drift layer or if soils are underlain by Oxford Clay. Brown earths: Locally non-calcareous soils are observed developed in a drift layer with a depth of more than 1 meter. Subsoil: Locally soils have sandy loam or sandy subsoil.

For profile descriptions see p.p. 40-41.

BCg-3 Imperfectly drained, Brown calcareous soils with gleying. Deep, with predominantly clayloam and loam textures.

These soils are associated with the Summertown-Radley terraces and are found in narrow strips between these terraces and the Thames alluvium.

The soils of this mapping unit do not correspond to the soils of any mapping unit of the large scale map. Their position in the landscape has some similarity with mapping unit BC(g)-3/4 of the large scale map. But the soils are hardly elevated above the level of the floodplain and subsoils are coarse textured.

The terrain is very gently sloping towards the alluvium and soils are developed in drift, partly underlain by alluvium. The textures of these soils are variable, but loam and clayloam textures predominate.

The surface horizon is dark brown to dark greyish brown (7½YR-10YR4/2-4/3), non-humose, and has calcareous or slightly calcareous clayloam or loam textures with subangular blocky structure. The surface horizon is usually slightly stony (small flints and limestones).

Below the surface horizon there is a weathered B with yellowish brown to brownish yellow and brown (10YR-7½YR5/4-6/5) colours, which has slightly calcareous or calcareous clayloam or loam textures, usually slightly stony. Mottling starts at about 40 cm depth in the lower part of the Bs-horizon or just below this horizon.

The subsoil has brown to brownish yellow or reddish yellow colours (7½YR-10YR5/5-6/5-6/6) with grey mottles and has calcareous clayloam or loam textures.

Impurities.

Surface horizon: Locally with clay texture. Subsoil: Oxford Clay or river gravels have been observed below 80 cm depth.

BEg-3 Imperfectly drained Brown earths with gleying. Deep soils, with predominantly clayloam texture, and partly with loamy subsoil.

These soils are observed in three different landscape positions.

a. On the boundary between the Oxford Clay landscape and the alluvium. The soils are partly developed in drift over Oxford Clay, and partly in alluvium.
b. In a narrow and incised valley, running through the Oxford Clay landscape between remnants of the Hanbourough terraces. The soils are developed in colluvium.
c. In the alluvium of the Thames Valley and located between the Summertown-Radley terraces. The soils are developed in alluvium.

The large scale map represents only Brown earths of landscape position a. There, they are sufficiently described (see p. 43; mapping unit BEg-3). As far as the Brown earths of the landscape positions b and c deviate from these, the differences will be recorded.

The Brown earths in the narrow valley are developed in colluvium. Soils are more stratified. Clayloam and loam textures are common but also clay texture in subsurface horizon or in subsoil occurs. Slightly stony horizons are common and locally a stony horizon in the subsoil has been observed (predominantly small flints). The colours of some loamy textured subsoil-horizons indicate enrichment with secondary iron.
The soils, just near the brooklet are better drained (drainage class 4) and Bs-horizons are stronger developed.

The Brown earths developed in alluvium near the Summertown-Radley terraces are characterized by loam or siltloam texture in subsoil. The surface horizon has a non-calcareous loam or clayloam texture. The structure is subangular blocky and consistence is usually friable.

The weathered B-horizon is yellowish brown (10YR5/4) and has non-calcareous loam or clayloam texture. Mottling starts about 40 cm depth. Ochreous mottles and dark fine mottles of secondary manganese are common.

In the subsoil there is a gleyed Cg horizon with loam or siltloam texture. Locally subsoils are calcareous or highly calcareous and river gravels occur within 1 meter depth.

For profile description see p. 43.
Description of a representative profile of the southern occurrence:

Ap 0-20 cm Very dark greyish brown (10YR3/2), non-humose and non-calcareous loam, subangular blocky structure; friable.
Bs 20-40 cm Yellowish brown (10YR5/4), non calcareous loam with friable consistence.
Bsg 40-55 cm Pale brown (10YR6/3), non calcareous clayloam with ochreous mottles and dark fine mottles of secondary manganese; slightly plastic consistence.
Cg 55-100 cm Pink (7½YR7/4), calcareous sandy loam, with grey mottles and some limestone gravels.

NSG-2 Poorly drained Non-calcareous Surface water gley soils. Deep soils with clay or clayloam over clay textures.

This mapping unit represents the more or less level parts of the Oxford Clay landscape. Usually the horizon is level or nearly level with slopes up to 2 degrees, but near terrace remnants or valleys, gentle slopes up to 4 degrees are observed.

On the Oxford Clay is partly superimposed a drift layer with a thickness of 20-80 cm. The soils are developed in Oxford Clay or in drift over Oxford Clay. They are poorly drained and have non-calcareous clay or clayloam over clay textures.

The surface horizon is dark greyish brown to greyish brown (10YR 4/2-5/2), non humose and non-calcareous and of clay or clayloam texture. Usually soils are stoneless except for some soils developed in drift over Oxford Clay which have slightly stony surface horizons (small flints). The structure is mainly angular blocky. Some surface horizons are structureless and slaked. The consistence is plastic or slightly plastic or firm when dry.

Distinct gleying starts below the Ap horizon and colours are light brownish grey to brown (2½Y6/2-10YR5/3). The texture is usually clay and non-calcareous with plastic consistence. With depth gleying intensifies and colours change into grey (5Y5/1-6/1). The consistence changes into very plastic. Many soils have slightly calcareous subsoils, usually starting below 50 cm depth.

Impurities.

Subsoil: Some soils have a relatively high content of fine sand below 80 cm depth. Locally this subsoil is stratified and very thin sandy layers alternate with layers of clay texture (Kellaways Beds ?).

Description of a representative profile.

Ap	0-20 cm	Dark greyish brown (10YR4/2), non-humose and non-calcareous clayloam. Slightly stony (small flints), angular blocky; structureless and slaked horizon.
C1g	20-60 cm	Light brownish grey (2½Y6/2) non-calcareous clay. Gleyed horizon with a few small flints and plastic consistence.
C2g	60-100 cm	Grey (5Y6/1), slightly calcareous and plastic clay with grey and ochreous mottles (Oxford Clay).

NGG1-2 Poorly drained Non-calcareous Ground-water gley soils. Deep soils with predominantly clayloam texture, underlain by a loam or sandy loam textured subsoil.

In part, these soils are surveyed and described for the large scale map. This description is also valid for the larger area of these soils, mapped on medium scale (see p.p. 46-47).
Only the following additions have to be made:
The surface horizon: The colour is usually dark greyish brown (10YR4/2) but ranges from very dark greyish brown to greyish brown (10YR3/2-5/2). Slightly humose and humose surface horizons are common in the alluvial valley near Claywell Farm.
The subsurface horizon: Clay texture is observed in the alluvial valley near Claywell Farm and also scattered all over the delineated area.
Subsoil: The sandy loam or loam textured subsoil, usually starts between 50 and 70 cm depth.
The soils of the alluvial valley near Claywell Farm have subsoils with clay texture and contain some flints.
Impurities.
For the small occurrence of this mapping unit in the south-eastern part of the map a non-ripened, sandy loam subsoil has been described and the soil is considered very poorly drained.

For a general description of the mapping unit see p. p. 46-47 .

NGG2-2 Poorly drained, Non-calcareous Ground-water gley soils. Deep soils with clay or clay over clayloam textures, underlain by a loam or sandy loam textured subsoil.

The soils of this mapping unit are nearly similar to those described as NGG2-2 for the large scale map (p. 48). Only the following additions have to be made:
Surface horizon: The colour is dark greyish brown to dark grey (10YR 4/2-4/1).
Soil texture: The soil texture is clay over clay loam or clay; both underlain by loam or sandy loam. Some soils do not have a coarse textured subsoil within 1 meter depth and the soils are then non-calcareous over the whole depth.

Description of a representative profile.

A1p 0-25 cm Dark greyish brown (10YR4/2), non-humose; angular blocky; slightly plastic; non-calcareous
C1g 25-75 cm Light brownish grey (2½Y6/2), non-calcareous clay. Gleyed horizon with ochreous mottles and dark fine mottles of secondary manganese; firm consistence.
C2g 75-100 cm Light brownish grey (2½Y6/2), calcareous loam . Gleyed horizon with concretions of secondary calcium carbonate (puppets); slightly plastic consistence.

BCg/CSG Soil complex of:
Poorly and imperfectly drained Brown calcareous soils with gleying and
Poorly drained Calcareous Surface-water gley soils.
Deep soils with clay or clayloam over clay textures.

Four occurrences of this mapping unit are delineated. They are located on the sloping sides of the Hanbourough terraces with outcropping Oxford Clay. The terrain has convex and straight slopes, usually up to 5 degrees, but locally slopes of 6 and 7 degrees are encountered. The soils are developed in Oxford Clay or in drift over Oxford Clay and have clay or clayloam over clay texture.

Brown calcareous soils with gleying and Calcareous Surface-water gley soils are common, but for this map scale they cannot be mapped separately. From the large scale survey it is known that the Brown calcareous soils with gleying can be observed near the boundary with the level soils on the terraces. The Calcareous Surface-water gley soils are more common on the lower parts of the sloping terrace-sides. Their proportions will vary within the four occurrences of this mapping unit but it is expected that the Calcareous Surface-water gley soils cover approximately 60% of the delineated areas and the Brown calcareous soils with gleying 40%.

The soils of this soil complex are similar to those of mapping units BCg-2/3 and CSG-2, described for the large scale map (see p. 42 and p. 44). Only some properties deviate or the range of properties is different. These are mentioned below:

The colour of the surface horizon: This colour ranges from dark greyish brown to dark brown and brown (10YR4/2-5/3-4/3), but dark greyish brown colours dominate.

Soil texture: Locally soils have loam or clayloam texture and are underlain by loam or loamy sand with yellow (10YR7/6) or reddish yellow ($7\frac{1}{2}$YR5/6) colours. There enrichment by secondary iron in subsoil is common.

Ground-water level: Groundwater is only observed in soils with loam or loamy sand textured subsoils, as mentioned above (60 and 80 cm depth).

Other soils: Locally Brown earths and Non-calcareous Surface-water gley soils are observed. They are considered impurities and together their proportion is expected to be less than 10%.

5.7 Sample area Great Brook

The sample area Great Brook covers an area of 347 ha and is located between the village of Aston and the river Thames.

Except for the terrace, on which the village of Aston is situated, all soils are developed in alluvium. The alluvial soils are level with only some small, slightly higher parts, scattered over the area. Natural levees are absent and the sediments of large parts of the Thames Valley have a "basin-like" character.

The southern part of the sample area is characterized by a number of gullies and remnants of old river courses, indicating processes of alternating erosion and deposition during a younger stage.

The alluvial soils of this sample area differ from those mapped in the Yelford area, which are developed in Thames alluvium of an older stage. In the Great Brook area, the alluvium is predominantly of the younger stage. In many places the alluvium of the older stage has been partly or completely eroded and younger sediments have been deposited.

Only islands of older stage alluvium are left, usually recognizable as slightly higher parts of the landscape. In the northern part of the sample area, the alluvium of the older stage is wide-spread. Nearer to the river Thames, the remnants of older alluvium are almost absent.

The alternating process of erosion and deposition has caused an intricate soil pattern in large parts of this sample area, in particular the area south of the Great Brook. The Great Brook itself is an canalized old course of the river Thames, apparent from ox-bows and other remnants of the old course.

Land use

Most fields are arable. Near to the river Thames, the proportion of grassland is relatively high. Locally land use appears poorly related to the suitability of the soils. E.g. arable farming has been observed on very poorly drained clayey soils near the river Thames.

The area surveyed at large scale (fig. 1; area A)

The soil map covers an area of 75 ha and the fields belong to four different farms. All fields were arable. Standing crops and the existence of brooks and ditches made access difficult. Particularly in the southern part of the large scale area, external soil features are weak or absent. Standing crop made any features invisible.

The large scale area is located on both sides of the Great Brook and was thought to be representative for the whole sample area.

Generally the range of soils and soil distribution are similar for both surveyed areas. But south of the Great Brook this similarity seems to decrease.

5.8 Large scale map Great Brook (Appendix 3)

BCT-4/5 Moderately well drained and well drained Brown Calcareous soils over terraced river gravels. Shallow and moderately deep with loam and loam over clayloam textures.

The soils of this mapping unit are located on a terrace of Summertown-Radley stage. The terrain is level but a low ridge about 1 meter high separates two different terrain levels. This ridge is probably the boundary between the terrace of Summertown-Radley stage and the terrace of Flood Plain stage. On the Geological Map of Witney these two stages are not separated for this area.

The soils are developed in terraced gravels or in drift over terraced gravels. They have calcareous loam or loam over clayloam texture and are underlain by terraced river gravels, usually starting between 30 and 80 cm depth.

The surface horizon is dark brown to very dark greyish brown (7½YR 3/2-4/2; 10YR3/2-4/3), non-humose and has calcareous loam texture. It has subangular blocky or locally crumb structure and friable consistence. Usually the horizon is slightly stony or stony (small flints and limestones).

The weathered B-horizon is dark brown (10YR4/3; 7½YR4/4-4/3), calcareous and has loam or clayloam texture and usually friable consistence. The horizon is usually stony. The weathered B-horizon is underlain by terraced river gravels, starting between 30 and 80 cm depth.

The soils on the low ridge, described above, are usually deep. The terrain west of this ridge has a lower level and is very slightly sloping from the soils on terrace into the alluvial soils without clear external soil features. In many places, the soils are moderately well drained here.

Impurities.

Soil depth: Deep soils are observed on the low ridge. Soil texture : Some soils, west of the low ridge have clay texture in subsoil. Locally terrace gravel is absent and soils are underlain by a gleyed horizon with clay texture (Oxford Clay). Human influence: There has been a gravel pit near the boundary with the alluvial soils. Here the terrain is irregular now and in its surroundings soils are disturbed by digging.

Description of a representative profile.

A1p	0-20 cm	Very dark greyish brown (10YR3/2) non-humose, calcareous sandy loam; subangular blocky; friable consistence; slightly stony.
Bs	20-45 cm	Dark brown (7½YR4/2), highly calcareous stony loam, with friable consistence (small limestones and flints).
IIC	>45 cm	Gravels.

BCg-2/3 Poorly and imperfectly drained, Brown calcareous soils with gleying. Deep soils with loam or clayloam texture over clay (Oxford Clay).

Only one occurrence of this mapping unit is delineated, as a narrow strip, located between the terrace soils (BCT-4/5) and the alluvial soils (CGG-2). The terrain is very slightly sloping (up to 1 degree) towards the alluvial soils.

The soils are developed in a drift layer of 60-100 cm thickness and underlain by Oxford Clay. In this sample area, Oxford Clay in subsoil only exists in a very narrow zone, bordering the terrace.

The surface horizon is dark greyish brown (10YR4/2), non-humose and has calcareous loam texture. The structure is subangular blocky and consistence is friable or slightly plastic.

The Bs-horizon is dark brown to pale brown (7½YR4/4-10YR6/3) and gleying starts between 20 and 40 cm depth. It has calcareous loam or clayloam texture; usually slightly stony (gravels and small limestones).

The Oxford Clay starts between 60 and 100 cm depth. It is a plastic or very plastic clay, usually highly clacareous with very small rounded concretions and large white and soft spots, both consisting of secondary calcium carbonate. The horizon has grey or light olive grey (5Y6/1-6/2) colours and is strongly gleyed.

Description of a representative profile.

A1p	0-25 cm	Dark greyish brown (10YR4/2), non-humose, calcareous loam; subangular blocky; friable; slightly stony.
Bs	25-40 cm	Dark brown (7½YR4/4), calcareous clayloam, without mottles.
Bsg	40-80 cm	Brown (7½YR5/4), calcareous loam with strong brown mottles; slightly stony and slightly plastic. Underlain by a thin horizon of river gravels.
IICg	80-100 cm	Light olive grey (5Y6/2), highly calcareous and very plastic clay. Large white spots of secondary calcium carbonate.

BCg-2 Poorly drained, Brown calcareous soils with gleying. Shallow and moderately deep with clay and clayloam textures, underlain by river gravels.

These soils are located in the southern part of the area within a short distance of the river Thames. The terrain is level. The parent material is Thames alluvium and Brown calcareous soils with gleying have developed in small areas where relatively thin clayey sediments are underlain by river gravels.

The surface horizon is very dark greyish brown to dark greyish brown (10YR3/2-4/2) and is slightly humose or locally humose. It has slightly calcareous clay or clayloam texture, usually with slightly plastic consistence. The structure is subangular with slightly plastic consistence. The structure is subangular blocky, or crumb when organic matter content is relatively high.

The weathered B-horizon is gleyed and has reddish yellow to brown and pale brown (7½YR6/6-5/4; 10YR6/3) colours. It has slightly calcareous or calcareous clayloam or clay texture with slightly plastic or plastic consistence. The lower part of this horizon is slightly stony (limestone gravels).

The soils are underlain by river gravels within 30 and 60 cm depth. Locally there is a horizon with sandy loam texture just on top of the river gravels.

Some sites show thin buried A1-horizons. They are observed just below the surface horizon or deeper in the subsoil and are indicated by slightly darker colours and sharp boundaries.

Impurities.

Human influence: Two small mounds with a cross-section of 20-30 meters are located within this delineated area. Here,the soils are moderately well drained and have calcareous clayloam texture.

In spite of the full-grown cerals, these mounds were easily recognizable by lines of taller and greener crops. These differences in height and colour exist in a circle, surrounding the mounds and also as a square on top of it. Probably they indicate former buildings. May be they are relicts of an imitation air field, which during the war was made somewhere in these surroundings.

Description of a representative profile.

A1p 0-20 cm Dark greyish brown (10YR4/2), slightly humose and very slightly calcareous clay; subangular blocky structure and slightly plastic consistence.

Bsg 20-35 cm Pale brown (10YR6/3), slightly calcareous clay with reddish yellow mottles. Slightly stony (river gravels) and slightly plastic.

IIC >35 cm Highly calcareous river gravels.

BEg-2 Poorly drained, Brown earths with gleying. Deep soils with clay-loam texture underlain by loam or sandy loam.

Brown earths with gleying are developed in alluvium of an older stage. They are associated with those Non-calcareous ground-water gley soils, which are also developed in the alluvium of older stage (NGG-2; see p.p. 66 - 67).

The Brown earths with gleying are usually located on slightly higher parts of the area. As impurities they are included within mapping unit NGG-2. Only one pure area has been delineated.

The terrain is level and slightly elevated above the surrounding Ground-water gley soils (NGG-2 and CGG-2).

The surface horizon is dark greyish brown (10YR4/2) and non-humose. It has non-calcareous clayloam texture. The structure is subangular blocky and it has plastic or slightly plastic consistence.

The weathered B-horizon is dark brown to strong brown (7½YR4/5) and has non-calcareous clayloam texture. Consistence is plastic or slightly plastic. Gleying starts just below the surface horizon. The yellowish red (5YR5/6) colour of mottles in the subsurface horizon seems to be typical for Brown earths developed in alluvium of older stage. In the lower part of the Bsg-horizon, fine dark spots of secondary manganese are also common.

A calcareous or highly calcareous horizon with loam or sandy loam texture, starts within 40 and 70 cm depth. This coarse textured subsoil is stratified and thin layers of gravels or white (10YR8/1) "algal-marl"-like horizons are common. The colours are nearly homogeneous brown or light brown (7½YR5/5-6/4) and except for white spots of secondary calcium carbonate, mottles are often absent.

Impurities.

Surface horizon: Texture is locally clay. Soil depth: Moderately deep soils are scattered over the area and river gravels start within 80 and 100 cm depth.

Description of a representative profile.

A1p	0-25 cm	Dark greyish brown (10YR4/2), non-humose and non-calcareous clayloam; plastic consistence. "Structureless" and slaked horizon.
Bsg	25-60 cm	Brown (7½YR5/4), non-calcareous clayloam with yellowish red (5YR5/6) mottles; slightly plastic
C1g	60-85 cm	White (10YR8/2), highly calcareous loam. "Algal-marl"-like horizon with light brown mottles (7½YR6/4);
C2g	85-100 cm	Light brown (7½YR5/6), calcareous sandy loam with limestone gravels.

CGG-2 Poorly drained, Calcareous Ground-water gley soils. Moderately deep soils over river gravels. Clayloam and clay textures, usually underlain by loam or sandy loam.

The soils of this mapping unit are located in the northern part of the area. They represent the slightly lower parts of the landscape. The soils are developed in recent alluvium which is deposited by small brooks.

The surface horizon is usually dark greyish brown (10YR4/2) but also very dark greyish brown and dark brown colours (10YR-7½YR3/2) occur. Non-humose surface horizons are common, but near the brook, which is collecting the water of Norton Ditch and High Moor Brook, many surface horizons are slightly humose or humose. The texture is clayloam or clay which is slightly calcareous or calcareous. Near the brook highly calcareous surface horizons are common.

The structure is angular or subangular blocky with slightly plastic or plastic consistence. Horizons with high organic matter have crumb or subangular blocky structure.

The subsurface horizon is grey to light brownish grey or greyish brown (2½Y-10YR5/1-5/2-6/2; 5Y5/1) and has calcareous clayloam or clay texture with plastic or slightly plastic consistence. Brown and strong brown mottles together with greyish mottles are common.

Between 40 and 70 cm depth the texture usually changes into calcareous or highly calcareous loam or sandy loam with irregular rounded concretions of secondary calcium carbonate (puppets). Near the brook soils are observed with clay and clayloam texture, directly underlain by river gravels at about 70 cm depth. The colour of the loamy subsoil is greyish with ochreous mottles or strong brown to reddish yellow with only a few grey mottles.

Nearly all soils are underlain by river gravels within 60-100 cm depth. Near the terrace the top of the gravels are cemented by secondary iron (7½YR-5YR5/6). Locally the river gravels are overlain by a thin "algal-marl"-like horizon with white or light greyish colours.

Groundwater was observed in nearly all auger holes between 70 and 100 cm depth.

Impurities.

Highly calcareous soils: Many soils near the brook have small shell fragments in the surface horizon or in other horizons. Some soils have shell fragments in all horizons and are highly calcareous over the whole soil depth. Non-calcareous or slightly calcareous horizons: Near the boundary with the Non-calcareous Ground-water gley soils (mapping unit NGG-2), and in the southern part of the delineated area, non-calcareous or very slightly calcareous sub-surface horizons occur, with fine dark mottles of manganese. These soils are probably developed in very shallow deposits of recent alluvium over the non-eroded lower part of older alluvium. Non-calcareous Ground-water gley soils: Small patches with Non-calcareous Ground-water gley soils developed in older alluvium occur within this area. Very poorly drained soils: Near the brook the soils have locally a non-ripened subsoil and are considered very poorly drained. Also, buried A1-horizons are observed here in the subsoil.

Description of a representative profile.

A1p 0-20 cm Dark greyish brown (10YR4/2), non-humose and slightly calcareous clay. Many small shell fragments and some snail-shells. Weak, angular blocky structure and plastic consistence.

C1g 20-30 cm Light brownish grey (2½Y6/2), calcareous clay with strong brown mottles; slightly plastic consistence.

C2g 30-45 cm Light brownish grey (2½Y6/2) slightly calcareous clay-loam with strong brown mottles of iron oxide and dark mottles of manganese oxide.

C3g 45-70 cm Very pale brown (10YR8/3), highly calcareous loam with white soft spots and irregular rounded concretions of secondary calcium carbonate and reddish yellow mottles; slightly stony (river gravels).

IIC >70 cm Highly calcareous river gravels.

CGG-2/1 Poorly and very poorly drained, Calcareous Ground-water gley soils. Deep soils with clay and silty clay texture, partly underlain by loam, clayloam or peat. Partly with non-ripened subsoil.

The soils of this mapping unit are located in the centre of the area. Remnants of meanders and ox-bows of old river courses are visible. The terrain is level, but locally near old river courses, very slightly elevated patches occur. Here the soils have less greyish sub-surface horizons but soil texture is usually similar to other sites.

The soils are poorly or very poorly drained and are developed in recent alluvium. They have clay or silty clay texture and thin buried A1-horizons are common. Some soils show 3 or 4 buried A1-horizons. Except for a few sites near Great Brook with river gravels starting between 60 and 100 cm depth, all soils are deep. Some soils have clay or silty clay texture over more than 1 meter depth, but most soils have clayloam or sandy loam texture, starting at about 80 cm depth. Subsoils with peat are observed in old river courses and also scattered elsewhere over the delineated area.

Surface horizons are often dark greyish brown (10YR4/2) but others have dark grey and very dark greyish brown (10YR4/1-3/2) colours. They have calcareous clay texture and are non-humose or slightly humose. The horizon has usually plastic consistence and subangular or angular blocky structure. Some surface horizons with relatively high organic matter content have crumb structure. Highly calcareous surface horizons with shell fragments and snail-shells occur.

The sub-surface horizon is distinctly gleyed and has grey (2½Y-5Y 5/1-6/1) to light brownish grey and greyish brown colours (2½Y-10YR5/2-6/2). It has calcareous clay and silty clay texture and plastic consistence. Enrichment with secondary calcium carbonate is often present and has pseudo-mycelium ') morphology. Also concretions of secondary iron oxide and shell fragments are observed in the sub-surface horizons.The soils of this mapping unit are characterized by thin buried A1-horizons between 20 and 80 cm depth. They have dark grey (5Y-10YR4/1; N4) or grey (2½Y5/1; N5) colours, lower calcium carbonate content and more silty character than horizons situated above and below. Mottles in buried A1-horizons are usually redder than in other horizons.

The subsoil is calcareous or highly calcareous and has grey (5Y-2½Y-10YR5/1-6/1) or light grey (2½Y7/1) colours. Some soils have also clay and silty clay textured subsoil but most have clayloam texture starting below 60 cm depth or sandy loam texture starting about 80 cm depth. Subsoils consisting of peat are less frequently observed. It is a very dark brown or very dark greyish brown (10YR2/2-3/2), strongly weathered peat with reed remnants. It is non-calcareous or very slightly calcareous, increasing to calcareous with depth. The subsoils with sandy loam or clayloam texture are often dominated by brownish yellow, yellow or reddish yellow (7½YR-10YR5/6-6/5-6/6-7/6) colours with or without grey mottles. Irregular rounded concretions ($CaCO_3$) occur in sandy loam textured subsoils and to a lesser extent in clayloam textured subsoils. Concretions of secondary iron oxide are also observed but are less frequent.

Nearly half of the area is considered very poorly drained, and has soils with non-ripened subsoil. Nearly ripened or half ripened horizons with weak consistence occur between 50 and 100 cm depth. Usually they have clay or silty clay texture, but also non-ripened subsoils with clayloam or sandy loam texture are observed. Groundwater was observed in some auger holes between 70 and 100 cm depth.

') Fine thread-like occurrences of white $CaCO_3$.

Impurities.
Soil depth: Near Great Brook some soils are underlain by river gravels starting between 60 and 100 cm depth. These soils are moderately deep.
Calcium carbonate content: Near the boundary with mapping unit NGG-2/1 in the south, soils have non-calcareous or very slightly calcareous surface horizons or sub-surface horizons. Some soils are intergrades to Non-calcareous Ground-water gley soils.

Description of a representative profile.

A1p	0-20 cm	Very dark greyish brown (10YR3/2), slightly humose, calcareous clay with some snail-shells, subangular blocky; plastic consistence.
C1g	20-30 cm	Greyish brown (10YR5/2) calcareous silty clay with secondary calcium carbonate indicated by a white "pseudo-mycelium" pattern; strong brown mottles; plastic consistence.
A11bg	30-40 cm	Dark grey (N4/0) calcareous silty clay with yellowish red mottles; plastic consistence.
C2g	40-45 cm	Grey (5Y5/1) calcareous silty clay with yellowish red mottles; plastic consistence.
A12bg	45-55 cm	Dark grey (2½Y4/1), non-calcareous silty clay with yellowish red mottles; plastic consistence.
C3g	55-90 cm	Grey (5Y6/1) slightly calcareous clay with strong brown mottles and some concretions of secondary iron oxide. Nearly ripened horizon changing into half-ripened horizon with depth. Weak consistence.
G	90-100 cm	Light grey (2½Y7/1), highly calcareous clayloam with some irregular rounded concretions of secondary calcium carbonate. Practically unripe horizon.

NGG-2 Poorly drained, Non-calcareous Ground-water gley soils. Moderately deep and deep soils with clayloam or clayloam and clay texture, underlain by loam or sandy loam subsoil.

Two areas are delineated. They are both located north of Great Brook. The terrain is level and the soils are developed in alluvium of an older stage.

The surface horizon is dark greyish brown to dark brown and very dark greyish brown (7½YR-10YR3/2-4/2), non-humose and has non-calcareous clayloam or clay texture. The structure is angular or subangular blocky and consistence is plastic.

The sub-surface horizon (Cg) is light brownish grey to pale brown (2½Y6/2; 10YR6/2-6/3) with strong brown or reddish yellow mottles. It has non-calcareous clayloam or clay texture usually with plastic consistence. With depth the colours change less, but usually the number of grey mottles increases and dark fine spots of secondary manganese are common. Below 40 cm depth many soils are very slightly calcareous or slightly calcareous.

The subsoil has calcareous or highly calcareous sandy loam or loam texture, and starts within 40 and 80 cm depth. It has light greyish brown or light grey to white (2½Y6/2-7/2; 10YR8/2) colours with light brown or reddish yellow mottles. Locally this horizon has a homogeneous light brown or reddish yellow colour with only a few grey mottles. The subsoil is often stratified. Thin layers of river gravels, gravelly layers and white "algal-marl"-like layers are common. Irregular rounded concretions of secondary calcium carbonate are observed in the subsoils of many sites. Subsoils and concretions are similar to those described for the Non-calcareous Ground-water gley soils of sample area Yelford (see p. 46). In some auger holes ground-water was observed within 80 to 100 cm depth.

The northern area consists of moderately deep soils which are underlain by river gravels within 80 to 100 cm depth. The southern area consists of both moderately deep and deep soils.

Impurities.

Brown earths with gleying: Locally the colours in the sub-surface horizon are brown and soils are considered Brown earths with gleying. Calcareous Ground-water gley soils: Some soils have slightly calcareous sub-surface horizons. These soils meet the criteria for Calcareous Ground-water gley soils. Organic matter content: The surface horizon is locally slightly humose.

On the Geological Map of Witney, older alluvium has been mapped only in an area near Langford. It is mentioned in the memoir of the geological map that the deposit lies about 20 ft above the level of the Thames alluvium.

All the alluvial soils of sample area Yelford and parts of the alluvial soils of sample area Great Brook are considered to be developed in older alluvium. But in both areas they are hardly elevated above the level of the recent alluvium.

For this survey the distinction is predominantly made on soil features. After the survey period a short visit was made to the area of Langford. The soils there seem nearly similar to those we have considered to be developed in older alluvium. But according to their elevation the soils are probably deposited in an earlier period.

As compared with soils developed in recent alluvium, there are a number of soil features which are associated with development in older alluvium. But their recognition at every site is sometimes difficult.

In areas where recent alluvium is present, the older alluvium was partly or totally eroded before the recent alluvium was deposited. This pattern of erosion and deposition can be very complicated without clear external soil features. Also auger examination is less suitable for this recognition.

As compared to soils developed in recent alluvium, some soil features are absent and others are different. The following soil features are considered to indicate older alluvium:

- decalcified surface and sub-surface horizons.
- sub-surface horizons are more brownish
- terrain slightly elevated above the level of the soils developed in recent alluvium.
- mottles in sub-surface horizon are often redder and are combined with fine dark spots of manganese in the lower part of the horizon.
- the subsoil has redder hue and chroma is often more than one.
- buried A1-horizons or peat layers are usually absent.

Description of a representative profile.

A1p 0-15 cm Dark greyish brown (10YR4/2), non-humose and non-calcareous clayloam. Angular blocky structure and plastic consistence.

C1g 15-55 cm Pale brown (10YR6/3), non-calcareous clayloam with strong brown (7½YR5/6) and grey mottles; plastic consistence.

C2g 55-75 cm Light brownish grey (2½Y6/2), very slightly calcareous clayloam with strong brown mottles of iron oxide and fine dark spots of manganese oxide.

C3g 75-100 cm Strong brown (7½YR5/6), calcareous loam with a few grey mottles. Wet horizon with some limestone gravels.

NGG-2/1 Poorly and very poorly drained Non-calcareous Ground-water gley soils over river gravels. Moderately deep with clay and silty clay texture, usually underlain by sandy loam or clayloam. Partly with non-ripened subsoil.

The soils of this mapping unit are located in the southern part of the area within a short distance of the present-day river channel. The soils are non-calcareous, even so they are considered to be developed in relatively recent alluvium. The distribution of soils and the soil pattern indicate that the alluvium is deposited by a river, which was situated further away than to-day. Probably it ran north of this area, near the present-day Great Brook. Buried A1-horizons are common in sub-surface horizons and in the subsoil, indicating deposition under marshy conditions. With increasing distance from a river, the calcium carbonate contents of the deposits usually decreases. Apart from this, the deposition under marshy condition is favourable for a rapid decalcification.

The terrain is level. Most soils are poorly drained, but also 30-40% of the area have very poorly drained soils, which is indicated by a non-ripened subsoil within 80 cm depth. The soils have non-calcareous clay or silty clay texture. Especially buried A1-horizons have silty texture. The thickness of the clay layer is 40-60cm, which is mainly underlain by calcareous sandy loam or clayloam. River gravels start within 60-100 cm depth.

The surface horizon is dark brown (7½YR4/2-3/2), slightly humose and has non-calcareous clay texture with plastic or slightly plastic consistence. The structure is angular or subangular blocky except for surface horizons with high organic matter content, which have crumb structure.

The sub-surface horizon is grey (5Y5/1-6/1) with non-calcareous clay or silty clay texture. Thin buried A1-horizons with very dark grey or grey (2½Y4/1-N5/0) colours are common. Gleying is distinct with grey and reddish yellow mottles. The consistence is plastic.

Usually within 60 cm depth the texture changes into calcareous sandy loam or clayloam. Locally the clay is directly underlain by river gravels. Non-ripened subsoils are observed in some of the relatively deep soils. They have weak consistence and dark grey to greenish grey colours.

Within 60 to 100 cm depth the soils are underlain by river gravels. Locally the river gravels are overlain by a highly calcareous layer of white (10YR8/1) "algal-marl"-like loam or by highly calcareous coarse sand.

Groundwater was observed in one auger hole at 70 cm depth.

Impurities.

Calcium carbonate content: Thin, very slightly calcareous or slightly calcareous layers are common in the surface or in the sub-surface but than buried A1-horizons are non-calcareous. Some sites meet the criteria for Calcareous Ground-water gley soils. Organic matter content: Some soils have a humose surface horizon. Subsoil: Locally the subsoils are gravelly (limestone gravels) and once some flints were observed.

Description of a representative profile.

A1p	0-20 cm	Dark brown (7½YR4/2) slightly humose, non-calcareous clay; weak angular blocky structure; plastic consistence.
C1g	20-35 cm	Light brownish grey (2½Y6/2) non-calcareous clay with plastic consistence; at 30 cm depth a very thin, dark grey A1b horizon occurs with yellowish red mottles.
C2g	35-60 cm	Reddish yellow (7½YR6/7) very slightly calcareous clayloam with grey mottles
C3g	60-80 cm	White (10YR8/1) highly calcareous loam with some river gravels; "algal-marl"-like horizon.
IIC	>80 cm	Highly calcareous river gravels and small stones.

BCg/CGG Soil complex of:
Imperfectly drained Brown Calcareous soils with gleying
and
Poorly drained Calcareous Ground-water gley soils.
Shallow and moderately deep soils with clay texture underlain by river gravels, starting between 30 and 60 cm depth.

These soils are represented by a small area and are located south of Great Brook. The terrain is slightly elevated above the level of the surrounding soils.

The soils are developed in alluvium and are underlain by river gravels, starting between 30 and 60 cm depth.

The surface horizon is dark greyish brown (10YR4/2), non-humose and has slightly calcareous clay texture. The structure is subangular blocky.

The sub-surface horizon has slightly calcareous clay texture. In the central and highest part of this small area, this horizon has brownish colours and gleying starts below 30 cm depth. They are considered Brown calcareous soils with gleying.

The slightly lower parts have soils with more greyish sub-aurface horizons and mottling starts just below the Ap-horizon. They represent the Calcareous Ground-water gley soils.

The soils are underlain by river gravels, starting between 30 and 60 cm depth. On top of the river gravels there is a thin gravelly horizon which has clay or clayloam texture.

5.9 Medium scale map Great Brook (Appendix 4)

This sample area is smaller than those of Caswell and Yelford. It covers 347 ha. From this area only 272 ha are surveyed on medium scale. An area of 75 ha has first been mapped on large scale and this part of the medium scale soil map is generalized from the large scale soil map (see chapter 7).

The description of mapping units of this soil map is in addition to those of similar soils of the large scale map. The soils, soil conditions and soil properties are here described as far as they deviate from those recorded for the large scale map. Where necessary, references will be made to similar soils, described for the large scale soil map.

Only soils that are quite different from those occurring in the large scale area, will be completely described.

BCT-4/5 Moderately well drained and well drained Brown Calcareous soils over terraced river gravels. Shallow and moderately deep. Loam and clayloam texture, partly over clayloam or clay texture.

A small part of this delineated area is described for the large scale map. The soils of the larger area, surveyed on medium scale are nearly similar to those described for the large scale area (p. 58).

The low ridges mentioned there are also often observed here. They are indicated on the soil map and devide the delineated area into a central part, with a peripheral slightly lower lying part.

For the description of soils, the following additions have to be made.

The surface horizon has loam or clayloam texture with friable or very friable consistence. During the survey period, the surface horizon was locally very dry with firm consistence. Usually the horizon is slightly stony, occasionally stoneless. Shallow soils have often stony horizons.

The weathered B-horizon has brown, dark brown or yellowish brown (7½YR4/4-5/4; 10YR5/4) colours and is slightly stony.

The soils are underlain by terraced river gravels usually starting between 30 and 80 cm depth, locally with a layer with clay texture on top of it.

The boundary between the soils of the terraces and the alluvial soils is often nearly invisible. The terrain is very slightly sloping into the alluvial plain without clear external features. Near this boundary the soils are often underlain by a gleyed Oxford Clay and terraced gravels are absent. White spots of secondary calcium carbonate are common in these subsoils. Here the soils are moderately well drained or imperfectly drained, depending on the depth where the Oxford Clay starts.

The soils of the central part are usually well drained and both moderately deep and shallow soils are common. The central part is surrounded by a slightly lower area. Here moderately well drained and moderately deep soils are more common.

Over the delineated area as a whole the moderately deep soils cover 60% of the area and the shallow soils 40%. All shallow soils and about half of the moderately deep soils are well drained. In fact they cover about 60% of the area. Moderately well drained or lesser drained soils represent about 40% of the area.

Impurities.

Soil depth: Deep soils are observed scattered over the area and more frequently on ridges and near the boundary with the alluvial soils.

Drainage class: Soils near the boundary with alluvial soils have often imperfect drainage, whether underlain by Oxford Clay or not.

NGG-2 Poorly drained, Non-calcareous Ground-water gley soils. Moderately deep and deep soils with clayloam texture, usually underlain by loam or sandy loam.

Most of the Non-calcareous Ground-water gley soils of this soil map, are mapped together with Brown earths with gleying as a soil complex (p.p. 75 - 76 ; mapping unit NGG/BEg). Only one small area is considered pure (mapping unit NGG-2).It is located north of Great Brook.

The terrain is level and soils are developed in older alluvium. The soils are often moderately deep and underlain by river gravels, starting between 80 and 100 cm depth, but some soils are deep.

The surface horizon is non-humose, dark greyish brown (10YR4/2) and locally dark brown (7½YR3/2). It has non-calcareous clayloam texture with angular and subangular blocky structure and plastic consistence.

The subsurface horizon is light brownish grey (2½Y-10YR6/2) to pale brown (10YR6/3) with strong brown or reddish yellow mottles and some grey mottles. It has non-calcareous clayloam texture with plastic consistence. With depth the number of grey mottles increases and here fine dark spots of manganese also occur. The lower part of the horizon is often very slightly calcareous.

Between 40 and 80 cm depth the soils are underlain by a calcareous or highly calcareous loam or sandy loam. The colour is light grey to light greyish brown (2½Y6/2-7/2) with brown mottles, or homogeneous light brown to reddish yellow (7½YR5/6) with a few or no grey mottles. It contains irregular rounded concretions of secondary calcium carbonate. Some subsoils are white (10YR8/2) and have "algal-marl"-like character.

Some auger holes contain ground-water below 80 cm depth.
Most soils have river gravels starting between 80 and 100 cm depth, but some are deep.

Impurities.

Human influence: On the western boundary of this area, a slightly elevated mound occurs. The soils are moderately well drained and have a dark anthropic layer of about 50-70 cm thickness, with many pottery fragments, large stones, bones and phosphorous spots. These soils look very similar to those of the mounds of the river-clay area in the Netherlands ("moorgronden"). According to an archaeologist consulted the pottery fragments are mainly of late Roman and mediaeval age.

For the description of a representative profile of this mapping unit see p.67.

NGG-1 Very poorly drained Non-calcareous Ground-water gley soils. Deep soils with clay and silty clay texture underlain by a non-ripened clayey subsoil.

The soils of this area are delineated in the southern part of the sample area. The soils are partly bordering the present-day river Thames but in the south eastern part of the area they are bordering ancient river courses.

The terrain is level and soils are developed in recent alluvium. The soils are considered "non-calcareous" but many soils have calcareous or highly calcareous surface horizons. The mineral parts of this horizon are probably deposited by the present-day river. The material below the surface horizon also originates from recent alluvium but is of an earlier stage. The frequent occurrence of buried, humose A1-horizons indicates that periodic sedimentation has taken place in an swampy area at some distance from the active river.

The surface horizon is relatively thin (10-15 cm) and has dark brown (10YR3/3; 7½YR3/2) or very dark greyish brown (10YR3/2) colour. It has calcareous or highly calcareous, clay or silty clay texture and snail-shells are common. Locally the surface horizon is non-calcareous. In spite of the high clay content, the surface horizon has subangular blocky or crumb structure and friable or slightly plastic consistence. This is caused by the relatively high organic matter content (slightly humose and humose).

The sub-surface horizon has grey (2½Y-5Y5/1-6/1) colours and is characterized by a number of dark grey, buried A1-horizons. These are slightly humose but locally they consist of peat. The sub-surface horizon has non-calcareous clay or silty clay texture with plastic or very plastic consistence. Within the area of this mapping unit, the soils were also observed in a pit. The sub-surface horizons show strongly developed, coarse prismatic structure with strongly pronounced slickensides.

The subsoil is usually non-ripened and starts between 50 and 80 cm depth. It has clay texture with very soft consistence. Some subsoils are non-calcareous over the whole soil depth, but others are slightly calcareous, starting between 50 and 80 cm depth. Intensively gleyed horizons are common with grey, dark grey, olive grey and dark greenish grey (2½Y-5Y4/1-5/2-6/1; 5GY3/1-4/1) colours. Reddish brown (5YR4/4) concretions of secondary iron oxide and bluish spots (vivianite ?) are locally observed.

Groundwater is observed in many auger holes between 50 and 100 cm depth. Parts of the area are probably periodically flooded.

The results of the mechanical analyses indicate that the clay content of this soils is higher than was expected (Appendix 7; table 3). The clay content of the sampled profile near the Thames ranges from 65-85%. Therefore it is possible that many of the alluvial soils have higher clay content than estimated during the survey period.

Impurities.

Soil depth: Some soils are moderately deep and are underlain by river gravels starting at about 80 cm depth. Non-ripened subsoil: A few sites have nearly ripened horizons in the sub-surface horizon, starting between 30 and 50 cm depth and half-ripened or totally unripe horizons in the subsoil.

Description of a representative profile.

A1 0-14 cm Dark brown (7½YR3/2), slightly humose, highly calcareous clay; subangular blocky; friable consistence. Many small (1-2 mm) abandoned snail-shells in the lower part.

C1g 14-33 cm Dark greyish brown (2½Y4/2), non-humose, very slightly calcareous clay with dark reddish brown (5YR3/5) mottles; coarse prismatic structure, with strongly pronounced slickensides; very plastic consistence.

A11bg 33-46 cm Very dark grey (5YR3/1), slightly humose, non-calcareous silty clay with dark reddish brown mottles (5YR3/4); coarse prismatic structure with slickensides; plastic consistence.

A12bg 46-70 cm Very dark grey (7½YR3/1), humose, non-calcareous silty clay with dark reddish brown mottles (2½YR3/4); "structureless" to weak subangular blocky; slightly plastic consistence.

G 70-100 cm Very dark greenish grey (5GY3/1), slightly humose and half ripened silty clay; "structureless"; soft consistence. Dark reddish brown mottles only in the upper part. The horizon changes with depth from non-calcareous into slightly calcareous.

CGG-2 Poorly drained, Calcareous Ground-water gley soils. Moderately deep soils over river gravels. Clayloam and clay textures, usually underlain by loam or sandy loam.

The area surveyed for the medium scale map gave less new information about the soils of this mapping unit. Nearly half of the area was already surveyed and described for the large scale map. This description is valid for the larger area surveyed for this map (see p.p. 62-63).

Only a few remarks will be made:

Soil texture: The sub-surface horizons have clayloam and clay texture but for this delineated area as a whole clayloam texture is more common.

Consistence: During survey some profiles were dry and had firm consistence in surface and sub-surface horizons.

Impurities.

Apart from impurities recorded (see p. 62) the following will be added:

Soil depth: Locally river gravels are not observed within 1 meter depth and soils are deep. Also scattered patches with river gravels within 60 cm depth occur. Non-calcareous Ground-water gley soils: In the south between Meadow Farm and Great Brook Non-calcareous groundwater gley soils with non-calcareous or very slightly calcareous horizons are observed together with Calcareous Ground-water gley soils. Here the deposits of recent alluvium seem to be either very shallow or absent.

Locally dark anthropic layers are observed in the sub-surface, probably indicating ancient human activity.

In this part of the area no groundwater was observed in the auger holes.

Brown Calcareous soils with gleying: These are observed near the boundary with the terrace-soils (BCT 4/5) and south of Meadow farm.

For the description of a representative profile see p.p. 62-63.

Soil complexes.

NGG/BEg Soil complex of:
Poorly drained Non-Calcareous Ground-water gley soils
and
Poorly and imperfectly drained Brown earths with gleying.
Deep and moderately deep soils with clayloam texture and usually underlain by sandy loam, loam or siltloam.

A small part of this soil complex had already been surveyed for the large scale map and there only pure areas are delineated. For the medium scale map a soil complex had to be delineated, partly because of the low number of observations and partly because of the map scale.

The terrain is level. The soils are developed in older alluvium. The Non-calcareous Ground-water gley soils cover about 60% of the delineated area. They are described for the large scale map (see p.p. 66-67 ; mapping unit NGG-2).
The Brown earths with gleying are often observed on slightly higher parts of the landscape and represent about 40% of the soil complex. For detailed description see p. 61; mapping unit BEg-2.

In some aspects the range of soil properties deviates from those described for the pure mapping units:
The soil complex situated north of Great Brook:

All soils are poorly drained. As compared with the pure mapping unit (NGG-2), horizons with clay texture are less frequent and are considered impurities for this soil complex. The surface and sub-surface horizons have slightly plastic or plastic consistence.

The coarser textured subsoil has locally siltloam texture.The soils are underlain by river gravels starting between 60 and 100 cm depth.
The soil complex situated south of Great Brook:

This area consists also of soils of both soil groups in nearly the same proportions as mentioned above. But the soils are of somewhat coarser texture. Horizons with clay texture are absent. The surface horizon has clayloam texture and locally loam texture. In the subsoil siltloam texture is common, starting between 40 and 100 cm depth. Locally siltloam texture changes into sandy loam within 1 meter depth. Horizons with siltloam texture are light grey (10YR-2½Y7/2) and usually calcareous and have friable consistence. Enrichment with secondary calcium carbonate is also common, indicated by rounded concretions or by a pattern of white "pseudo mycelium".

Silt loam texture has been observed in the Thames Valley in scattered and usually slightly elevated sites. They have a loess-like character. As no silt loam is observed in areas outside the Thames Valley, it is doubtful if they represent "in situ" aeolian deposits of Pleistocene age. These sediments are probably eroded from aeolian deposits elsewhere and deposited in the Thames Valley by water. In most places there it has been further eroded during later periods. Only small remnants are left, which are now covered with alluvium of older stage.

The soils of this second area are deep. The Non-calcareous Groundwater gley soils are poorly drained. The Brown earths with gleying are poorly or imperfectly drained.

Description of representative profiles are given on p. 61 and p. 67. A profile with siltloam texture in the subsoil is described below.

A1p 0-20 cm Dark brown (7½YR3/2) non-humose, non-calcareous clayloam; slaked and structureless horizon with plastic consistence.

Bsg 20-45 cm Yellowish brown (10YR5/4) non-calcareous clayloam with some pink (7½YR7/4) mottles; slightly plastic consistence.

C1g 45-70 cm Light grey (10YR7/2), highly calcareous siltloam with yellow mottles (10YR7/5); friable; strongly enriched by secondary calcium carbonate.

C2g 70-100 cm Light grey (2½Y7/2), calcareous siltloam with strong brown mottles (7½YR5/6); friable consistence. Some gravels and small stones below 90 cm depth.

CGG/NGG Soil complex of:
Calcareous Ground-water gley soils
and
Non-Calcareous Ground-water gley soils.
Poorly and very poorly drained. Deep and moderately deep soils with clay and silty clay texture, partly underlain by loam or clayloam.
Partly with non-ripened subsoil.

The soils of this soil complex cover nearly the whole area between Great Brook and the river Thames. Here pure mapping units are delineated for the large scale map. Near the Great Brook, Calcareous Ground-water gley soils are delineated. More to the south Non-calcareous Ground-water gley soils occur. Shallow and moderately deep Brown calcareous soils occur, but they cover very small areas.

For the medium scale map, the Calcareous Ground-water gley soils and the Non-calcareous Ground-water gley soils are mapped together as a soil complex. In general, the Calcareous Ground-water gley soils are common in the northern part of the area and Non-calcareous Ground-water gley soils in the southern part. But the intricacy of the soil pattern and the absence of clear external (soil) features, prevent delineation for the medium scale map.

The terrain is level but in many places traces of old river courses are observed. Some of them are leveled and hardly visible in the terrain. The soils are developed in recent alluvium. They are poorly and very poorly drained. About 40% of the area is covered by soils with non-ripened subsoils. Non-ripened subsoils are more frequently observed below Non-calcareous Ground-water gley soils.

Calcareous Ground-water gley soils cover about 45% of the area. They are similar to those described for the large scale map (see mapping unit CGG-2/1; p.p. 64 - 65). Non-calcareous Ground-water gley soils cover about 40% of the area (mapping unit NGG-2/1; p. 68).
Other soils cover about 15% of the area and are considered as impurities. Usually they consist of shallow or moderately deep Brown calcareous soils underlain by river gravels. Most of them are poorly or imperfectly drained and are gleyed. They have clayloam or clay texture and are found scattered over the area without clear external (soil) features (see mapping unit BCg-2; page 60). Others are well drained Brown Calcareous, shallow soils with loam texture underlain by river gravels. They are located on small but distinctly higher parts of the terrain.

As described in the legend, most soils are slightly humose, but non-humose and humose surface horizons also occur. As compared to the area covered by the large scale map, humose surface horizons are more common and the Non-calcareous Ground-water gley soils are deep and moderately deep.

Some of the Calcareous Ground-water gley soils, especially those in the western part of the area, have non-calcareous and clay textured subsoils below 50 cm depth. Here the deposits of relatively recent alluvium may have been covered by more recent deposits of the present-day river.

For the description of representative profiles see p. 65; p. 68 and p. 60.

6. THE RELATIONS BETWEEN LARGE SCALE SOIL MAPS AND MEDIUM SCALE SOIL MAPS

6.1 General

The three sample areas can be considered as unknown areas for this surveyor. Knowledge about the distribution of soils, soil pattern, soil conditions and their relationship with landscape features was extremely limited. Therefore the survey started with large scale mapping of an area of about 100 ha for each of the sample areas (fig. 1; areas A). These parts of the sample area are only surveyed at large scale. For the medium scale soil map they are generalized from the large scale soil map (zie chapter 7).

The remaining parts of the sample areas (fig. 1; areas B) are surveyed at medium scale. During this survey, knowledge gained from the large scale survey was used. There is no doubt that the medium scale soil maps are strongly influenced by this survey procedure.

The surveyed area for the medium scale soil map is about four times that of the large scale soil map, for each of the sample areas. It is obvious that the detailed information, obtained from the large scale survey, can be used for a much larger area. From the Reconnaissance survey it is expected that the detailed information is sufficient to map whole SP30 on medium scale with the same survey method. Only the area north-east of the river Windrush should be excluded. Here patches with unbedded drift occur. These are not surveyed in detail and the soil pattern is not sufficiently understood for this method of medium scale soil survey.

From the Geological Map of Witney (sheet 236) it is expected that most parts of this area also could be surveyed in a similar manner. Most probably some more detailed information would be necessary, especially from the Thames alluvium somewhere between Stanton Harcourt and Oxford. Also more detail information from limestone-areas would be necessary.

The main problem for the survey method employed is to decide to what extent, the detailed information obtained from the area surveyed in detail can be used for similar soils outside that area. Two aspects have to be considered:

1. To what degree the range of soil properties is valid for similar soils outside the area surveyed in detail?
2. Does the character of the relations between soils and external soil features allow delineation of soils by this observation density?

6.2 The range of soil properties

In general the range of soil properties is based on those of similar soils described for the area surveyed in detail. Usually the number of observations in itself is too low for a good estimate of the whole range of soil properties and the frequency distributions within each mapping unit. But if no indications are found that the range of soil properties is deviating from those of similar soils of the area surveyed in detail, the same range of soil properties is used for their description.

Information on delineated areas that are very small, is often supported by only one augering in each occurrence. E.g.: mapping unit BCFg-3 in sample area Caswell. Here the decision about the range of soil properties is partly based on the range of soil properties observed for the large scale soil map. But the variation in soil properties observed be-

tween each of these small occurrences also influences the range of soil properties used for the description of such a mapping unit of the medium scale soil map.

In some aspects the range and frequency distributions of soil properties employed for the description of the large scale mapping units, appear not to be typical for similar soils outside the area surveyed in detail. For these aspects the range and frequency distributions of soil properties have then been changed. This will involve a narrowing or an widening of the range of soil properties. Examples of these are mentioned in chapter 7; under b and c.

When a delineated area is only supported by a few augerings, as for the medium scale soil map, the observed range of soil properties may be narrower than in the density augered large scale areas. For the survey method employed this is particularly true for soil features that are weakly expressed or have no external expression. It is thus possible that the medium scale mapping unit may have the wider range encountered at larger scale but that this has remained undetected.

Nearly all soils in the area surveyed at medium scale are represented by similar soils, occurring in the area surveyed in detail. Only a few mapping units outside the area surveyed in detail have soils with deviating soil conditions and soil properties. Here the descriptions of the soils are mainly based on the knowledge obtained from the medium scale survey only. But for some aspects, the detailed information of associated soils can be used. E.g.: mapping unit NGG-1, consisting of very poorly drained soils with non-ripened subsoil does not occur in the area surveyed in detail (sample area Great Brook). But the soils of large scale mapping units NGG-2 and CGG-2 have locally non-ripened subsoils.

Deviating soil conditions also occur in Caswell. Here mapping unit COG-2/3 consists of alluvial soils over limestone. In sample area Yelford the mapping unit BCg-3 consists of soils which are transitional between the soils of the terraces and alluvial soils. The soils of both mapping units are not observed in the areas surveyed in detail.

6.3 The delineation of the medium scale mapping units

Soil boundaries are most easily recognized where they are related to clear external soil and landscape features. Similarly uniform soil groups (and their subgroups) aid the delineation of boundaries. Accurate positioning of the boundaries is difficult where the soil is highly variable and external soil features are absent. In practice those parts of the landscape where soil boundaries are accompanied by prominent external features are delineated first.
The framework of a soil map is decided by a number of such external features. For many of the remaining parts the positioning of the soil boundaries is less accurate. Often such an area of land has remained after delineation of the surrounding areas. If further delineation seemes to be unreliable, then such an area is often described by soils with a relatively wide range of soil properties.

The delineation of the medium scale mapping units are based on relatively few observations (approximately 1 augering per 5 or 6 ha). But for this survey proceduce the knowledge of the detailed survey is used for the medium scale survey. This facilitates the delineation of soils by a relatively low observation density.

The knowledge about the relations between external features and some soil boundaries is only obtained from the detailed survey. Some weakly expressed external features were discovered, which have proved to be necessary for the delineation. Afterwards they are used for the medium scale survey. Without the detailed survey their relations with soils would not have been understood and most probably some of them would not have been observed at all. E.g.: the mapping unit BEg/NGG in sample area Caswell (see p. 28 and p. 38).
These soils are situated in narrow strips on very gentle slopes and have no clear external soil features. For the medium scale soil map the soils could be detected by the occurrence of mole heaps. Their delineation was only possible by detailed information about their position in the landscape. But the knowledge about these criteria was obtained from the detailed soil survey.

So the delineation of the mapping units of the medium scale soil map are all influenced by the knowledge obtained from the detailed survey. The following mapping units are strongly influenced by this knowledge and some of them would not have been delineated at all without this knowledge.

In sample area Caswell: BEg/NGG (5 occurrences) and BCFg-3 (5 occurrences).
In sample area Yelford: BCg/CSG (4 occurrences) and BCT-4/5 (5 occurrences).
In sampleearea Great Brook: NGG/BEg (2 occurrences). Here soil complex CGG/NGG is an example of two pure mapping units of the large scale soil map, which could not be delineated for the medium scale soil map, because of the absence of external soil features.

Range of soil properties:		Boundaries: unchanged	Boundaries: deleted
	unchanged	a. non-generalized	d. all or some of the occurrences of a pure m.u. omitted and mentioned or not mentioned as impurities e. small soil complexes omitted and mentioned as impurities
	widened	b.	f. combination of two pure m.u. into a new pure m.u. g. combination of two pure m.u. into a soil complex h. soil complexes included with a pure m.u.; only parts contribute to the impurities
	narrowed	c.	------

Fig. 4. Types of generalization used in this survey (a-h refer to descriptions in chapter 7).

7. THE GENERALIZATION FROM THE LARGE SCALE SOIL MAPS

For each of the sample areas, the area A (fig. 1) has only been surveyed on large scale. For the medium scale soil map these areas have been generalized from the large scale soil maps.

The need for generalization is mainly decided by the size of the mapped areas . But the quality of the generalization is strongly influenced by the occurrence of clear external features, which are related to soil boundaries. Also knowledge about soil pattern and distribution of soils, outside the large scale area (fig. 1, areas B) has influence on the generalization.

In this report the term generalization is only considered in relation to soil maps. Such generalization always consists of an altera tion of the soil boundaries or the range of soil properties or both. The change of the boundaries may be limited to smoothing but more often a generalization is made by deletion of boundaries. This may cause a change in the range of soil properties. But such changes both by widening or narrowing of the range are also often applied without any alteration of the soil boundaries.

For this survey different types of generalization are applied but smoothing of soil boundaries occurs in one instance only. The other types of generalization are shown in fig. 4 and will be discussed here.

a. Non-generalized mapping units.

In some places there was no need for generalization. Both the soil boundaries and the range of soil properties used for the description of the large scale mapping units remain unchanged. E.g.: mapping unit NSG-2 in sample area Caswell.

b. Soil boundaries are not generalized, but the soils are described by a wider range of some of the soil properties.

This is caused by a wider range of some soil properties existing outside the large scale area. E.g.: sample area Yelford, where mapping unit NGG2-2 for the medium scale soil map is described by a wider range of textural classes. Mapping unit BEg is described here by a wider range of textural classes and slope classes.

c. Soil boundaries are not generalized but the soils are described by a narrower range of some of the soil properties.

As compared with similar mapping units of the large scale soil map, the mapping units of the medium scale soil map are usually described by a wider range of soil properties. But in some cases this range has been narrowed. This occurs if the range of a soil property within the large scale area is relatively large, as compared to the range for soils occurring over the whole sample area. The range of this soil property has then been narrowed and in as far as the soils do not fit in this narrower range, they are considered impurities for the medium scale soil map. E.g.: the range of the organic matter content of m.u. BC(g)-3/4 in sample area Caswell is smaller for the medium scale soil map.

In some cases the range of a soil property for the medium scale soil map has also been narrowed, if this soil property is not related to any external feature. Then survey effort for the medium scale soil map can be insufficient, either for its discovery, or to judge whether this wider range has to be considered as impurity.

E.g.: in sample area Caswell m.u. BCFg-3/4 has been changed into BCFg-3 for the medium scale soil map. Also the mapping units BEg-3 and BEg-3/2 are changed into BEg-3 for the medium scale soil map. It was expected that these differences in drainage could not be consistently discovered from external features in a medium scale survey. If so it would hardly be possible to judge whether it could be considered as an impurity or not.

d. Omission of all or some of the occurrences of a mapping unit of the large scale map. These are included within another pure m.u. of the medium scale map. They might be mentioned as impurities of this m.uu As compared with the similar m.u. of the large scale map, the range of soil properties has not been changed.

The reason for this type of generalization can be the small size of the delineated areas on the large scale soil map. E.g.: in sample area Caswell, one of the occurrences of m.u. BCFg-3/4 and the delineated area of m.u. BCg-2/3. For the larger area of the medium scale mapping unit, their proportions are thought to be so small, that they are not even mentioned as impurities.

This type of generalization is also employed if the soil boundaries are not accompanied by external features or if the proportions of the omitted areas, are thought to be much smaller, outside the large scale area. E.g.: mapping unit BCL-5 in sample area Caswell. For the large scale soil map, four mapping units are delineated here. The mapping unit of the medium scale soil map is named after one of these four and has the same range of soil properties. The three other mapping units are omitted and considered as impurities.

e. Omission of soil complexes of the large scale soil map. The range of soil properties has not been widened and both components of the soil complex are mentioned as impurities of the mapping unit in which they are included

In sample area Great Brook the soil complex BCg/CGG is omitted for the medium scale soil map. These soils are considered not to be a dominant component of the soil complex CGG/NGG, in which they are included. For the medium scale soil map they are only mentioned as impurities of this soil complex.

f. Combination of two or more pure mapping units into one pure mapping unit for the medium scale soil map. Both soils are considered as main components of the generalized mapping unit. The range of soil properties has been widened

In this case the mapping units belong to the same soil group (Appendix 6; table 2), but the small size of the delineated areas or lack of external features prevent delineation for the medium scale soil map. E.g.: the medium scale mapping unit BCT-4/5 in sample area Yelford.

g. Combination of two pure mapping units into one complex mapping unit for the medium scale soil map. Both are considered as main components the soil complex

This type of generalization is employed for the soils of mapping units which belong to different soil groups. In sample area Yelford the pure mapping units BCg-2/3 and CSG-2 are combined for the medium scale soil map into soil complex BCg/CSG. The reasons for the generalization here are also the small size of the delineated areas and the absence of clear external features.

In sample area Great Brook the mapping units NGG-2/1 and CGG-2/1 are combined into soil complex CGG/NGG. Here the intricacy of the soil pattern and the absence of clear external features prevent delineation for the medium scale soil map.

h. Omission of soil complexes of the large scale soil map which are included with a pure mapping unit. Parts of the soil complex cause a widening of the range of soil properties; other parts contribute to the impurities

This has been done for relatively small soil complexes of the large scale soil map. E.g.: the soil complex CGG/NGG of the large scale soil map is included in the larger pure mapping unit NGG-2 (sample area Caswell). Only the component CGG contribute to the impurities.

8. SOME REMARKS ON THE SUITABILITY OF SOILS FOR AGRICULTURE

These remarks are tentative in as far as this surveyor was unfamiliar with the finer details of farm management practices in this area.

The soils of the surveyed areas show big differences. Such big differences also occur within each sample area. For the soil map these differences are recorded by the range of a number of soil properties.

The most important properties for agricultural purposes are thought to be soil drainage, soil texture and soil depth. In this survey the soil drainage ranges from well drained to very poorly drained; soil texture ranges from loam or sandy loam to heavy clay; soil depth ranges from very shallow to deep.

The suitability of soils is decided by their yields under the normal range of climatologic conditions and their capability to be used for different purposes. The crops were observed only during the survey period. This was a wet period lasting from the end of May to the end of June 1972. Information was also obtained from talks with farmers. Only general remarks will be made about the suitability of the dominant soils.

Most of the soils of the limestone landscape in sample area Caswell can be used for both arable farming and grassland. Here the best soils are well drained and moderately deep and have loam and clayloam textures. E.g.: mapping unit BCL3-5 of the large scale soil map. The shallow soils can also be used for both (mapping unit BCL-5 of the medium scale soil map). But here the crops suffer from drought for some weeks in most summers. After rain the grass starts regrowing quickly. On these soils the grass production period is from early in spring till late in autumn. The surface horizons are not susceptible to poaching.

The soils of mapping units BCFg-3 and BCFg-3/4 are imperfectly drained and have clayey texture. They are less suitable for agriculture than other soils in the limestone area.

The Non-calcareous Surface-water gley soils are the most common soils in the Oxford Clay landscape (NSG-2). They are poorly drained and usually have clayey texture. Ley farming and arable farming are widespread. Due to the poor permeability of the subsoil, the soils suffer from seasonal surface wetness. They are often plastic when wet and hard when dry. Usually the cultivation is restricted to short periods. Where the Oxford Clay is overlain by a coarser textured drift layer, the soils are less restricted by seasonal surface wetness and cultivation is much easier.

Ground-water gley soils occur in the valley of the Norton Ditch. They represent the least suitable soils for agriculture in sample area Caswell. They are poorly drained and have clayloam and clay textures. For grassland the growing season is restricted by the high ground water table. Locally they suffer from flooding. In such places poaching is frequently observed. This also occurs in places where the organic matter content of the surface horizon is relatively high (slightly humose or humose). Also the cultivation of these soils is difficult and restricted to limited periods.

In sample area Yelford the most suitable soils for agriculture are found on the terraces (BCT-5; BCT-4/5). They can be compared with the soils of the limestone landscape, as described for sample area Caswell. The shallow and very shallow soils are susceptible to drought. Generally the soils are well drained. More poorly drained soils are often observed near the boundaries of the terraces, where they are underlain by Oxford Clay.

The Brown Earths with gleying (BEg-3) are often transitional soils between Surface-water gley soils and Ground-water gley soils. They are developed in drift over Oxford Clay or in alluvium. They are usually somewhat better drained than the surrounding soils and are more suitable for arable farming and grassland.

The soils developed in Oxford Clay can be divided into those which occur in the level parts and those which have gently sloping surfaces. The Non-calcareous Surface-water gley soils (NSG-2) are usually developed on the level parts of the Oxford Clay landscape. They are characterized by the same limitations as described for similar soils of sample area Caswell. But in the Yelford area, the influence of seasonal surface wetness will be more serious, because of the occurrence of more level parts.

The sloping parts of the Oxford Clay landscape are usually found near the terrace remnants. Here Brown calcareous soils with gleying and Calcareous Surface-water gley soils are developed (CSG-2; BCg-2/3; BCg/CSG). The soils are generally somewhat better drained than the Non-calcareous Surface-water gley soils. Also the limitations caused by seasonal surface wetness will be less serious for soils located on slopes.

The Non-calcareous Ground-water gley soils (NGG1-2; NGG2-2) are used for both grassland and arable farming. Those which are located in the narrow valley of the limestone landscape are restricted to similar limitations as described for the Caswell area.

Most of the Non-calcareous Ground-water gley soils are located in the wide Thames valley and are developed in older alluvium. Also here the growing season of grassland is restricted by a high ground-water table. For arable farming the cultivation is difficult and structureless and slaked horizons are often observed. But in this area surface horizons with relatively high organic matter content are rarely present and the soils are less susceptible to poaching. Flooding rarely occurs in this area. As compared with the Ground-water gley soils in narrow valleys, these soils have a higher suitability for agriculture.

Nearly all soils of sample area Great Brook are developed in alluvium. Most of them are Ground-water gley soils. Small patches with Brown Earths with gleying or Brown Calcareous soils also occur. The suitability of the alluvial soil in general is restricted. The limiting factors are: The grass starts growing late in spring. In wet periods the soils are susceptible to poaching especially in places where the soils have a relatively high content of organic matter in the A1-horizon. For this reason the grazing period is often limited. For ley farming cultivation is often difficult and in wet periods impossible.

These limiting factors do not have the same influence on all the soils distinguished. For some soils these factors are absent or have only a weak influence on their suitability for agricultural purposes. The least suitable soils for agriculture are the very poorly drained, Non-calcareous Ground-water gley soils with non-ripened subsoils (NGG-1). Here the suitability is seriously influenced by all these limiting factors. According to farmers the yield of wheat and barley are about half of those of other Ground-water gley soils in the same area.

Most faroured soils in this area are those developed in older alluvium and located on slightly higher parts (NGG/BEg; BEg-2). They are often slightly coarser textured and are also slightly better drained. Especially if they have a loam or silt loam subsoil, they are considered good soils by farmers.

The suitability of the soils of the mapping units NGG-2; CGG-2; NGG-2/1; CGG-2/1 and CGG/NGG are considered to be intermediate between

the soils discussed above. Of these, the soils of the mapping units NGG-2 and CGG-2 are thought to have fewer limitations because they are usually somewhat coarser textured and very poorly drained soils are rarely present here.

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