

The sand and gravel resources of the country between Ely and Cambridge, Cambridgeshire

Description of 1 : 25 000 sheets TL 56 and 57

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The first twelve reports on the assessment of British sand and gravel resources appeared in the Report series of the Institute of Geological Sciences as a subseries. Report 13 and subsequent reports appear as Mineral Assessment Reports of the Institute.

Details of published reports appear at the end of this Report.

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PREFACE

National resources of many industrial minerals may seem so large that stocktaking appears unnecessary but the demand for minerals and for land for all purposes is intensifying and it has become increasingly clear in recent years that regional assessments of the resources of these minerals should be undertaken. The publication of information about the quantity and quality of deposits over large areas is intended to provide a comprehensive factual background against which planning decisions can be made.

Sand and gravel, considered together as naturally occurring aggregate, was selected as the bulk mineral demanding the most urgent attention, initially in the south-east of England, where about half the national output is won and very few sources of alternative aggregates are available. Following a short feasibility project, initiated in 1966 by the Ministry of Land and Natural Resources, the Industrial Minerals Assessment Unit (formerly the Mineral Assessment Unit) began systematic surveys in 1968. The work is now being financed by the Department of the Environment and is being undertaken with the cooperation of the Sand and Gravel Association of Great Britain.

This report describes the sand and gravel resources of 200 km² of country between Ely and Cambridge, Cambridgeshire, shown on the accompanying resource sheet TL 56 and 57. The fieldwork was conducted by Mr C. E. Corser and by Mr. A. R. Clayton, who prepared the results for publication. The work is based on six-inch-scale geological surveys carried out by Institute Field Staff in 1938 and 1939 and between 1947 and 1953, and published on 1:50 000 Geological Sheet 188 (Cambridge). Information for the northernmost part of the district was obtained from six-inch-scale soil mapping carried out by staff of the Soil Survey of Great Britain in 1972 and incorporated in 1:50 000 Geological Sheet 173 (Ely) by Mr R. W. Gallois of the Institute's Field Staff. The geological lines now presented at 1:25 000 scale include minor amendments resulting from the present work. Particular thanks are due to Mr Gallois for his constructive comments on the geology of the district.

Mr J. D. Burnell, ISO, was responsible for negotiating access to land for drilling. The ready cooperation of land owners and tenants is gratefully acknowledged.

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The sand and gravel resources of the country between Ely and Cambridge, Cambridgeshire

Description of 1:25 000 sheets TL 56 and 57

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SUMMARY

The geological maps of the Institute of Geological Sciences, pre-existing borehole information and 122 boreholes drilled for the Industrial Minerals Assessment Unit, form the basis of the assessment of sand and gravel resources of the country between Ely and Cambridge, Cambridgeshire.

All deposits in the area which might be potentially workable for sand and gravel have been investigated and a simple statistical method has been used to estimate the volume. The reliability of the volume estimates is given at the symmetrical 95 per cent probability level.

The 1:25 000 map is divided into three resource blocks, containing between 4.1 and 11.4 km² of sand and gravel and two 'barren' areas where no potentially workable sand and gravel deposits have been found. For each resource block the geology of the deposits is described and the mineral-bearing area, the mean thicknesses of overburden and mineral and the mean gradings are stated. Detailed borehole data are also given. The geology, the position of the boreholes and the outlines of the resource blocks are shown on the accompanying map.

Bibliographic reference

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Notes

National Grid References given in this report all lie within the 100-km square TL.

Unless otherwise stated all boreholes referred to in this Report are given a Registration Number of the form 57 NW 41, explained in Appendix E.

INTRODUCTION

The survey is concerned with the estimation of resources, which include deposits that are not currently exploitable but have a foreseeable use, rather than reserves, which can only be assessed in the light of current, locally prevailing, economic considerations. Clearly, both the economic and the social factors used to decide whether a deposit may be workable in the future cannot be predicted; they are likely to change with time. Deposits not currently economically workable may be exploited as demand increases, as higher grade or alternative materials become scarce, or as improved processing techniques are applied to them. The improved knowledge of the main physical properties of the resource and their variability, which this survey seeks to provide, will add significantly to the factual background against which planning policies can be decided (Archer, 1969; Thurrell, 1971; Harris and others, 1974).

The survey provides information at the 'indicated' level 'for which tonnage and grade are computed partly from specific measurements, samples or production data and partly from projection for a reasonable distance on geologic evidence. The sites available for inspection, measurement, and sampling are too widely or otherwise inappropriately spaced to permit the mineral bodies to be outlined completely or the grade established throughout'. (Bureau of Mines and Geological Survey, 1948, p. 15).

It follows that the whereabouts of reserves must still be established and their size and quality proved by the customary detailed exploration and evaluation undertaken by the industry. However, the information provided by this survey should assist in the selection of the best targets for such further work. The following arbitrary physical criteria have been adopted:

- a The deposit should average at least 1 m in thickness.
- b The ratio of overburden to sand and gravel should be no more than 3:1.
- c The proportion of fines (particles passing the No. 240 mesh B.S. sieve, about $\frac{1}{16}$ mm) should not exceed 40 per cent.
- d The deposit should lie within 25 m of the surface, this being taken as the likely maximum working depth under most circumstances. It follows from the second criterion that boreholes are drilled no deeper than 18 m if no sand and gravel has been proved.

A deposit of sand and gravel which broadly meets these criteria, is regarded as 'potentially workable' and is described and assessed as 'mineral' in this report. As the assessment is at the indicated level, parts of such a deposit may not satisfy all the criteria.

For the particular needs of assessing sand and gravel resources, a grain-size classification based on the

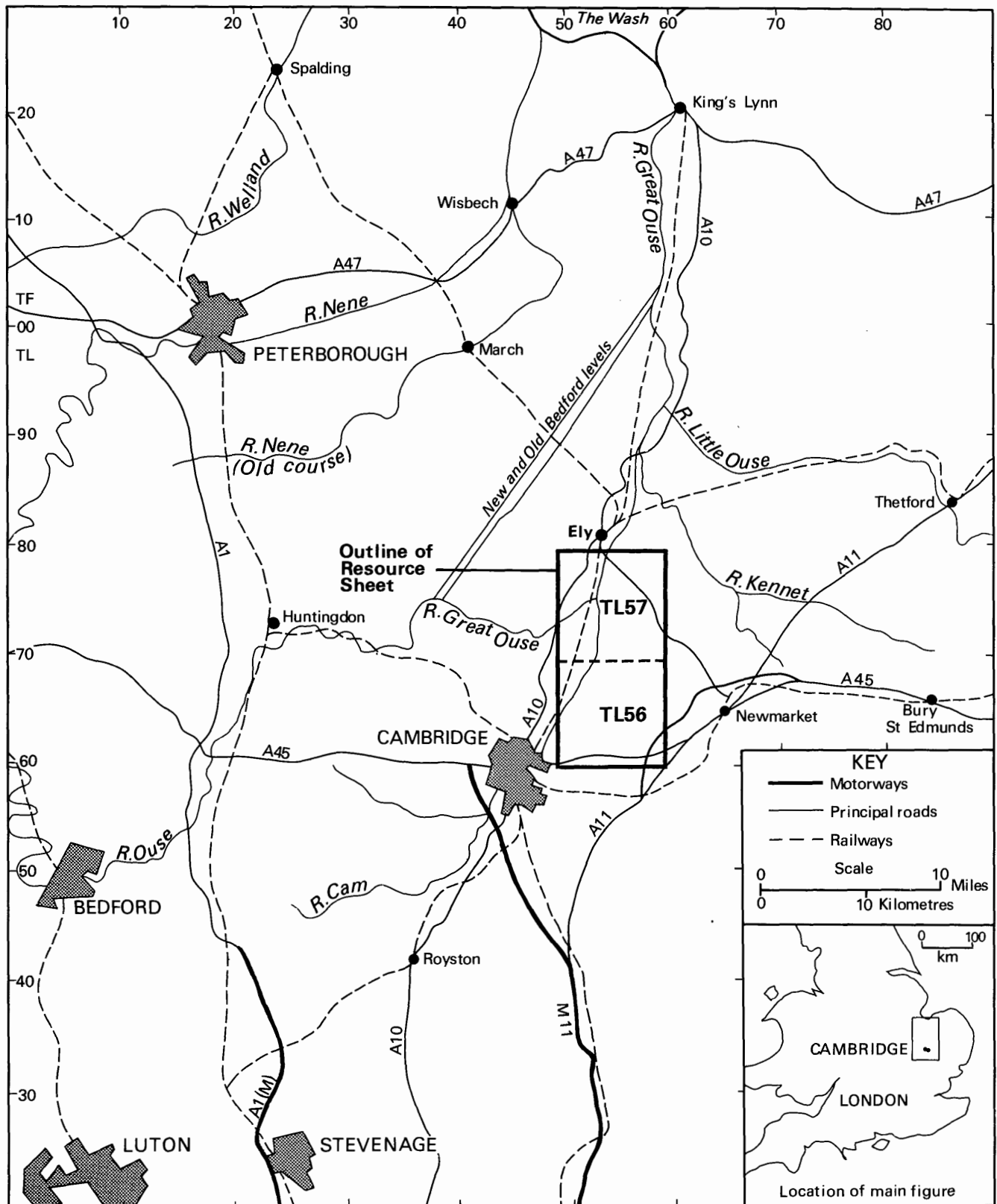


Figure 1 Sketch map showing the location of sheets TL 56 and 57, which constitute the resource sheet

geometric scale $\frac{1}{16}$ mm, $\frac{1}{4}$ mm, 1 mm, 4 mm, 16 mm has been adopted. The boundaries between fines (that is, the clay and silt fractions) and sand, and between sand and gravel material, are placed at $\frac{1}{16}$ mm and 4 mm respectively (see Appendix C).

The assessment of resources is based on data from 122 boreholes drilled for the Industrial Minerals Assessment Unit (IMAU), 13 pre-existing boreholes (mainly wells) and 15 exposure records (listed in Appendix D). In

addition to thickness data, information provided by IMAU boreholes includes detailed lithological descriptions of each deposit and grading analyses of the sand and gravel deposits: data from other boreholes and exposures are not generally as comprehensive as those from IMAU boreholes. Logs of IMAU boreholes are given in abbreviated form in Appendix F and are explained in Appendix E.

The volume and other characteristics are assessed

within resource blocks, each of which, ideally, contains approximately 10 km² of sand and gravel. No account is taken of any factors, for example, roads, villages and high agricultural or landscape value, which might stand in the way of sand and gravel being exploited, although towns are excluded. The estimated total volume therefore bears no simple relationship to the amount that could be extracted in practice.

It must be emphasised that the assessment applies to the resource block as a whole. Valid conclusions cannot be drawn about the mineral in parts of a block, except in the immediate vicinity of the actual sample points.

DESCRIPTION OF THE DISTRICT SHOWN ON SHEET TL 56 AND 57

GENERAL

This area is one of low relief and flanks the rivers Cam and Great Ouse. It lies to the north and east of Cambridge between Stow cum Quy [521 607] and Ely [544 800] (Figure 1). Part of the district is fenland lying below the level of the rivers Cam and Great Ouse at elevations of less than 1 m above OD. In the south-east lies a large area of undulating chalkland with little or no drift, rising to more than 50 m above OD around Four Mile Stable Farm [584 600]. In the north-west corner, low ridges of Kimmeridge Clay, Gault Clay or Woburn Sand, capped by Boulder Clay, attain heights of 23 m above OD near Ely [at 528 796]. Between Upware [537 702] and Barway [546 758] an inlier of Upware Limestone forms a low ridge trending north-south surrounded by fenland.

The River Cam flows in a northerly direction across the district almost to Little Thetford [531 761] where it joins the River Great Ouse; both rivers are confined between artificial banks. The right-bank tributaries of the Cam have been replaced by a series of straight artificial watercourses known as lodes and the fenland is drained by a complex system of dykes mostly constructed between the 17th and 19th centuries.

The district is intensively cultivated, yielding cereals, vegetables and root crops with exceptionally high yields coming from the black peaty fenland soils. There is an active limestone quarry north of Upware [at 544 724] producing roadstone, and a large disused clay pit north-west of Burwell [at 577 689]. Between about 1850 and 1890 'coprolites' (calcium phosphate nodules) were quarried from the Woburn Sand, the uppermost beds of the Gault Clay and the Cambridge Greensand (base of the Lower Chalk) in the Reach [566 662] and Horningsea [515 640] districts for use as a source of fertiliser (Grove, 1976). Over the centuries Burwell Stone (from the horizon of the Totternhoe Stone) has been quarried locally for use as a building stone. There is no current sand and gravel working in the district.

Major roads connecting Cambridge, Ely and Newmarket follow the higher ground to the west, south and east of the district and main railway lines link Cambridge, Ely and Newmarket. The rivers Cam and Great Ouse are navigable to small boats.

GEOLOGY

The geological deposits occurring at and near the surface in the district are listed in Table 1 and the relationships between the drift deposits are shown in Figure 2. A detailed account of the geology of the district is given by Worssam and Taylor (1969).

Table 1 List of geological deposits

Deposit	Maximum thickness recorded in the district (m)	Lithology
DRIFT		
Quaternary (Recent and Pleistocene)		
<i>Recent deposits</i>		
Terrington Beds	c. 1.0	silt and fine-grained sand
Shell Marl	c. 1.0	calcareous mud
Alluvium	2.0	silt and clay
Nordelph Peat	5.0	
Barroway Drove Beds	6.0	silty clay
'Lower' Peat	1.7	
<i>River Terrace Deposits</i>		
First Terrace	2.8	clayey pebbly sand
Second Terrace	3.0	sandy gravel
Third Terrace	2.1	clayey sandy gravel
Fourth Terrace	3.0	sandy gravel
Head Gravel	c. 2.0	clayey sandy gravel
Boulder Clay	6.9	sandy pebbly clay
Glacial Sand and Gravel	c. 2.0	very clayey sand
SOLID		
Cretaceous		
Middle Chalk with Melbourn rock at base		white chalk with thin marl seams
Lower Chalk, comprising:		white chalk
Upper Beds, with Totternhoe Stone at base		
'Chalk Marl'		alternating hard white and clayey soft chalk
Cambridge Greensand		pebbly glauconitic silt
Gault		dark grey mudstone and pale grey calcareous mudstone
Woburn Sands (Lower Greensand)		glauconitic sand
Jurassic		
Kimmeridge Clay	}	soft dark grey mudstone and pale grey calcareous mudstone
Amphthill Clay		
Upware Limestone		coralline and oolitic limestones

The Jurassic and Cretaceous rocks in the area generally have a gentle south-easterly dip and have been subjected to minor folding. A gentle anticlinal fold has brought underlying Jurassic and Lower Cretaceous rocks to the surface as a ridge trending north-south between Upware and Barway. Rocks older than the Upware Limestone have been proved only in boreholes.

Glacial deposits occur in the district but are of only minor extent: they comprise boulder clays with associated sands and gravels. The Recent deposits show evidence of two marine transgressions: the earlier, between c. 6000 and c. 4000 years ago, may have been due to subsidence of the North Sea basin, and the later, during the Romano-British period about 2000 years ago, may have been due to a eustatic rise in sea level. It is quite probable, however, that both transgressions were due to rises in sea-level caused by post-Pleistocene melting of ice-caps.

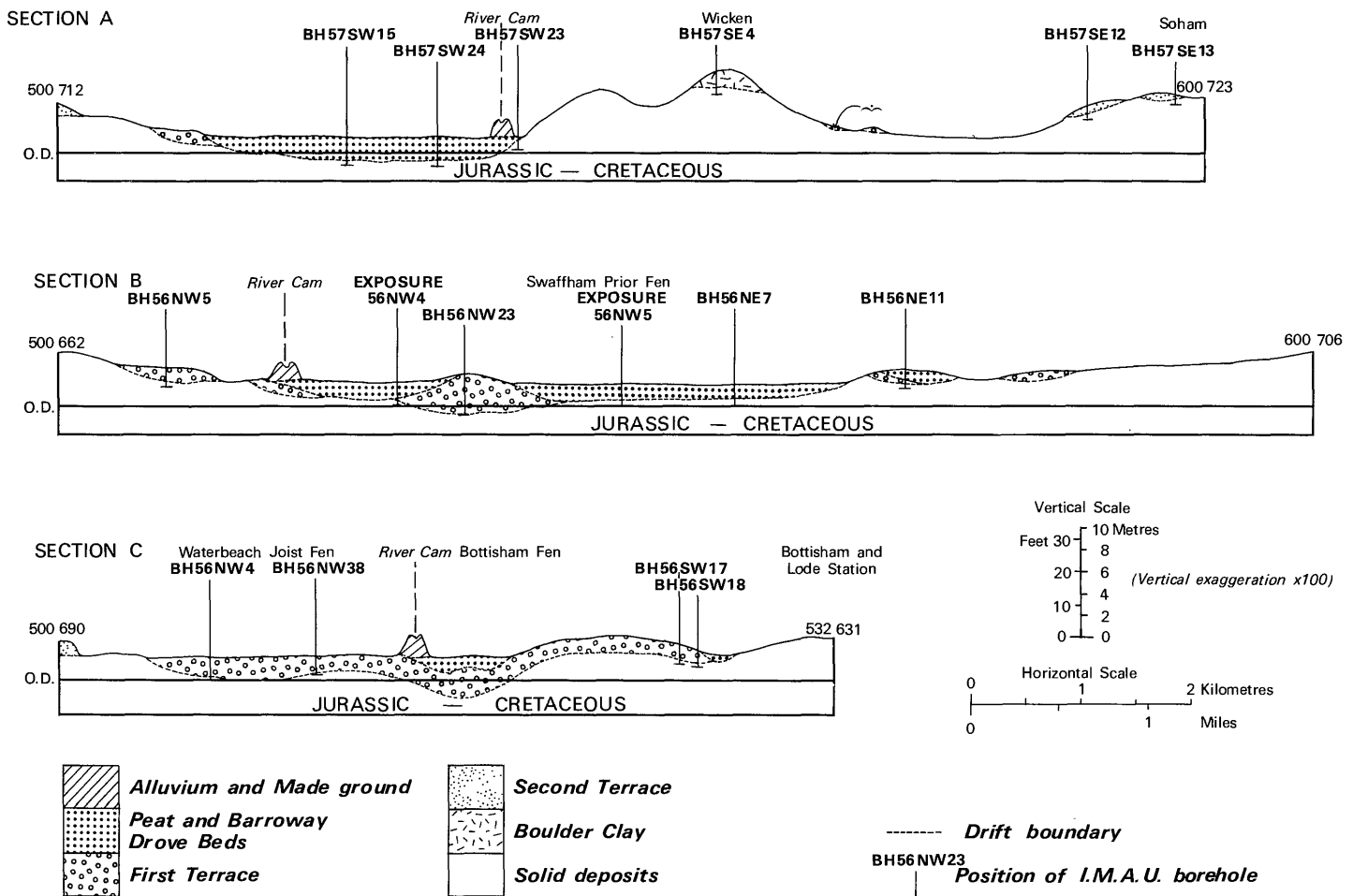


Figure 2 Schematic sections across the district showing the relationships between the principal Drift deposits

SOLID

Upware Limestone and Ampthill Clay: The Upware Limestone consists of cream-coloured oolitic limestone with seams or irregular masses of 'rag' composed of compound corals.

The Upware Limestone is underlain by the Ampthill Clay. This formation comprises soft dark mudstones and pale grey mudstones that weather to yellow or brown clays and are rich in crystals of selenite. Erosion surfaces marked by phosphatic pebble beds are common in the upper part of the formation: muddy limestones (cementstone) seams and concretions occur at several levels. Fossils, mostly bivalves and the ammonite *Amoeboceras*, are common at many levels but are usually destroyed by weathering in surface exposures.

Kimmeridge Clay: This formation crops out in the north-west of the district. It is lithologically similar to the Ampthill Clay but, in addition, contains thin seams of oil shale (kerogen-rich mudstone) (Gallois, 1979a, b). As with the Ampthill Clay, fossils (especially bivalves and ammonites) are common throughout but again are commonly destroyed by weathering. Only the lower part of the formation is preserved within the district: over much of the south-eastern part of the area it has been removed by erosion prior to the deposition of the Woburn Sands.

Woburn Sands (Lower Greensand): In this district the Woburn Sands is thin and incomplete in comparison with other parts of southern England. It comprises

poorly sorted fine- to coarse-grained glauconitic sandstone, pebbly in parts and contains thin seams of phosphatic pebbles. The formation crops out mainly beneath the drift deposits of the western, north-central and north-eastern parts of the district.

Gault: Occupying a broad syncline in the central part of the district but largely concealed beneath drift deposits, the Gault consists of hard, dark grey clay with occasional seams of phosphatic pebbles. A thin pebbly limonitic sand (Norfolk Carstone) occurs at the base, the lower part of which is silty, passing up into highly calcareous beds. The Gault rests on the Woburn Sands throughout the area except near Upware where it overlaps onto the Upware Limestone. It is separated by a minor unconformity from the overlying Cambridge Greensand (basal bed of the Chalk).

Lower Chalk: Occurring mainly in the south and east of the district, the Lower Chalk forms the largest area of exposed solid rocks. It is divided into the Cambridge Greensand, 'Chalk Marl', and upper beds.

The base of the Chalk is marked by the Cambridge Greensand, a thin bed of glauconitic silt containing phosphatic pebbles. Above this lies the 'Chalk Marl' comprising alternations of grey argillaceous chalk and hard white chalk. The Totternhoe Stone (or Burwell Rock) separates the 'Chalk Marl' from the higher beds of the Lower Chalk. The Totternhoe Stone comprises grey, weathering to brown, compact, well-jointed, pebbly and highly fossiliferous chalk which gives rise to a pronounced topographical feature marked at its base by

a strong spring-line. The higher beds of the Lower Chalk consist of well-jointed compact white chalk.

Middle Chalk: This formation comprises beds of massive greyish white chalk with marly partings and occasional seams of nodular and tabular flints. At the base of the deposit about 2 m of hard yellowish white nodular chalk (the Melbourn Rock) forms a well-defined topographical feature and spring-line.

DRIFT DEPOSITS

Boulder Clay: In the northern part of the district, lying at between 3 m and 23 m above OD, are several patches of Boulder Clay. They form low ridges trending north-west to south-east, which are cut across by the rivers Cam and Great Ouse. At Wicken [570 707], Padney [522 743] and Stretham [513 749] the deposits appear to be channel infills, while at Witchford Airfield [520 785] and near Ely [at 525 797] they take the form of plateau-like cappings on a low ridge.

The Boulder Clay consists of sandy, pebbly bluish grey clay, derived mostly from the local Upper Jurassic and Cretaceous rocks, and weathers to a brown stony clay. It is locally gravelly or sandy, containing abundant fine pebbles (4 to 16 mm) of chalk and flint and, more rarely, limestone, sandstone, quartzite and igneous and metamorphic rocks. Discrete beds of sand and gravel occur beneath or within the boulder clay between Ely and Wicken and were proved in IMAU boreholes 57 NW 41, 57 SE 3 and 57 SE 4. These deposits are up to 2.5 m thick and comprise generally 'clayey' sand (for nomenclature see Appendix C) which may locally contain a high proportion of Woburn Sands debris.

Glacial Sand and Gravel: The only mapped deposit of Glacial Sand and Gravel occurs south-west of Ely [at 526 794] and comprises 'very clayey' sand about 2 m thick.

Head Gravel: Two small patches of Head Gravel occur in the south-east of the district around Four Mile Stable Farm [584 600] and Gravelpit Farm [588 626] at heights of 50 m and 45 m respectively. These poorly sorted and poorly bedded high-level deposits comprise locally-derived flint, chalk, clay and sand with a variety of erratics, and probably represent solifluxion products derived from patches of Boulder Clay that have since been removed by erosion.

River Terrace Deposits

Four distinct river terraces have been recognised in the district (Worssam and Taylor, 1969). For the most part the deposits comprise clayey, sandy, flint and chalk gravels which may be either well bedded or poorly bedded.

Fourth Terrace: A single patch of Fourth Terrace lies across the edge of the district south-east of Stow cum Quy [520 605]. It has an elevation of 18 m above OD and comprises up to about 3 m of sandy gravel.

Third Terrace: At an elevation of 12 m above OD in the south of the district near Bottisham [535 602], a thin gravelly bench of Third Terrace deposits occurs incised into the adjoining Fourth Terrace. Capping the high ground around Soham in the east of the district are five small deposits of sandy gravel attributable to the Third

Terrace; these lie at between 6 and 12 m above OD and have a maximum recorded thickness of 1.5 m.

Second Terrace: Occurring widely throughout the district, the Second Terrace deposits range in elevation from about 3 to 6 m above OD. The largest outcrop is south-east of Clayhythe [at 506 630] and consists of sandy gravel with a maximum recorded thickness of 3 m. In the vicinity of Soham there are several small irregular patches of Second Terrace between 1 and 2 m thick and lying at about 6 m above OD. Other Second Terrace deposits occur near Vicarage Farm [505 698], and one elongated patch, overlain in part by a narrow strip of Alluvium, lies at an anomalous 30 m above OD south-east of New England Stud Farm [at 594 602].

First Terrace: Most of the First Terrace deposits are to be found bordering the rivers Cam and Great Ouse and lying at elevations generally less than 3 m above OD. They also occur in the fenlands lying to the east of the Cam. Large areas of the First Terrace are exposed at Bottisham Fen [525 645], around Waterbeach Joist Fen [510 675] and south of Stretham Mere [514 719]. The deposits also occur as inliers where the overlying peat has wasted away, for example at Swaffham Bulbeck Fen [535 669], Adventurers' Fen [562 692] and elsewhere.

First Terrace deposits range in thickness from 10 cm to a maximum proved thickness of 3.0 m in borehole 57 SE 1, but they are generally thin and discontinuous particularly where overlain by peat. Evidence from trench sections indicates that First Terrace deposits are mainly 'clayey' pebbly sand, with subordinate interbedded silts and clays. Beneath the peat deposits east of Thorney Hill [515 791], sand and gravel deposits attributable to the First Terrace comprise locally derived reworked Woburn Sands and rest directly on Kimmeridge Clay (Skertchly, 1877; Seale, 1975).

Deposits in the vicinity of Lode [at 515 636] have been disturbed and mixed with the underlying clays during 'coprolite'-winning operations (see the paragraph headed 'Worked areas' in the section dealing with the map).

Recent Deposits

These deposits include 'Lower' Peat, the Barroway Drove Beds, Nordelph Peat, Alluvium, Shell Marl and the Terrington Beds.

'Lower' Peat: This deposit infills erosional depressions in older superficial deposits or in the uneven bedrock surface: it is therefore of variable thickness, ranging from about 10 cm thick at the fen margins to a maximum proved thickness of 1.7 m in borehole 56 NW 19. The peat comprises decomposed vegetable matter (such as freshwater reeds, willow and alder), together with scattered shells and occasional vertebrate remains; some bog-oak is found near the margins of the deposit.

The 'Lower' Peat is widely overlain by the Barroway Drove Beds and the Nordelph Peat and, locally, by other younger superficial deposits. It accumulated from late Neolithic times until about 6000 years ago.

Barroway Drove Beds: This term has been recently introduced (Gallois, 1979a) to cover deposits elsewhere referred to under a variety of names such as 'Fen Clays' or 'Buttery Clay'.

The Barroway Drove Beds do not crop out in the district, for they are everywhere overlain by peat; they

are known only from borehole records and trench sections. They are estuarine or brackish-water deposits comprising soft, grey to greenish blue clays and silts with varying amounts of sand (mostly infilling creeks), scattered pebbles and organic matter comprising peaty seams containing rootlets. The deposits range from 10 cm to as much as 6.0 m thick and are thickest immediately adjacent to the River Cam. They are invariably overlain by the Nordelph Peat and in turn may overlie an older bed of peat (the so-called 'Lower' Peat), older superficial deposits or Solid rocks.

Nordelph Peat: This deposit overlies the Barroway Drove Beds in the district but may also rest on other older superficial deposits or Solid rocks. It ranges from about 10 cm thick at the fen margins to a maximum proved thickness of 5.0 m in IMAU borehole 56 NW 21 on Swaffham Prior Fen. Near the fen margins the Nordelph Peat may rest directly on the 'Lower' Peat giving rise to a continuous thickness of peat.

Subsequent shrinkage or wastage leaves slight depressions which mark former drainage lines, for example at Swaffham Bulbeck [554 629]. Peat also frequently occurs as infill in old river channels. In some areas the Nordelph Peat accumulated continuously from about 4000 years ago until the 17th to 19th centuries.

Throughout the district there has been rapid shrinkage and wastage of the peat deposits as a result of the drainage of the fens and the attendant lowering of the water table (Earp and Holmes *in* Worssam and Taylor, 1969, p. 94). Thicknesses quoted are present-day values, and are considerably less than the original thickness of peat existing before the commencement of artificial drainage (Godwin, 1978).

Alluvium: Narrow belts of freshwater Alluvium occur in the narrow strips of land lying between the artificial flood banks of the rivers Cam and Great Ouse. This Alluvium consists of fine silt and clay up to 2.0 m thick overlying peat or the solid deposits.

Shell Marl: This deposit occupies the sites of former fenland meres and abandoned meanders of the River Cam. Some of these abandoned water courses, now almost obliterated by ploughing, are to be found in the vicinity of Upware [at 545 695 and 526 690] and Bottisham Fen [524 669]. Soham Mere [575 730], now drained, was the site of a large freshwater fenland mere.

The deposits range from about 0.8 m to 1.1 m thick and comprise calcareous mud containing abundant comminuted freshwater shells with occasional clay and peaty seams locally.

Terrington Beds: Within this district the Terrington Beds are restricted to a narrow sinuous ridge (or roddon) in the vicinity of Stuntney [556 783] that marks the former position of the tidal channel of the River Great Ouse. The deposits comprise silts and fine-grained sands and were laid down about 2000 years ago (Gallois, 1979b).

COMPOSITION OF THE SAND AND GRAVEL DEPOSITS

The potentially workable deposits in this district comprise the First, Second, Third and Fourth terraces of the rivers Cam and Ouse, and Head Gravels.

First and Second Terrace Deposits: Overall, these deposits grade as 'pebbly sand' but vary locally from 'sand' to 'gravel' and are commonly 'clayey' to 'very clayey' (see Appendix C).

The fines comprise clay and silt; locally a high chalk content is present.

The sand fraction is fine or medium grained with coarse sand present only as a minor constituent. The fine sand is composed predominantly of rounded quartz grains with crystalline calcite and chalk usually comprising between 20 and 50 per cent of the fraction. Mica, goethite and glauconite grains although conspicuous, are present only in minor amounts. In the medium sand size-range rounded quartz is the dominant constituent with subordinate amounts of angular flint. The proportion of calcium carbonate is markedly less than in the fine fraction, ranging from around 5 per cent to 30 per cent in parts, and comprises mainly rounded, partly dissolved chalk grains. Glauconite, goethite and mica are either very rare or absent. The coarse sand fraction consists predominantly of angular flint fragments with subordinate (or locally equal) amounts of rounded chalk with traces of sandstone, limestone or mudstone; quartz is either very rare or absent.

The gravels are predominantly fine grained with the coarse gravel fraction rarely exceeding 32 mm in mean diameter. The fine gravel comprises angular and subangular flint pebbles with subordinate (or locally equal) amounts of hard chalk, minor amounts of sandstone, mudstone, limestone and quartz and occasional fragmentary belemnites and coprolites. The coarse gravel is composed of angular and subangular flint pebbles with minor amounts of sandstone and other sedimentary rocks occurring only sporadically.

Third and Fourth Terrace Deposits and Head Gravels: The grading characteristics and composition of these deposits are broadly similar to those of the First and Second Terrace deposits: the main differences noted in samples from boreholes are the generally higher fines content of these deposits (Figure 3), and the smaller proportion of chalk and virtual absence of calcite crystals in the sand fractions.

THE MAP

The sand and gravel resource map is folded into the pocket at the end of this report. The base map is the Ordnance Survey 1:25 000 Outline Edition in grey, on which the topography is shown by contours in green, the geological data in black, and the mineral resource information in shades of red.

Geological data: The geological boundary lines and symbols are taken from the geological maps of the area surveyed in 1938 and 1939 and 1947 to 1953 at the scale of 1:10 560 by members of the Institute's East Anglia and South-Eastern England Unit. Information for about 35 km² of ground along the northern edge of the district was obtained from 1:10 560 scale Soil Survey maps surveyed in 1972 and now incorporated in the 1:50 000 Geological Sheet 173 (Ely). Borehole data, which include the stratigraphic relations, thickness and mean particle size distribution of the sand and gravel samples collected during the assessment survey are also shown.

The geological boundaries are regarded as the best interpretation of the information available at the time of the survey. However, it is inevitable, particularly with deposits such as those included in this area, that local

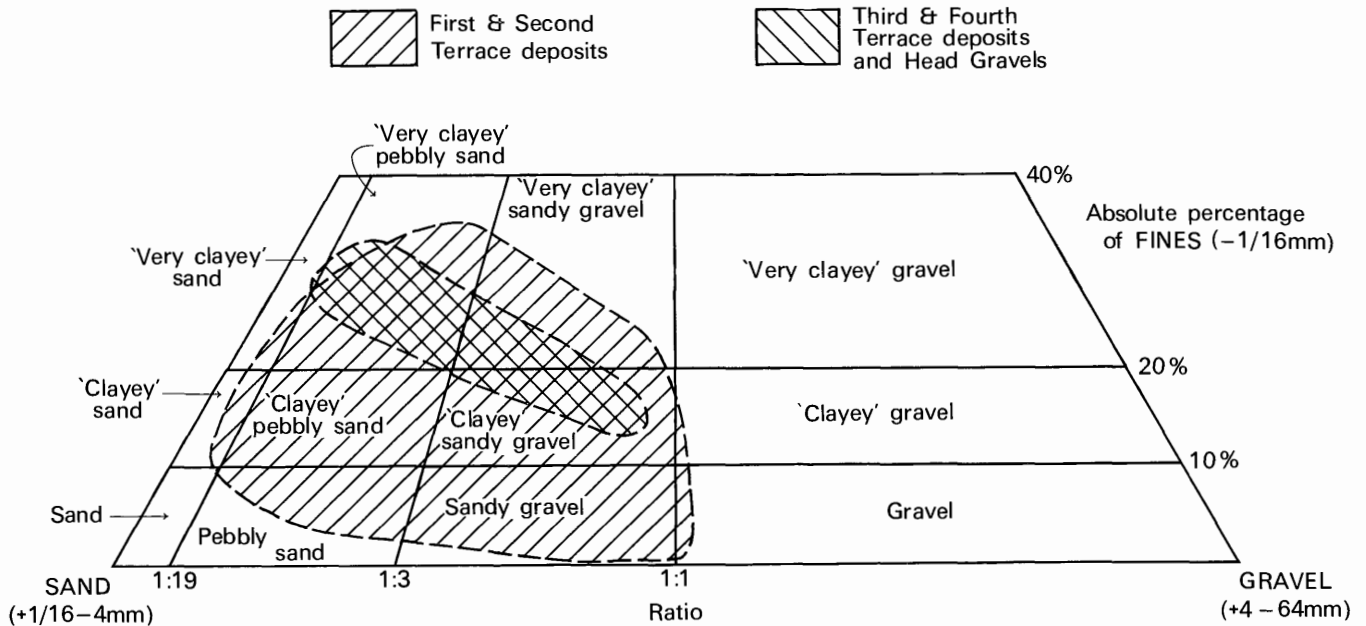


Figure 3 Comparison of the range in grading characteristics of the sand and gravel deposits

discrepancies or irregularities will be revealed by some boreholes (as for example at borehole 56 NW 18). Where necessary these are taken into account in the assessment of resources (see Appendix B).

Mineral resource information: For assessment purposes the mineral bearing ground is divided into resource blocks. These may be divided into areas of mineral and areas where sand and gravel is not potentially workable or is absent (for definitions of 'mineral' and 'potentially workable' see p. 1): In this survey the mineral has been subdivided into areas where it is exposed (that is where overburden averages less than 1 m in thickness), and areas where it is present in continuous or almost continuous spreads beneath overburden greater than 1 m in thickness. Elsewhere sand and gravel is considered to be discontinuous beneath overburden or absent. (Mineral is described as 'almost continuous' where it is present in 75 per cent or more of the boreholes in a resource block.)

Areas where bedrock crops out and where the available evidence suggests that sand and gravel is not potentially workable or is absent are uncoloured on the map; where appropriate the reason is stated. In such areas it is assumed that mineral is absent except in infrequent and relatively minor patches which can neither be outlined nor assessed quantitatively within the context of this survey. Areas of unassessed sand and gravel, for example, north of Wicken [at 571 719], are indicated by a red stipple.

For the most part, the areas of the various categories of deposits are measured from the mapped geological boundary lines. Where there is a transition from one category to another which cannot be related to the geological map and which cannot be delineated accurately, inferred boundaries, shown by a distinctive symbol, have been inserted. Such boundaries are drawn primarily for the purpose of volume estimation. The symbol is intended to convey an approximate location within a likely zone of occurrence rather than to represent the breadth of the zone, its size being limited only by cartographic considerations. For the purpose of measuring areas the centre-line of the symbol is used.

Worked areas: The approximate extent of known sand and gravel workings to January 1979 are shown on the map. Locations where coprolite working (p. 3) has resulted in the removal and reinstatement of sand and gravel deposits are indicated on the map but it is not usually possible to delimit such areas accurately. Although sand and gravel deposits may have been disturbed by coprolite working they are not considered to have been worked and for assessment purposes are treated as in-situ deposits.

RESULTS

The statistical results are summarised in Table 2. Fuller grading particulars are shown in Figure 4. No attempt has been made to assess the resources present within the Woburn Sands although some details are given in the borehole logs (Appendix F).

Accuracy of results: For the three resource blocks, the accuracy of results at the 95 per cent probability level ranges from 26 to 41 per cent (that is, it is probable that 19 times out of 20 the true volumes lie within the given limits of the mean). However, the true values are more likely to be nearer the figures estimated than the limits. Moreover, it is probable that in each block approximately the same percentage limits would apply for the estimate of volume of a very much smaller parcel of ground (say 100 hectares) containing similar sand and gravel deposits, if the results from the same number of sample points (as provided by, say, ten boreholes) were used in the calculation. Thus, if closer limits are needed for the quotation of the reserves in part of a block, it can be expected that data from more than ten sample points will be required, even if the area is quite small. This point can be illustrated by considering the whole of the potentially workable sand and gravel on this sheet. The total volume (33 million m³) can be estimated to limits of ± 18 per cent at the 95 per cent probability level, by a calculation based on the data from 57 sample points spread across the three resource blocks. However it must be emphasised that the quoted volume of sand and gravel has no simple relationship with the amount that could be extracted in practice, as no allowance has been

Table 2 The sand and gravel resources of the country between Ely and Cambridge, Cambridgeshire

Block	Area		Mean thickness		Volume of sand and gravel			Mean grading percentages		
	Block	Mineral	Overburden	Mineral	Limits at 95% confidence level ±%	±m ³ × 10 ⁶	Fines	Sand	Gravel	
	km ²	km ²	m	m			m ³ × 10 ⁶	- $\frac{1}{16}$ mm	+ $\frac{1}{16}$ -4 mm	+4 mm
A	12.5	9.7	1.2	1.3	12.6	26	3.3	11	70	19
B	12.5	11.4	0.9	1.3	14.8	30	4.4	13	59	28
C	11.7	4.1	0.5	1.4	5.7	41	2.4	29	58	13
All	36.7	25.2	0.9	1.3	33.1	18	5.9	18	61	21

made in the calculations for any restraints (such as existing buildings and roads) on the use of land for mineral working.

NOTES ON THE RESOURCE BLOCKS AND UNASSESSED SAND AND GRAVEL DEPOSITS

The mineral-bearing ground of the district has been divided into three resource blocks comprising a total of 36.7 km²; the remainder of the district is considered to be barren except for minor occurrences of (unassessed) sand and gravel, described below.

Resource Blocks

The sand and gravel deposits of each resource block are broadly similar in age, genesis, thickness and composition. Blocks A and B contain all of the River Terrace Deposits of the low ground flanking the rivers Cam and Ouse; Block C contains the River Terrace Deposits and Head Gravels occurring on the higher ground of the south and east of the district. Each resource block has been assessed statistically and the results are given in Table 2 and Figure 4.

Block A

This block occupies 12.5 km² of low-lying ground between the rivers Cam and Ouse and contains 9.7 km² of potentially workable sand and gravel deposits. These deposits occur both at the surface and beneath overburden and comprise First Terrace with some small patches of Second and Third Terrace deposits along the western margin of the block. Bedrock comprises Gault clay with small patches of Woburn Sands and Kimmeridge Clay in the north and north-west.

The assessment of resources is based on 10 Industrial Minerals Assessment Unit (IMAU) boreholes and 10 other records (summarised in Table 3). The maximum recorded thickness of mineral is 2.4 m in borehole 56 NW 38 but the deposit thins-out rapidly beneath the continuous spreads of peat in the north and western parts of the block. The mean thickness of mineral is 1.3 m and the total estimated volume is 12.6 million m³ ± 26 per cent.

In IMAU boreholes the mineral comprises pebbly sand or, more locally, sandy gravel and may be 'clayey' or 'very clayey' in places. The mean grading for the block

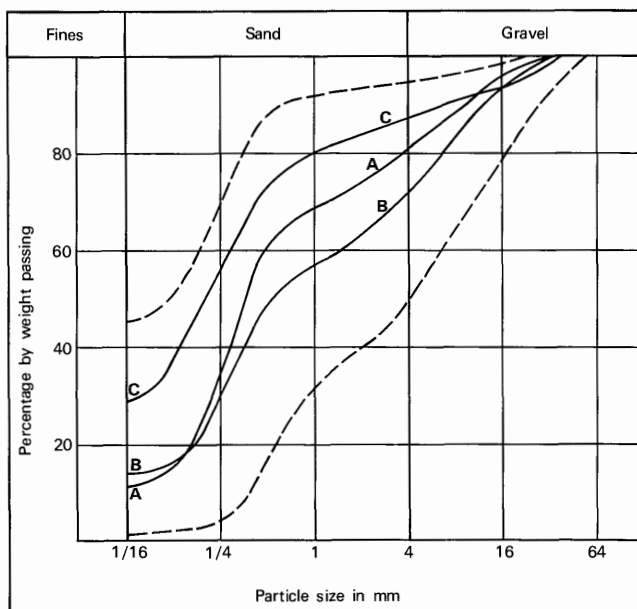


Figure 4 Mean particle size distributions for the assessed thickness of mineral in resource blocks A, B and C: the dotted lines indicate the envelope within which the mean grading curves of the assessment boreholes fall

Block Mean grading percentage

Block	- $\frac{1}{16}$ mm	+ $\frac{1}{16}$ - $\frac{1}{8}$ mm	+ $\frac{1}{8}$ - $\frac{1}{4}$ mm	+ $\frac{1}{4}$ - $\frac{1}{2}$ mm	+ $\frac{1}{2}$ -1 mm	+1 -2 mm	+2 -4 mm	+4 -8 mm	+8 -16 mm	+16 -32 mm	+32 -64 mm
A	11	4	20	26	8	5	7	8	8	3	0
B	13	3	14	19	8	6	9	12	10	6	0
C	29	8	20	17	7	3	3	4	3	5	1

Table 3 Block A: data from boreholes and exposures used in the assessment of resources

A IMAU boreholes

Borehole	Recorded thickness		Mean grading percentages					
	Overburden	Mineral	Fines	Fine sand	Medium sand	Coarse sand	Fine gravel	Coarse gravel
	m	m	$-\frac{1}{16}$ mm	$+\frac{1}{16}-\frac{1}{4}$ mm	$+\frac{1}{4}-1$ mm	$+1-4$ mm	$+4-16$ mm	$+16$ mm
56 NW 3	0.4	0.5	19	14	24	19	19	5
56 NW 4	0.5	1.0	9	19	56	9	7	0
56 NW 5	1.2	1.8	5	28	36	11	16	4
56 NW 6	2.3	1.3	2	2	26	21	33	16
56 NW 8	1.3	0.7	5	22	46	10	15	2
56 NW 9	0.9	0.7	14	29	30	9	17	1
56 NW 10	0.8	1.5	6	36	32	13	12	1
56 NW 14	0.8	1.0	27	24	34	4	11	0
57 SW 12	0.5	1.0	22	39	30	5	4	0
57 SW 20	1.6	0.9	15	11	30	21	21	2
Block mean grading			11	24	34	12	16	3

B Non-IMAU boreholes*

Borehole	Recorded thickness	
	Overburden m	Mineral m
56 NW 35	2.4	1.3
56 NW 36	2.1	1.8
56 NW 37	0.6	2.1
56 NW 38	0.6	2.4
56 NW 40	1.5	1.2
57 SW 29	1.5	1.1

C Exposures

Exposure	Recorded thickness	
	Overburden m	Mineral m
56 NW E2	1.3	2.3
57 SW E2	2.1	0.8
57 SW E4	2.6	1.3+
57 SW E5	2.4	0.0

* Excluding details of any boreholes held on 'Commercial-in confidence' basis.

is fines 11 per cent, sand 70 per cent and gravel 19 per cent, but the fines and gravel content varies widely (Table 3A). Fines vary from 2 per cent in borehole 56 NW 6 to 27 per cent in 56 NW 14 and the gravel from 4 per cent in borehole 57 SW 12 to 49 per cent in 56 NW 6. The sand content varies from 49 per cent in borehole 56 NW 6 to 84 per cent in 56 NW 4.

Overburden, comprising clay or peat, overlies almost all of the potentially workable sand and gravel of the block. It ranges in thickness from 0.4 m to 2.6 m and has a mean value of 1.2 m.

Block B

This block is in two parts. The larger part occupies the low-lying ground on the east bank of the River Cam between Lode [532 627] and Upware [537 701] and a smaller part occupies similar ground near the fen edge north-west of Burwell [588 673]. The total area of the block is 12.5 km² and mineral is present over 11.4 km².

The geology, lithology and grading characteristics of this block are similar to those of Block A. The potentially workable sand and gravel deposits include First and Second Terrace deposits occurring both at the surface and beneath overburden. These deposits are thin, even at outcrop, and wedge out rapidly beneath the continuous spreads of peat particularly in the north of the block. Bedrock comprises Gault clay in the north with Lower Chalk rocks occurring in the southern part of the block.

The assessment of resources is based on 15 IMAU boreholes and 7 other records (summarised in Table 4). The mean thickness of mineral in the block is 1.3 m, thicknesses ranging from a maximum of 2.8 m in borehole 56 NW 12 to a minimum thickness of 0.7 m recorded in boreholes 56 SW 17 and 56 SW 18 (Table 4B). However, sand and gravel was not found in boreholes 56 NW 24, 56 NW 18 or 56 NE 12 and these results were taken into account in the calculation of resources. The estimated volume of mineral in the block is 14.8 million m³ ± 30 per cent.

On evidence from IMAU boreholes, the mineral of this block comprises pebbly sand or sandy gravel and is generally 'clayey'. The mean grading is fines 13 per cent, sand 59 per cent and gravel 28 per cent although there are some marked variations between boreholes (Table 4A). The fines content is usually between 11 and 30 per cent but in boreholes 56 NW 22, 56 NW 12 and 56 SW 10 it is only 6 per cent or less. The sand content varies from 42 per cent in borehole 56 SW 12 to 85 per cent in 56 NW 23. The gravel content is generally between 18 and 47 per cent but in boreholes 56 NE 11, 56 NW 23 and 56 NW 31 it constitutes no more than 11 per cent of the mineral.

Although locally absent in the south of the block, overburden is invariably present elsewhere, reaching a maximum recorded thickness of 5.5 m in borehole 56 NW 42; however the mean thickness of the overburden is only 1.3 m.

Table 4 Block B: data from boreholes and exposures used in the assessment of resources

A IMAU Boreholes

Borehole	Recorded thickness		Mean grading percentages					
	Overburden	Mineral	Fines	Fine sand	Medium sand	Coarse sand	Fine gravel	Coarse gravel
	m	m	$-\frac{1}{16}$ mm	$+\frac{1}{16}-\frac{1}{4}$ mm	$+\frac{1}{4}-1$ mm	+1-4 mm	+4-16 mm	+16 mm
56 NW 11	2.4	2.4	14	9	27	16	23	11
56 NW 12	0.6	2.8	4	6	25	18	36	11
56 NW 17	0.2	1.3	17	45	8	9	18	3
56 NW 18	1.1	absent	-	-	-	-	-	-
56 NW 22	3.2	2.1	1	7	37	15	35	5
56 NW 23	1.2	1.3	11	47	32	6	4	0
56 NW 24	1.7	absent	-	-	-	-	-	-
56 NW 25	1.1	0.9	17	18	34	13	18	0
56 NW 31	1.0	0.8	22	24	32	11	11	0
56 NE 11	1.9	1.6	30	34	21	8	7	0
56 NE 12	1.0	absent	-	-	-	-	-	-
56 SW 9	0.3	1.8	26	16	26	7	16	9
56 SW 10	0.2	1.8	6	15	45	13	19	2
56 SW 11	0.2	1.2	24	20	26	11	17	2
56 SW 12	1.1	1.1	22	10	15	17	27	9
Block mean grading			13	17	27	15	22	6

B Non-IMAU boreholes*

Borehole	Recorded thickness	
	Overburden	Mineral
	m	m
56 NW 39	0.3	1.1
56 SW 17	0.7	0.7
56 SW 18	0.6	0.7

C Exposures

Exposure	Recorded thickness	
	Overburden	Mineral
	m	m
56 SW E1	0.0	1.2
56 SW E2	0.0	2.4
56 SW E3	0.0	0.9

* Excluding details of any boreholes held on 'Commercial-in confidence' basis.

Block C

The mineral in this block occurs on three separate areas of high ground in the east and south of the district. The total area of the block is 11.7 km² but mineral is present in only 4.1 km². The potentially workable deposits comprise small, usually isolated patches of First, Second, Third and Fourth Terraces and Head Gravel occurring at elevations of between 3 and 8 m above OD around Soham [593 732] and between 16 and 50 m in the districts around Stow cum Quy [521 607] and south-east of Swaffham Prior [569 641]. Lower and Middle Chalk forms the bedrock throughout much of the block with Gault clay occurring locally around Soham.

The assessment of resources is based on 14 IMAU boreholes and 4 other records (summarised in Table 5). The maximum recorded thickness of mineral in the block is 3.6 m in borehole 56 SW 16 and the minimum is 0.7 m in borehole 56 SW 15 nearby. Sand and gravel was not found in four boreholes and these results are taken into account in the calculation of resources. The mean thickness of mineral is 1.4 m and the estimated volume is 5.7 million m³ ± 41 per cent.

Evidence from IMAU boreholes indicates that the deposits are broadly uniform in grade, usually comprising 'very clayey' pebbly sand, but they may contain more gravel locally. The mean grading for the block is fines 29 per cent, sand 58 per cent and gravel 13 per cent. The fines and sand content vary little between boreholes and although the gravel content is greater than 20 per cent in boreholes 57 NE 20 and 56 SW 13, elsewhere it ranges only from 5 to 12 per cent (Table 5A).

Overburden is generally thin and mainly comprises soil. The mean thickness of overburden is 0.5 m although thicknesses ranging from 1.3 to 2.4 m were proved in four widely spaced boreholes (Table 5). A clay seam 40 cm thick occurs between two mineral horizons in borehole 57 SE 10 but it appears to be only lenticular.

Unassessed Sand and Gravel Deposits

Discontinuous spreads of sand and gravel occur locally in the 'barren' areas of the north of the district. These deposits are thin and of only minor extent and have therefore not been assessed; they are described briefly below.

Adjacent to the River Great Ouse between Ely and the confluence of the Cam and the Great Ouse [at 535 746], thin and discontinuous spreads of River Terrace Deposits occur beneath the Alluvium and Fen Deposits. Additionally in IMAU borehole 57 NW 35, north of Little Thetford [532 763], a thin seam of Glacial Sand and Gravel is overlain by Boulder Clay and Fen Deposits. The sand and gravel deposits are usually less than 1 m thick but exceptionally reach 2.8 m thick in IMAU borehole 57 NE 5; they have a mean thickness of 40 cm. Taken together, the Alluvium, Fen Deposits and Boulder Clay in this vicinity range from 0.8 m to 7.2 m thick and have a mean thickness of about 3.5 m. A summary of data from IMAU boreholes in this vicinity is given in Table 6.

Table 5 Block C: data from boreholes and exposures used in the assessment of resources

A IMAU boreholes

Borehole	Recorded thickness		Mean grading percentages					
	Overburden	Mineral	Fines	Fine sand	Medium sand	Coarse sand	Fine gravel	Coarse gravel
	m	m	$-\frac{1}{16}$ mm	$+\frac{1}{16}-\frac{1}{4}$ mm	$+\frac{1}{4}-1$ mm	$+1-4$ mm	$+4-16$ mm	$+16$ mm
56 SW 13	0.0	1.7	24	15	32	5	10	14
56 SW 15	0.0	0.7	27	38	19	4	9	3
56 SE 73	0.0	2.8	29	34	20	8	7	2
56 SE 74	0.1	1.0	28	44	21	2	2	3
56 SE 75	0.5	absent	–	–	–	–	–	–
56 SE 76	0.5	absent	–	–	–	–	–	–
57 NE 18	0.2	1.6	29	23	34	8	5	1
57 NE 19	2.0	absent	–	–	–	–	–	–
57 NE 20	0.2	1.5	27	24	16	11	11	11
57 SE 9	0.0	2.1	29	28	29	5	6	3
57 SE 10	1.5	1.2*	26	34	23	6	7	4
57 SE 11	2.4	0.9	15	14	22	11	18	20
57 SE 12	0.0	0.9	32	40	18	3	4	3
57 SE 13	1.3	absent	–	–	–	–	–	–
Block mean grading			29	28	24	6	7	6

B Non-IMAU boreholes†

Borehole	Recorded thickness	
	Overburden m	Mineral m
56 SW 16	0.0	3.6
57 SE 1	0.0	3.1

C Exposures

Exposure	Recorded thickness	
	Overburden m	Mineral m
56 SE E1	0.0	1.2+
57 SE E1	0.0	1.5

* A waste parting 0.4 m thick divides the mineral into two parts; only combined grading data are given.

† Excluding details of any boreholes held on ‘Commercial-in confidence’ basis.

Table 6 Data from IMAU boreholes adjacent to the River Great Ouse between Ely and the confluence of the Cam and the Great Ouse

Borehole	Recorded thickness	
	Overburden/waste m	Sand and gravel m
57 NW 35	5.5	0.5
57 NW 36	1.9	0.3
57 NW 37	4.3	0.7
57 NW 38	7.0	0.4
57 NW 39	3.0	absent
57 NW 40	4.0	0.9
57 NW 42	7.2	absent
57 NW 43	4.0	absent
57 NE 4	4.7	absent
57 NE 5	1.2	2.8
57 NE 8	4.0	0.8
57 NE 9	0.8	absent
57 SW 17	3.4	absent
57 SW 18	2.0	absent
57 SW 19	3.0	0.8

Between Soham and the rivers Cam and Ouse, sand and gravel has been found in only two places: in IMAU borehole 57 NW 41, 2.0 m of ‘clayey’ sand comprising reworked Woburn Sand is overlain by 6.0 m of Boulder Clay and peat, and in IMAU borehole 57 SE 3, 2.5 m of

‘very clayey’ sand occurs as a small inlier within the Boulder Clay. These sand and gravel deposits are classified as Glacial Sand and Gravel.

In the extreme north-eastern part of the district, east and south-east of Thorney Hill [577 793], numerous small patches of River Terrace Deposits occur both at the surface and beneath the Fen Deposits. These sand and gravel deposits, often largely of resorted Woburn Sand, are generally less than 1 m thick and have a mean thickness of about 0.6 m. Fen Deposits in this vicinity range from 0.6 to 2.7 m thick and have a mean thickness of 1.5 m. Data from IMAU boreholes in this area are summarised in Table 7.

Table 7 Data from IMAU boreholes east of Thorney Hill [577 793]

Borehole	Recorded thickness	
	Overburden/waste m	Sand and gravel m
57 NE 12	1.6	0.7
57 NE 13	1.7	absent
57 NE 14	1.2	absent
57 NE 15	0.6	1.1
57 NE 16	2.7	1.0
57 NE 17	0.9	0.8

APPENDIX A

FIELD AND LABORATORY PROCEDURES

Trial and error during initial studies of the complex and variable glacial deposits of East Anglia and Essex showed that an absolute minimum of five sample points evenly distributed across the sand and gravel are needed to provide a worthwhile statistical assessment, but that, where possible, there should be not less than ten. Sample points are any points for which adequate information exists about the nature and thickness of the deposit and may include boreholes other than those drilled during the survey and exposures. In particular, the cooperation of sand and gravel operators ensures that boreholes are not drilled where reliable information is already available; although this may be used in the calculations, it is held confidentially by the Institute and cannot be disclosed.

The mineral shown on each 1:25 000 sheet is divided into resource blocks. The arbitrary size selected, 10 km², is a compromise to meet the aims of the survey by providing sufficient sample points in each block. As far as possible the block boundaries are determined by geological boundaries so that, for example, glacial and river terrace gravels are separated. Otherwise division is by arbitrary lines, which may bear no relationship to the geology. The blocks are drawn provisionally before drilling begins.

A reconnaissance of the ground is carried out to record any exposures and inquiries are made to ascertain what borehole information is available. Borehole sites are then selected to provide an even pattern of sample points at a density of approximately one per square kilometre. However, because broad trends are independently overlain by smaller scale characteristically random variations, it is unnecessary to adhere to a square grid pattern. Thus such factors as ease of access and the need to minimise disturbance to land and the public are taken into account in siting the holes; at the same time it is necessary to guard against the possibility that ease of access (that is, the positions of roads and farms) may reflect particular geological conditions, which may bias the drilling results.

The drilling machine employed should be capable of providing a continuous sample representative of all unconsolidated deposits, so that the in-situ grading can be determined, if necessary, to a depth of 30 m (100 ft) at a diameter of about 150 mm (6 in), beneath different types of overburden. It should be reliable, quiet, mobile and relatively small (so that it can be moved to sites of difficult access). Shell and auger rigs have proved to be almost ideal.

The rigs are modified to enable deposits above the water table to be drilled 'dry', instead of with water added to facilitate the drilling, to minimise the amount of material drawn in from outside the limits of the hole. The samples thus obtained are representative of the *in-situ* grading, and satisfy one of the most important aims of the survey. Below the water table the rigs are used conventionally, although this may result in the loss of some of the fines fraction and the pumping action of the bailer tends to draw unwanted material into the hole from the sides or the bottom.

Following a short reconnaissance survey using a 152 mm-diameter hand auger and a 100 mm-diameter 'Minuteman' portable powered continuous flight auger, the main survey was conducted with a modified shell and auger rig using 152 mm-diameter tools.

A continuous series of bulk samples is taken throughout the sand and gravel. Ideally samples are composed exclusively of the whole of the material encountered in the borehole between stated depths. However, care is taken to discard, as far as possible, material which has caved or has been pumped from the bottom of the hole. A new sample is commenced whenever there is an appreciable lithological change within the sand and gravel, or at every 1 m (3.3 ft) depth. The samples, each weighing between 25 and 45 kg (55 and 100 lb), are despatched in heavy duty polythene

bags to a laboratory for grading. The grading procedure is based on British Standard 1377 (1967). Random checks on the accuracy of the grading are made in the Institute's laboratories.

All data, including mean grading analysis figures calculated for the total thickness of the mineral, are entered on standard record sheets, abbreviated copies of which are reproduced in Appendix F.

Detailed records may be consulted at the appropriate offices of the Institute, upon application to the Head, Industrial Minerals Assessment Unit.

APPENDIX B

STATISTICAL PROCEDURE

Statistical assessment

- 1 A statistical assessment is made of an area of mineral greater than 2 km², if there is a minimum of five evenly spaced boreholes in the resource block (for smaller areas see paragraph 12 below).
- 2 The simple methods used in the calculations are consistent with the amount of data provided by the survey. Conventional symmetrical confidence limits are calculated for the 95 per cent probability level, that is, there is a 5 per cent or one in twenty chance of a result falling outside the stated limits.

3 The volume estimate (V) for the mineral in a given block is the product of the two variables, the sampled areas (A) and the mean thickness (\bar{l}_m) calculated from the individual thicknesses at the sample points. The standard deviations for these variables are related such that

$$S_V = \sqrt{(S_A^2 + S_{\bar{l}_m}^2)} \quad [1]$$

4 The above relationship may be transposed such that

$$S_V = S_{\bar{l}_m} \sqrt{(1 + S_A^2/S_{\bar{l}_m}^2)} \quad [2]$$

From this it can be seen that as $S_A^2/S_{\bar{l}_m}^2$ tends to 0, S_V tends to $S_{\bar{l}_m}$.

If, therefore, the standard deviation for area is small with respect to that for mean thickness, the standard deviation for volume approximates to that for mean thickness.

5 Given that the number of approximately evenly spaced sample points in the sampled area is n with mineral thickness measurements $l_{m_1}, l_{m_2}, \dots, l_{m_n}$, then the best estimate of mean thickness \bar{l}_m , is given by

$$\Sigma(l_{m_1} + l_{m_2} \dots l_{m_n})/n.$$

For groups of closely spaced boreholes a discretionary weighting factor may be applied to avoid bias (see note on weighting below). The standard deviation for mean thickness $S_{\bar{l}_m}$, expressed as a proportion of the mean thickness, is given by

$$S_{\bar{l}_m} = (1/\bar{l}_m) \sqrt{[\Sigma(l_m - \bar{l}_m)^2/(n-1)]}$$

where l_m is any value in the series l_{m_1} to l_{m_n} .

6 The sampled area in each resource block is coloured pink on the map. Wherever possible, calculations relate to the mineral within mapped geological boundaries (which may not necessarily correspond to the limits of deposit). Where the area is not defined by a mapped boundary, that is, where the boundary is inferred, a distinctive symbol is used. Experience suggests that the errors in determining area are small relative to those in thickness. The relationship $S_A/S_{\bar{l}_m} \leq \frac{1}{3}$ is assumed in all cases. It follows from equation [2] that

$$S_{\bar{l}_m} \leq S_V \leq 1.05 S_{\bar{l}_m} \quad [3]$$

7 The limits on the estimate of mean thickness of mineral, $L_{\bar{l}_m}$, may be expressed in absolute units $\pm(t/\sqrt{n}) \times S_{\bar{l}_m}$ or as a percentage $\pm(t/\sqrt{n}) \times S_{\bar{l}_m} \times (100/\bar{l}_m)$ per cent, where t is Student's t at the 95 per cent probability level for $(n-1)$

Block calculation 1:25 000 } Fictitious
Block }

Area
Block: 11.08 km²
Mineral: 8.32 km²

Mean thickness
Overburden: 2.5 m
Mineral: 6.5 m

Volume
Overburden: 21 million m³
Mineral: 54 million m³

Confidence limits of the estimate of mineral volume at the 95 per cent probability level: ±20 per cent
That is, the volume of mineral (with 95 per cent probability): 54±11 million m³

Thickness estimate measurements in metres
 l_o = overburden thickness l_m = mineral thickness

Sample point	Weighting w	Overburden		Mineral		Remarks
		l_o	wl_o	l_m	wl_m	
SE 14	1	1.5	1.5	9.4	9.4	IMAU boreholes
SE 18	1	3.3	3.3	5.8	5.8	
SE 20	1	nil	-	6.9	6.9	
SE 22	1	0.7	0.7	6.4	6.4	
SE 23	1	6.2	6.2	4.1	4.1	
SE 24	1	4.3	4.3	6.4	6.4	
SE 17	$\frac{1}{2}$	1.2	1.6	9.8	7.2	Hydrogeology Unit record
123/45	$\frac{1}{2}$	2.0		4.6		
1	$\frac{1}{4}$	2.7	2.6	7.3	5.8	Close group of four boreholes (commercial)
2	$\frac{1}{4}$	4.5		3.2		
3	$\frac{1}{4}$	0.4		6.8		
4	$\frac{1}{4}$	2.8		5.9		
Totals	$\Sigma w = 8$	$\Sigma wl_o = 20.2$		$\Sigma wl_m = 52.0$		
Means		$w\bar{l}_o = 2.5$		$w\bar{l}_m = 6.5$		

Calculation of confidence limits

wl_m	$ wl_m - w\bar{l}_m $	$(wl_m - w\bar{l}_m)^2$
9.4	2.9	8.41
5.8	0.7	0.49
6.9	0.4	0.16
6.4	0.1	0.01
4.1	2.4	5.76
6.4	0.1	0.01
7.2	0.7	0.49
5.8	0.7	0.49

$\Sigma (wl_m - w\bar{l}_m)^2 = 15.82$

$n = 8$

$t = 2.365$

L_v is calculated as

$1.05(t/w\bar{l}_m)\sqrt{[\Sigma(wl_m - w\bar{l}_m)^2/n(n-1)]} \times 100$
 $= 1.05 \times (2.365/6.5)\sqrt{[15.82/(8 \times 7)]} \times 100$
 $= 20.3$
 ≈ 20 per cent

Figure 5 Example of resource block assessment: calculation and results

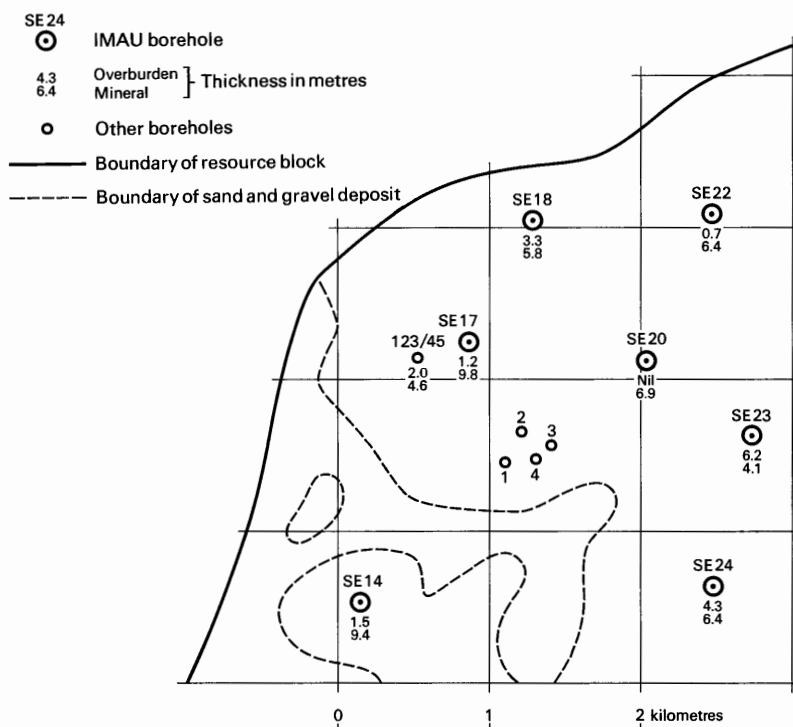


Figure 6 Example of resource block assessment: map of fictitious block

degrees of freedom, evaluated by reference to statistical tables. (In applying Student's *t* it is assumed that the measurements are distributed normally.)

8 Values of *t* at the 95 per cent probability level for values of *n* up to 20 are as follows:

<i>n</i>	<i>t</i>	<i>n</i>	<i>t</i>
1	infinity	11	2.228
2	12.706	12	2.201
3	4.303	13	2.179
4	3.182	14	2.160
5	2.776	15	2.145
6	2.571	16	2.131
7	2.447	17	2.120
8	2.365	18	2.110
9	2.306	19	2.101
10	2.262	20	2.093

(from Table 12, *Biometrika Tables for Statisticians*, Volume 1, Second Edition, Cambridge University Press, 1962). When *n* is greater than 20, 1.96 is used (the value of *t* when *n* is infinity).

9 In calculating confidence limits for volume, L_v , the following inequality corresponding to equation [3] is applied: $L_{\bar{t}_m} \leq L_v \leq 1.05 L_{\bar{t}_m}$

10 In summary, for values of *n* between 5 and 20, L_v is calculated as

$$[(1.05 \times t) / \bar{t}_m] \times [\sqrt{\Sigma(l_m - \bar{t}_m)^2 / n(n-1)}] \times 100$$

per cent, and when *n* is greater than 20, as

$$[(1.05 \times 1.96) / \bar{t}_m] \times [\sqrt{\Sigma(l_m - \bar{t}_m)^2 / n(n-1)}] \times 100$$

per cent.

11 The application of this procedure to a fictitious area is illustrated in Figures 5 and 6.

Inferred assessment

12 If the sampled area of mineral in a resource block is between 0.25 km² and 2 km² an assessment is inferred, based on geological and topographical information usually supported by the data from one or two boreholes. The volume of mineral is calculated as the product of the area, measured from field data, and the estimated thickness. Confidence limits are not calculated.

13 In some cases a resource block may include an area left uncoloured on the map, within which mineral (as defined) is interpreted to be generally absent. If there is reason to believe that some mineral may be present, an inferred assessment may be made.

14 No assessment is attempted for an isolated area of mineral less than 0.25 km².

15 *Note on weighting* The thickness of a deposit at any point may be governed solely by the position of the point in relation to a broad trend. However, most sand and gravel deposits also exhibit a random pattern of local, and sometimes considerable, variation in thickness. Thus the distribution of sample points need be only approximately regular and in estimating the mean thickness only simple weighting is necessary. In practice, equal weighting can often be applied to thicknesses at all sample points. If, however, there is a distinctly unequal distribution of points, bias is avoided by dividing the sampled area into broad zones, to each of which a value roughly proportional to its area is assigned. This value is then shared between the data points within the zone as the weighting factor.

APPENDIX C

CLASSIFICATION AND DESCRIPTION OF SAND AND GRAVEL

For the purposes of assessing resources of sand and gravel a classification should take account of economically important characteristics of the deposit, in particular the absolute content of fines and the ratio of sand to gravel.

The terminology commonly used by geologists when describing sedimentary rocks (Wentworth, 1922) is not entirely satisfactory for this purpose. For example, Wentworth proposed that a deposit should be described as a 'gravelly sand' when it contains more sand than gravel and there is at least 10 per cent of gravel, provided that there is less than 10 per cent of material finer than sand (less than $\frac{1}{16}$ mm) and coarser than pebbles (more than 64 mm in diameter). Because deposits containing more than 10 per cent fines are not embraced by this system a modified binary classification based on Willman (1942) has been adopted.

When the fines content exceeds 40 per cent the material is not considered to be potentially workable and falls outside the definition of mineral. Deposits which contain 40 per cent fines or less are classified primarily on the ratio of sand to gravel but qualified in the light of the fines content, as follows: less than 10 per cent fines—no qualification; 10 per cent or more but less than 20 per cent fines—'clayey'; 20 to 40 per cent fines—'very clayey'.

The term 'clay' (as written, with single quote marks) is used to describe all material passing $\frac{1}{16}$ mm. Thus it has no mineralogical significance and includes particles falling within the size range of silt. The normal meaning applies to the term clay where it does not appear in single quotation marks.

The ratio of sand to gravel defines the boundaries between sand, pebbly sand, sandy gravel and gravel (at 19:1, 3:1 and 1:1).

Thus it is possible to classify the mineral into one of twelve descriptive categories (see Figure 7). The procedure is as follows:

- 1 Classify according to ratio of sand to gravel.
- 2 Describe fines.

For example a deposit grading 11 per cent gravel, 70 per cent sand and 19 per cent fines is classified as 'clayey' pebbly sand. This short description is included in the borehole log (see Note 10, Appendix E).

Many differing proposals exist for the classification of the grain size of sediments (Atterberg, 1905; Udden, 1914; Wentworth, 1922; Wentworth, 1935; Allen, 1936; Twenhofel, 1937; Lane and others, 1947). As Archer (1970a, b) has emphasised, there is a pressing need for a simple metric scale acceptable to both scientific and engineering interests, for which the class limit sizes correspond closely with certain marked changes in the natural properties of mineral particles. For example, there is an important change in the degree of cohesion between particles at about the $\frac{1}{16}$ -mm size, which approximates to the generally accepted boundary between silt and sand. These and other requirements are met by a system based on Udden's geometric scale and a simplified form of Wentworth's terminology (Table 8), which is used in this Report.

The fairly wide intervals in the scale are consistent with the general level of accuracy of the qualitative assessments of the resource blocks. Three sizes of sand are recognised, fine ($+\frac{1}{16}-\frac{1}{4}$ mm), medium ($+\frac{1}{4}-1$ mm) and coarse ($+1-4$ mm). The boundary at 16 mm distinguishes a range of finer gravel ($+4-16$ mm), often characterised by abundance of worn tough pebbles of vein quartz, from larger pebbles often of notably different materials. The boundary at 64 mm distinguishes pebbles from cobbles. The term 'gravel' is used loosely to denote both pebble-sized and cobble-sized material.

The size distribution of borehole samples is determined

by sieve analysis, which is presented by the laboratory as logarithmic cumulative curves (see, for example, British Standard 1377: 1967). In this report the grading is tabulated on the borehole record sheets (Appendix F), the intercepts corresponding with the simple geometric scale $\frac{1}{16}$ mm, $\frac{1}{4}$ mm, 1 mm, 4 mm, 16 mm and so on as required. Original sample grading curves are available for reference at the appropriate office of the Institute.

Each bulk sample is described, subjectively, by a geologist at the borehole site. Being based on visual examination, the description of the grading is inexact, the accuracy depending on the experience of the observer. The descriptions recorded are modified, as necessary, when the laboratory results become available.

The relative proportions of the rock types present in the gravel fraction are indicated by the use of the words 'and' or 'with'. For example, 'flint and quartz' indicates very approximate equal proportions with neither constituent accounting for less than about 25 per cent of the whole; 'flint with quartz' indicates that flint is dominant and quartz, the principal accessory rock type, comprises 5 to 25 per cent of the whole. Where the accessory material accounts for less than 5 per cent of the whole, but is still readily apparent, the phrase 'with some' has been used. Rare constituents are referred to as 'trace'.

The terms used in the field to describe the degree of rounding of particles, which is concerned with the sharpness of the edges and corners of a clastic fragment and not the shape (after Pettijohn, 1957), are as follows.

Angular: showing little or no evidence of wear; sharp edges and corners.

Subangular: showing definite effects of wear. Fragments still have their original form but edges and corners begin to be rounded off.

Subrounded: showing considerable wear. The edges and corners are rounded off to smooth curves. Original grain shape is still distinct.

Rounded: original faces almost completely destroyed, but some comparatively flat surfaces may still remain. All original edges and corners have been smoothed off to rather broad curves. Original shape is still apparent.

Well-rounded: no original faces, edges or corners left. The entire surface consists of broad curves; flat areas are absent. The original shape is suggested by the present form of the grain.

Table 8 Classification of gravel, sand and fines

Size limits	Grain size description	Qualification	Primary classification
64 mm -	Cobble		
		Coarse	Gravel
16 mm -	Pebble		
		Fine	
4 mm -			
		Coarse	
1 mm -			
	Sand	Medium	Sand
$\frac{1}{4}$ mm -			
		Fine	
$\frac{1}{16}$ mm -			
	Fines (silt and clay)		Fines

- I Gravel
- II 'Clayey' gravel
- III 'Very clayey' gravel
- IV Sandy gravel
- V 'Clayey' sandy gravel
- VI 'Very clayey' sandy gravel
- VII Pebbly sand
- VIII 'Clayey' pebbly sand
- IX 'Very clayey' pebbly sand
- X Sand
- XI 'Clayey' sand
- XII 'Very clayey' sand

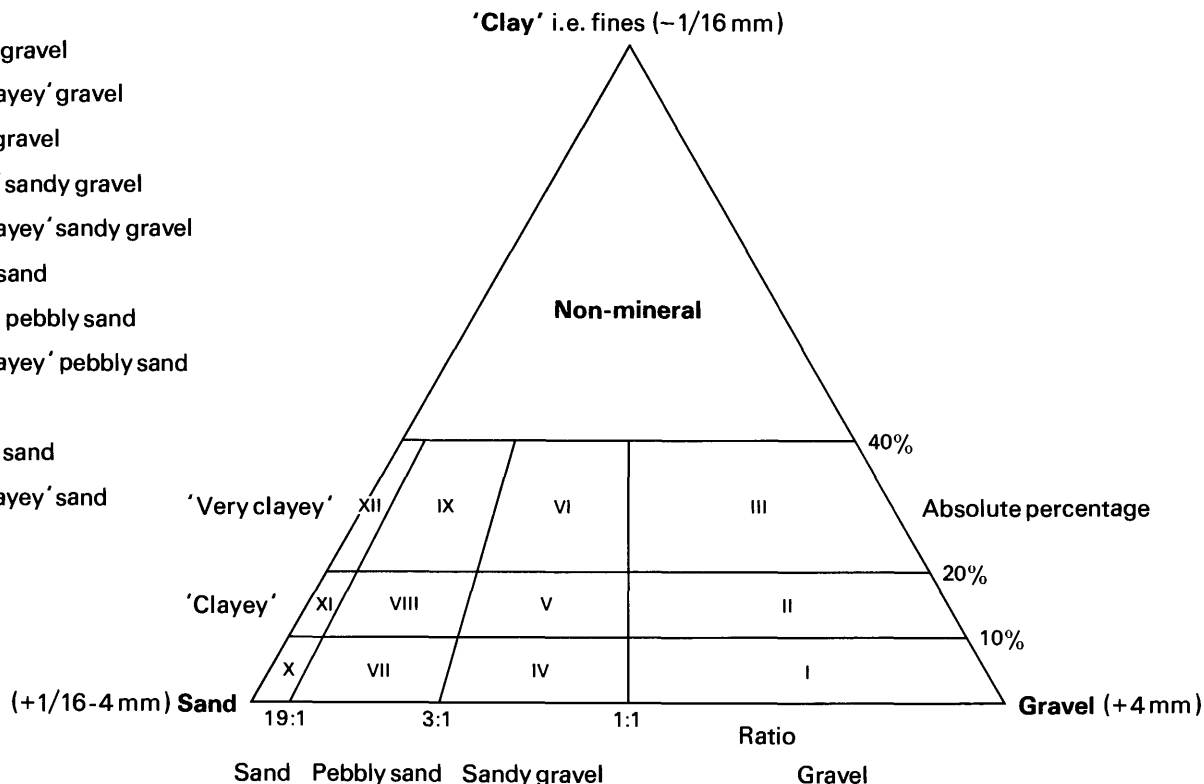


Figure 7 Diagram to show the descriptive categories used in the classification of sand and gravel

APPENDIX D

**LIST OF BOREHOLES AND EXPOSURES USED
IN THE ASSESSMENT OF RESOURCES**

Borehole Registration Number*	Grid reference†	Resource block	Borehole Registration Number*	Grid reference†	Resource block	Borehole Registration Number*	Grid reference†	Resource block
1 INDUSTRIAL MINERALS ASSESSMENT UNIT BOREHOLES‡			56 NE 5	5571 6991	-	57 SW 9	5093 7242	-
56 NW 3	5041 6972	A	56 NE 6	5529 6900	-	57 SW 10	5118 7499	-
56 NW 4	5066 6797	A	56 NE 7	5569 6787	-	57 SW 11	5161 7241	-
56 NW 5	5083 6645	A	56 NE 8	5577 6732	-	57 SW 12	5166 7192	A
56 NW 6	5050 6525	A	56 NE 9	5656 6996	-	57 SW 13	5148 7089	-
56 NW 7	5110 6989	-	56 NE 10	5635 6900	-	57 SW 14	5277 7295	-
56 NW 8	5101 6886	A	56 NE 11	5696 6871	B	57 SW 15	5241 7164	-
56 NW 9	5159 6878	A	56 NE 12	5771 6847	B	57 SW 16	5228 7021	-
56 NW 10	5130 6753	A	56 SW 9	5077 6292	B	57 SW 17	5351 7485	-
56 NW 11	5208 6635	B	56 SW 10	5144 6373	B	57 SW 18	5302 7468	-
56 NW 12	5152 6561	B	56 SW 11	5224 6379	B	57 SW 19	5372 7432	-
56 NW 13	5221 6924	-	56 SW 12	5220 6323	B	57 SW 20	5310 7367	A
56 NW 14	5214 6871	A	56 SW 13	5287 6045	C	57 SW 21	5387 7294	-
56 NW 15	5261 6798	-	56 SW 14	5341 6466	-	57 SW 22	5363 7191	-
56 NW 16	5256 6731	-	56 SW 15	5345 6027	C	57 SW 23	5387 7141	-
56 NW 17	5266 6599	B	56 SE 70	5525 6470	-	57 SW 24	5325 7137	-
56 NW 18	5243 6516	B	56 SE 71	5546 6320	-	57 SW 25	5307 7048	-
56 NW 19	5374 6980	-	56 SE 72	5552 6057	-	57 SW 26	5484 7470	-
56 NW 20	5325 6957	-	56 SE 73	5817 6011	C	57 SW 27	5420 7404	-
56 NW 21	5360 6869	-	56 SE 74	5921 6272	C	57 SW 28	5413 7339	-
56 NW 22	5311 6836	B	56 SE 75	5895 6100	C	57 SE 2	5595 7478	-
56 NW 23	5335 6721	B	56 SE 76	5943 6018	C	57 SE 3	5532 7336	-
56 NW 24	5396 6676	B	57 NW 24	5007 7910	-	57 SE 4	5568 7179	-
56 NW 25	5306 6641	B	57 NW 25	5102 7984	-	57 SE 5	5516 7090	-
56 NW 26	5376 6560	-	57 NW 26	5106 7944	-	57 SE 6	5611 7289	-
56 NW 27	5425 6990	-	57 NW 27	5134 7863	-	57 SE 7	5650 7080	-
56 NW 28	5491 6914	-	57 NW 28	5187 7795	-	57 SE 8	5715 7387	-
56 NW 29	5452 6816	-	57 NW 29	5262 7953	-	57 SE 9	5879 7422	C
56 NW 30	5483 6722	-	57 NW 30	5237 7856	-	57 SE 10	5954 7478	C
56 NW 31	5425 6720	B	57 NW 31	5227 7720	-	57 SE 11	5978 7345	C
56 NW 32	5486 6653	-	57 NW 32	5277 7639	-	57 SE 12	5899 7217	C
56 NW 33	5410 6616	-	57 NW 33	5384 7960	-	57 SE 13	5989 7214	C
56 NW 34	5490 6552	-	57 NW 34	5332 7767	-	2 OTHER BOREHOLES§		
			57 NW 35	5379 7741	-	56 NW 35	5106 6771	A
			57 NW 36	5362 7695	-	(188/330)		
			57 NW 37	5399 7651	-	56 NW 36	5080 6574	A
			57 NW 38	5462 7914	-	(188/247)		
			57 NW 39	5417 7869	-	56 NW 37	5153 6815	A
			57 NW 40	5449 7777	-	(188/284)		
			57 NW 41	5463 7704	-	56 NW 38	5131 6718	A
			57 NW 42	5428 7646	-	(188/258a)		
			57 NW 43	5430 7557	-	56 NW 39	5174 6517	B
			57 NE 4	5574 7960	-	(188/174)		
			57 NE 5	5576 7916	-	56 NW 40	5239 6977	A
			57 NE 6	5541 7776	-	(188/270)		
			57 NE 7	5516 7669	-	56 NW 41	5202 6659	-
			57 NE 8	5681 7955	-	(188/271)		
			57 NE 9	5647 7856	-	56 NW 42	5363 6793	B
			57 NE 10	5636 7592	-	(188/246)		
			57 NE 11	5737 7524	-	56 SW 16	5195 6006	C
			57 NE 12	5831 7964	-	(188/101)		
			57 NE 13	5894 7936	-	56 SW 17	5253 6402	B
			57 NE 14	5830 7860	-	(188/173)		
			57 NE 15	5893 7814	-	56 SW 18	5267 6430	B
			57 NE 16	5956 7971	-	(188/273)		
			57 NE 17	5957 7872	-	57 SW 29	5121 7185	A
			57 NE 18	5971 7596	C	(188/52)		
			57 NE 19	5906 7550	C	57 SE 1	5925 7445	C
			57 NE 20	5971 7532	C	(188/337)		

* By sheet quadrant. Borehole registration numbers are fully explained in Appendix E.

† All fall in 100-km square TL.

‡ Industrial Minerals Assessment Unit boreholes (along with other boreholes in the south of England notified to the Institute), are registered with the Institute's Southern England and South Wales Land Survey Division archive. Detailed records of IMAU boreholes are held by the Industrial Minerals Assessment Unit.

§ The boreholes listed here were previously given Hydrogeology Unit borehole numbers (given here in brackets) which referred to the relevant one-inch New Series Geological Sheet number (for these boreholes 188) and the individual borehole number. These boreholes are now numbered in the same manner as IMAU boreholes. Records of these boreholes are held by the Institute's Hydrogeology Unit and are published in the Well Catalogue for the Huntingdon and Cambridge districts (Matthews, Harvey and others, 1965).

Borehole Registration Number*	Grid reference†	Resource block	Borehole Registration Number*	Grid reference†	Resource block
3 EXPOSURES 					
56 NW E1	5125 6897	-	56 SE E1	5897 6123	C
56 NW E2	5068 6555	A			
56 NW E3	5297 6997	-	57 SW E1	5190 7284	-
56 NW E4	5282 6703	-	57 SW E2	5234 7185	A
56 NW E5	5467 6767	-	57 SW E3	5245 7100	-
			57 SW E4	5300 7317	A
56 SW E1	5092 6338	B	57 SW E5	5190 7248	A
56 SW E2	5068 6304	B			
56 SW E3	5114 6286	B	57 SE E1	5925 7380	C

* By sheet quadrant. Borehole registration numbers are fully explained in Appendix E.

† All fall in 100-km square TL.

|| The registration of exposures is unique to the Industrial Minerals Assessment Unit: records are held by the Unit.

APPENDIX E

EXPLANATION OF THE BOREHOLE RECORDS

Annotated example

TL 56 SW 9¹ 5077 6292² Near Lower Farm, Stow cum Quay³

Block B

Surface level +4.3 m⁴
 Water not struck⁵
 Percussion 152-mm diameter⁶
 November 1977

Overburden 0.3 m⁷
 Mineral 1.8 m
 Bedrock 0.5 m +⁸

LOG

Geological classification ⁹	Lithology ¹⁰	Thickness m	Depth m
	Soil, sandy and pebbly, dark brown	0.3	0.3
Second Terrace	'Very clayey' sandy gravel Gravel: fine, subangular flint with some subrounded chalk and quartz Sand: mainly medium, subrounded quartz with coarse flint, and chalk; grey chalky fines	1.8	2.1
Lower Chalk (Chalk Marl)	Chalk marl, soft glauconitic, white	0.5+	2.6

GRADING¹¹

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
26	49	25	0.3-1.1	24	25	30	3	10	8	0
			1.1-2.1	27	10	22	11	21	9	0
			Mean	26	16	26	7	16	9	0

COMPOSITION¹²

Depth below surface (m)	Percentages by weight in gravel fraction			
	Quartz	Chalk	Flint	Others
0.3-2.1	4	2	90	4

The numbered paragraphs below correspond with the annotations given on the specimen record.

1 Borehole registration number

Unless otherwise stated, boreholes listed or referred to in this report are identified by a Registration Number. This consists of two statements.

1 The number of the 1:25 000 sheet on which the borehole lies, for example TL 56.

2 The quarter of the 1:25 000 sheet on which the borehole lies and the number of the borehole in a series for that quarter, for example SW 9.

Thus the full registration number is TL 56 SW 9. Usually this is abbreviated to 56 SW 9.

2 The National Grid reference

All National Grid references in this publication lie within the 100-km square TL unless otherwise stated. Grid references are given to eight figures, accurate to within 10 m for borehole locations. (In the text, six-figure grid references are used for more approximate locations, for example, for farms.)

3 Location

The position of the borehole is generally referred to the nearest named locality on the 1:25 000 base map and the resource block in which it may lie is stated.

4 Surface level

The surface level at the borehole site is given in metres above Ordnance Datum. All measurements were made in metres. Where a surface level has been estimated it is prefixed by the 'c.' (circa).

5 Groundwater conditions

If groundwater was present the level at which it was encountered is normally given (in metres above OD).

6 Type of drill and date of drilling

The type of drill, the diameter of the borehole, and the month and year of completion of the borehole are stated.

7 Overburden, mineral, waste and bedrock

Mineral is sand and gravel which, as part of a deposit, falls within the arbitrary definition of potentially workable material (see p. 1). Bedrock is the 'formation', 'country rock' or 'rock head' below which potentially workable sand and gravel will not be found. Waste is any material other than bedrock or mineral. Where waste occurs between the surface and mineral it is classified as overburden.

8 The plus sign (+) indicates that the base of the deposit was not reached during drilling.

9 Geological classification

The geological classification is given whenever possible

10 Lithological description

When sand and gravel is recorded a general description based on the grading characteristics (for details see Appendix C) is followed by more detailed particulars. The description of other rocks is based on visual examination, in the field.

11 Grading data

A continuous series of bulk samples is taken throughout the thickness of sand and gravel. A new sample is commenced whenever there is an appreciable lithological change or at every 1 m of depth.

For each bulk sample the percentages of fines ($-\frac{1}{16}$ mm), fine sand ($+\frac{1}{16}$ – $\frac{1}{4}$ mm), medium sand ($+\frac{1}{4}$ –1 mm), coarse sand ($+1$ –4 mm), fine gravel ($+4$ –16 mm) and coarse gravel ($+16$ mm) are stated. The mean grading of groups of samples making up an identified mineral horizon are also given in detail and, to the left, in summary. Where more than one horizon is recognised the mean grading for the whole of the mineral in the borehole is also given. Where necessary in calculating the mean grading, data for individual samples are weighted by the thickness represented.

Fully representative sampling of sand and gravel is difficult to achieve, particularly where groundwater levels are high. Comparison between boreholes and adjacent exposures suggests that in borehole samples the proportion of sand may be higher and the proportion of fines and coarse gravel may be lower.

12 Composition

Details of the composition of the gravel fraction of selected samples or grouped samples may be given. Where appropriate the calculated weighted mean composition of grouped samples may be indicated.

APPENDIX F

INDUSTRIAL MINERALS ASSESSMENT UNIT BOREHOLE RECORDS

TL 56 NW 3 5041 6972 Redhill Farm, Waterbeach

Block A

Surface level +1.2 m
 Water not struck
 Hand auger 152-mm diameter
 September 1978

Overburden 0.4 m
 Mineral 0.5 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy and pebbly, brown	0.4	0.4
Second Terrace	'Clayey' sandy gravel Gravel: fine, angular to subrounded flint, with some quartz Sand: fine to coarse subrounded quartz, with chalk, and some coarse angular flint; brown fines	0.5	0.9
Gault	Clay, stiff, brown to grey	0.2+	1.1

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	$+1-4$	$+4-16$	$+16-64$	$+64$
19	57	24	0.4-0.9	19	14	24	19	19	5	0

COMPOSITION

Depth below surface (m)	Percentages by weight in gravel fraction			
	Quartz	Chalk	Flint	Others
0.4-0.9	2	20	64	14

Surface level +1.8 m
 Water struck at -0.2 m
 Percussion 152-mm diameter
 December 1977

Overburden 0.5 m
 Mineral 1.0 m
 Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Peaty soil, slightly clayey, contains scattered shells	0.5	0.5
First Terrace	Pebbly sand Gravel: fine, flint with chalk Sand: medium quartz with some coarse flint and chalk; buff coloured fines	1.0	1.5
Gault	Clay, gleyed in upper parts, mudstone concretions in places, grey	1.5+	3.0

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
9	84	7	0.5-1.5	9	19	56	9	7	0	0

Surface level +2.6 m
 Water struck at +0.3 m
 Percussion 152-mm diameter
 January 1978

Overburden 1.2 m
 Mineral 1.8 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
First Terrace	Peaty soil with rootlets, dark brown	0.5	0.5
	Sandy clay with scattered flint and quartz pebbles, buff	0.2	0.7
	Clay, ferruginous pockets in places, pebbly in lower part, orange-brown	0.5	1.2
	Pebbly sand with some hard clay pellets in upper part Gravel: fine, angular and subangular, bladed and tabular flint with sub- rounded chalk and lithic pebbles Sand: fine and medium with some coarse, mainly chalk with quartz and flint; brown fines	1.8	3.0
Gault	Clay, indurated below 3.7 m, grey	1.0+	4.0

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
5	75	20	1.2-2.2	8	28	31	12	17	4	0
			2.2-3.0	1	29	41	10	14	5	
			Mean	5	28	36	11	16	4	

COMPOSITION

Depth below surface (m)	Percentages by weight in gravel fraction			
	Quartz	Chalk	Flint	Others
1.2-3.0	trace	11	52	37

TL 56 NW 6 5050 6525 Fen End, Waterbeach

Block A

Surface level +1.9 m
 Water struck at -0.4 m
 Percussion 152-mm diameter
 January 1978

Overburden 2.3 m
 Mineral 1.3 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Soil on black woody peat, dark brown	1.7	1.7
Barroway Drove Beds	Clay, soft, slightly sandy, pale grey	0.6	2.3
First Terrace	Gravel Gravel: fine and coarse, mainly subangular flint with subrounded chalk and mudstone and traces of quartz Sand: medium and coarse, subangular flint with subrounded chalk quartz and mudstone; greyish-buff fines	1.3	3.6
Gault	Clay, calcareous, scattered selenite crystals, grey	1.0+	4.6

GRADING

Mean for deposit <i>percentages</i>			Depth below surface (m)	<i>percentages</i>						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
2	49	49	2.3-3.6	2	2	26	21	33	16	0

TL 56 NW 7 5110 6989 Near Vicarage Farm, Waterbeach

Surface level +0.9 m
 Water struck at -1.4 m
 Percussion 152-mm diameter
 December 1977

Waste 2.6 m
 Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, slightly clayey, numerous freshwater mollusc shells, brown Very clayey peat, soft, silty, brown	1.3 0.3	1.3 1.6
Barroway Drove Beds	Sandy clay, gleyed, contains scattered fine flint pebbles, buff to brown	0.6	2.2
First Terrace	Gravel Gravel: fine with some medium, subangular flint Sand: medium and coarse, subangular flint; cream to buff fines	0.4	2.6
Gault	Clay, stiff, gleyed at top, occasional belemnite fragments below, grey	1.4+	4.0

Surface level +1.4 m
 Water struck at -0.6 m
 Percussion 152-mm diameter
 December 1977

Overburden 1.3 m
 Mineral 0.7 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peaty soil on fibrous peat containing scattered gastropod shells, brown	1.0	1.0
	Sandy clay, with scattered fine flint pebbles, pale brown	0.3	1.3
First Terrace	Sandy gravel	0.7	2.0
	Gravel: fine angular flint with rounded chalk Sand: medium, mainly quartz with coarse flint and chalk; ochre coloured fines		
Gault	Clay, stiff, pale grey	1.0+	3.0

GRADING

Mean for deposit <i>percentages</i>			Depth below surface (m)	<i>percentages</i>						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
5	78	17	1.3-2.0	5	22	46	10	15	2	0

COMPOSITION

Depth below surface (m)	Percentages by weight in gravel fraction			
	Quartz	Chalk	Flint	Others
1.3-2.0	1	23	67	9

Surface level +0.8 m
 Water struck at -1.2 m
 Percussion 152-mm diameter
 December 1977

Overburden 0.9 m
 Mineral 0.7 m
 Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordeph Peat	Peaty soil on brown fibrous peat	0.8	0.8
	Clay, slightly sandy, brown	0.1	0.9
First Terrace	'Clayey' pebbly sand Gravel: fine angular flint with some subrounded chalk and quartz Sand: fine and medium quartz with medium to coarse flint and chalk; brown fines	0.7	1.6
Gault	Clay, stiff, pale grey	1.4+	3.0

GRADING

Mean for deposit <i>percentages</i>			Depth below surface (m)	Depth below surface (m) <i>percentages</i>						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
14	68	18	0.9-1.6	14	29	30	9	17	1	0

COMPOSITION

Depth below surface (m)	Percentages by weight in gravel fraction			
	Quartz	Chalk	Flint	Others
0.9-1.6	0	10	80	10

Surface level +1.5 m
 Water struck at +0.2 m
 Percussion 152-mm diameter
 January 1978

Overburden 0.8 m
 Mineral 1.5 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
First Terrace	Topsoil, clayey	0.4	0.4
	Clay, soft, silty and peaty, grey	0.4	0.8
	Pebbly sand Gravel: fine, subangular flint with subrounded chalk Sand: fine and medium, subrounded quartz with some coarse subangular flint and rounded chalk; brown fines	1.5	2.3
Gault	Clay, stiff, scattered selenite crystals, grey	1.0+	3.3

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
6	81	13	0.8-2.3	6	36	32	13	12	1	0

COMPOSITION

Depth below surface (m)	Percentages by weight in gravel fraction			
	Quartz	Chalk	Flint	Others
0.8-2.3	trace	14	76	10

Surface level +1.0 m
 Water struck at -1.4 m
 Percussion 152-mm diameter
 November 1977

Overburden 2.4 m
 Mineral 2.4 m
 Bedrock 1.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Peat Nordelph	'Clayey' peat	1.4	1.4
Barroway Drove Beds	Clay, soft, 'buttery', contains small soft chalk grains, pale grey	1.0	2.4
First Terrace	'Clayey' sandy gravel Gravel: mainly angular flint with some fine subrounded chalk Sand: fine to coarse chalk with medium quartz and coarse flint; pale grey fines	2.4	4.8
Gault	Clay, stiff, weathered at top, grey	1.3+	6.1

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
14	52	34	2.4-3.4	19	15	32	9	18	7	0
			3.4-4.8	10	5	23	21	27	14	0
			Mean	14	9	27	16	23	11	0

COMPOSITION

Depth below surface (m)	Percentages by weight in gravel fraction			
	Quartz	Chalk	Flint	Others
2.4-3.4	2	10	81	7
3.4-4.8	trace	7	87	6
Mean	1	8	85	6

TL 56 NW 12 5152 6561 Hatley's Farm, Lode

Block B

Surface level +1.8 m
 Water struck at +0.2 m
 Percussion 152-mm diameter
 November 1977

Overburden 0.6 m
 Mineral 2.8 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Peaty soil, silty and clayey, dark brown	0.6	0.6
First Terrace	Sandy gravel Gravel: mainly fine subangular flint with limestone Sand: medium quartz and coarse subangular flint, chalky throughout; orange brown fines	2.8	3.4
Gault	Clay, contains mudstone nodules and minute gypsum crystals, pale grey	1.0+	4.4

GRADING

Mean for deposit <i>percentages</i>			Depth below surface (m)	<i>percentages</i>						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
4	49	47	0.6-1.6	8	7	25	11	33	16	0
			1.6-2.6	3	7	25	18	36	11	0
			2.6-3.4	1	4	26	25	37	7	0
			Mean	4	6	25	18	36	11	0

TL 56 NW 13 5221 6924 Rush Hill Farm, Waterbeach

Surface level +0.2 m
 Water not struck
 Percussion 152-mm diameter
 December 1977

Waste 1.3 m
 Bedrock 1.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Peat Nordelph	Peaty soil on fibrous peat with a few gastropod shells, brown	1.0	1.0
	Sand clay, containing scattered fine flint pebbles, pale brown	0.1	1.1
First Terrace	Sandy gravel Gravel: fine, subangular flint with traces of subrounded quartz Sand: medium to coarse mainly subrounded flint; ochre brown fines	0.2	1.3
Gault	Clay, stiff, scattered small mudstone concretions, pale grey	1.3+	2.6

Surface level +0.6 m
 Water struck at -0.9 m
 Percussion 152-mm diameter
 December 1978

Overburden 0.8 m
 Mineral 1.0 m
 Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Peat Nordelph	Topsoil, peaty, clayey in lower part	0.7	0.7
	Sandy clay, gleyed, scattered pebbles, pale brown	0.1	0.8
First Terrace	'Very clayey' pebbly sand Gravel: fine with traces of coarse, mainly subangular flint Sand: fine to coarse subangular flint; orange coloured fines	1.0	1.8
Gault	Clay, stiff, silty, weathered at top, grey	1.2+	3.0

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
27	62	11	0.8-1.8	27	24	34	4	11	0	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the gravel fraction				
	Quartz	Chalk	Flint	Sandstone	Others
0.8-1.8	2	22	62	8	6

Surface level +1.2 m
 Water struck at +0.2 m
 Percussion 152-mm diameter
 November 1977

Waste 6.9 m
 Bedrock 1.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Alluvium on Nordelph Peat	Clayey peat with scattered shells at top	4.8	4.8
Barroway Drove Beds	Clay, scattered chalk grains, pale grey	1.2	6.0
First Terrace	Sandy gravel Gravel: fine to coarse, flint with traces of quartz Sand: fine and medium, quartz with chalk and flint, micaceous; mid-brown fines	0.9	6.9
Gault	Clay, scattered belemnites, dark grey	1.3+	8.2

TL 56 NW 16 5256 6731 Lode Farm, Swaffham Bulbeck

Surface level +0.8 m
 Water not struck
 Hand auger 152-mm diameter
 July 1977

Waste 6.0 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat and Barroway Drove Beds	Peat, silty, abundant gastropod shells and fine pebbles below 2.4 m, black	5.8	5.8
	Sand, with numerous fine flint and chalk pebbles brown	0.2	6.0
Gault	Clay stiff, grey	0.1+	6.1

TL 56 NW 17 5266 6599 Oily Farm, Lode

Block B

Surface level +1.8 m
 Water not struck
 Hand auger 152-mm diameter
 July 1977

Overburden 0.2 m
 Mineral 1.3 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
First Terrace	Soil, peaty, contains scattered fine pebbles, grey	0.2	0.2
	'Clayey' sandy gravel	1.3	1.5
	Gravel: fine with some coarse, angular to subrounded flint and rounded quartz and chalk Sand: fine subangular flint and rounded quartz and chalk, grey		
Gault	Clay, stiff, grey	0.2+	1.7

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	$+1-4$	$+4-16$	$+16-64$	$+64$
17	62	21	0.2-1.5	17	45	8	9	18	3	0

TL 56 NW 18 5243 6516 East of Vicarage Farm, Lode

Block B

Surface level +2.4 m
 Water not struck
 Percussion 152-mm diameter
 November 1977

Waste 1.1 m
 Bedrock 2.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Topsoil	Peaty soil	0.3	0.3
First Terrace	Sand clay, scattered flint pebbles, buff	0.8	1.1
Gault	Clay, stiff, weathered in upper 1.4 m, grey	2.4+	3.5

TL 56 NW 19 5374 6980 Reach Lode Lock, Swaffham Prior

Surface level +2.6 m
 Water struck at +0.8 m
 Percussion 152-mm diameter
 November 1977

Waste 8.7 m
 Bedrock 4.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground on peaty soil	0.4	0.4
Alluvium and Nordelph Peat	Clay, soft, peaty with abundant mollusc shells, scattered chalk and flint grains, grey	1.6	2.0
Barroway Drove Beds	Clayey silt and peat, soft, some comminuted shells and wood fragments, dark brown	3.4	5.4
	Clay, soft, 'buttery' texture, brownish grey	1.6	7.0
'Lower' Peat	Peat, silty, friable, some twigs, dark brown	1.7	8.7
Amphill Clay	Clay, firm to stiff, occasional mudstone pellets and numerous fossil bivalve fragments, pale grey	4.3+	13.0

TL 56 NW 20 5325 6957 Crooktree Farm, Waterbeach

Surface level +3.9 m
 Water struck at -3.2 m
 Percussion 152-mm diameter
 January 1978

Waste 7.6 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Alluvium	Peaty soil on peaty clay, locally with shelly seams, dark grey	1.0	1.0
	Clay, gleyed, sandy and silty with limestone pebbles, becomes peaty and shelly near base, pale brownish grey	1.0	2.0
Nordelph Peat	Peat with thin seams of soft grey calcareous shelly clay	3.0	5.0
Barroway Drove Beds	Peaty clay, silty and calcareous, very occasional seed pods, dark brownish grey	0.8	5.8
	Clay, gleyed and containing rootlets in upper 0.4 m, minute calcite crystals and rare mollusc shells below 6.2 m, pale bluish grey	1.3	7.1
First Terrace	Gravel Gravel: fine with trace coarse, subrounded and subangular flint with subrounded chalk and limestone Sand: medium and coarse subangular flint with some subrounded chalk; grey fines	0.5	7.6
Gault	Clay, gleyed in upper part, stiff, silty and calcareous, laminated at top, pseudobrecciated near base, grey	1.0+	8.6

TL 56 NW 21 5360 6869 Rand Hall, Swaffham Prior

Surface level +0.8 m
 Ground water conditions not recorded
 Hand auger 152-mm diameter
 July 1977

Waste 8.2 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, silty below 1.5 m, contains freshwater mollusc shells and scattered fine flint and chalk pebbles, black becoming brown with depth	5.0	5.0
Barroway Drove Beds	Silt, slightly peaty, grey	2.5	7.5
First Terrace	'Very clayey' sandy gravel Gravel: fine angular flint with rounded chalk Sand: medium with coarse, flint with chalk, grey fines	0.7	8.2
Woburn Sands	Sand, mainly quartz and lithic grains; greenish grey fines	0.1+	8.3

TL 56 NW 22 5311 6836 Bluehouse Farm, Swaffham Prior Fen

Block B

Surface level +0.9 m
 Water struck at -2.2 m
 Percussion 152-mm diameter
 November 1977

Overburden 3.2 m
 Mineral 2.1 m
 Bedrock 0.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat with scattered shells, black	2.0	2.0
Barroway Drove Beds	Clay, soft, silty, pale bluish grey, becomes pale green and sandy in lower 0.7 m	1.2	3.2
First Terrace	Sandy gravel Gravel: fine, subangular to subrounded flint with rounded chalk and quartz Sand: fine and medium quartz with medium and coarse flint and chalk; pale grey fines	2.1	5.3
Gault	Clay, stiff to indurated, dark grey	0.7+	6.0

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
1	59	40	3.2-4.9	1	6	37	15	36	5	0
			4.9-5.3	2	8	37	16	34	3	0
			Mean	1	7	37	15	35	5	0

TL 56 NW 23 5335 6721 North-west of Lord's Ground Farm, Swaffham Prior

Block B

Surface level +0.8 m
 Water not struck
 Hand auger 152-mm diameter
 July 1977

Overburden 1.2 m
 Mineral 1.3 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	0.7	0.7
	Sandy clayey silt with scattered fine flint pebbles, mottled grey and reddish brown	0.5	1.2
First Terrace	'Clayey' sand Gravel: fine subangular flint with rounded chalk Sand: fine and medium, mainly flint and chalk; yellowish brown fines	1.3	2.5
Gault	Clay stiff, bluish grey	0.1+	2.6

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
11	85	4	1.3-2.5	11	47	32	6	4	0	0

TL 56 NW 24 5395 6676 Lord's Ground Farm, Swaffham Prior

Block B

Surface level +0.8 m
 Groundwater conditions not recorded
 Hand auger 152-mm diameter
 July 1977

Waste 1.7 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, very peaty and sandy, grey	0.5	0.5
First Terrace	Sandy silt, thin gravel seams throughout, grey to brown	1.2	1.7
Gault	Clay, stiff, bluish grey	0.1+	1.8

TL 56 NW 25 5306 6641 Lythel's Farm, Swaffham Bulbeck

Block B

Surface level +1.2 m
 Water not struck
 Hand auger 152-mm diameter
 July 1977

Overburden 1.1 m
 Mineral 0.9 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	0.6	0.6
	Sandy silty clay, contains some fine flint and chalk pebbles, dark brown	0.5	1.1
First Terrace	'Clayey' pebbly sand Gravel: fine, angular flint with rounded chalk Sand: medium with fine and coarse angular flint with rounded chalk; brown fines	0.9	2.0
Gault	Clay, stiff, pale grey	0.1+	2.1

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
17	65	18	1.1-2.0	17	18	34	13	18	0	0

TL 56 NW 26 5376 6560 Giblin's Farm, Swaffham Bulbeck

Surface level +0.9 m
 Water not struck
 Hand auger 152-mm diameter
 July 1977

Waste 2.2 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, soft, black becoming brown	2.1	2.1
	Clay, scattered pebbles, bluish grey	0.1	2.2
Gault	Clay, soft to firm, pale grey	0.2+	2.4

TL 56 NW 27 5425 6990 East of Upware

Surface level +1.5 m
 Water struck at +0.2 m
 Percussion 152-mm diameter
 November 1977

Waste 2.2 m
 Bedrock 2.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	0.9	0.9
Barroway Drove Beds	Silty clay, sandy with scattered flint pebbles, mottled brown and olive green	1.9	2.2
Woburn Sands	Clayey sand, brownish grey	2.8+	5.0

TL 56 NW 28 5491 6914 Lodeside Drove, Burwell

Surface level +0.8 m
 Water struck at -0.8 m
 Hand auger 152-mm diameter
 June 1977

Waste 2.6 m
 Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black becoming brown	1.0	1.0
Barroway Drove Beds	Silt, very soft, contains pockets of peat, grey to greyish brown	1.6	2.6
Gault	Clay, soft becoming stiff, pale grey	0.6+	3.2

TL 56 NW 29 5452 6816 Blinkers Hill, Swaffham Prior

Surface level +0.8 m
 Water struck at -0.3 m
 Hand auger 152-mm diameter
 July 1977

Waste 2.2 m
 Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	1.1	1.1
Barroway Drove Beds	Clayey silt, sandy in lower parts with a few fine flint and chalk pebbles, mottled brown and grey	0.7	1.8
First Terrace	Sand Gravel: fine subangular flint and subrounded chalk Sand: medium, chalk with flint; brown fines	0.4	2.2
Gault	Clay, stiff, grey	0.3+	2.5

TL 56 NW 30 5483 6722 Newgant Farm, Swaffham Prior

Surface level +0.8 m
 Water not struck
 Hand auger 152-mm diameter
 July 1977

Waste 1.1 m
 Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	0.5	0.5
Barroway Drove Beds	Silt, whitish grey	0.2	0.7
	Silty clay, mottled brown and grey	0.4	1.1
Gault	Clay, stiff, brownish grey becoming dark grey	0.3+	1.4

TL 56 NW 31 5425 6720 Near Newgant Farm, Swaffham Prior

Block B

Surface level +0.8 m
 Water not struck
 Hand auger 152-mm diameter
 July 1977

Overburden 1.0 m
 Mineral 0.8 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	0.7	0.7
	Silt, sandy and clayey, with occasional pebbly sand pockets, grey	0.3	1.0
First Terrace	'Very clayey' pebbly sand Gravel: fine angular flint and subrounded chalk and quartz Sand: medium with fine and some coarse, angular flint with subrounded chalk and quartz; brown fines	0.8	1.8
Gault	Clay, stiff, pale bluish grey	0.1+	1.9

GRADING

Mean for deposit <i>percentages</i>			Depth below surface (m)	<i>percentages</i>						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	$+1-4$	$+4-16$	$+16-64$	$+64$
22	67	11	1.0-1.8	22	24	32	11	11	0	0

TL 56 NW 32 5486 6653 Little Fen Drove, Swaffham Prior

Surface level +0.8 m
 Water not struck
 Hand auger 152-mm diameter
 July 1977

Waste 0.9 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	0.5	0.5
Barroway Drove Beds	Silty clay with thin sand seams, mottled brown and grey	0.4	0.9
Gault	Clay, stiff, bluish grey	0.2+	1.1

TL 56 NW 33 5410 6616 Highbridge Farm, Swaffham Prior

Surface level +0.8 m
 Water not struck
 Hand auger 152-mm diameter
 July 1977

Waste 1.4 m
 Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	0.7	0.7
	Silty clay, slightly sandy with scattered pebbles, grey becoming brown	0.3	1.0
First Terrace	'Clayey' pebbly sand Gravel: fine flint and chalk Sand: medium with fine and coarse, flint and chalk; brown fines	0.4	1.4
Gault	Clay, stiff, bluish grey	0.3+	1.7

TL 56 NW 34 5490 6552 Whiteway Drove, Swaffham Prior

Surface level +1.2 m
 Water not struck
 Hand auger 152-mm diameter
 July 1977

Waste 1.9
 Bedrock 0.1+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	1.2	1.2
Barroway Drove Beds	Sandy silt, pale grey	0.7	1.9
Gault	Clay, stiff, grey	0.1+	2.0

TL 56 NE 5 5571 6991 South of Wicken Sedge Fen

Surface level +1.5 m
 Water not struck
 Hand auger 152-mm diameter
 June 1977

Waste 0.8 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	0.8	0.8
Gault	Clay, stiff, pale grey	0.2+	1.0

TL 56 NE 6 5529 6900 Huberstead's Farm, Burwell

Surface level +0.9 m
 Water struck at -0.1 m
 Hand auger 152-mm diameter
 June 1977

Waste 0.9 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	0.4	0.4
	Sandy clay, pale brown	0.1	0.5
First Terrace	'Clayey' sandy gravel Gravel: fine, flint Sand: medium and coarse; brown fines	0.4	0.9
Gault	Clay, stiff, pale grey	0.2+	1.1

TL 56 NE 7 5569 6787 Cullam's Farm, Burwell

Surface level +1.8 m
 Water not struck
 Hand auger 152-mm diameter
 June 1977

Waste 1.3 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, clay seam at base, black	1.3	1.3
Gault	Clay, stiff, bluish grey	0.2+	1.5

TL 56 NE 8 5577 6732 North-west of Hurdle Hall, Reach

Surface level +1.8 m
 Water not struck
 Hand auger 152-mm diameter
 July 1977

Waste 1.1 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, scattered pebbles at top, black	1.1	1.1
Gault	Clay, stiff, pale grey	0.2+	1.3

TL 56 NE 9 5656 6996 Ragamoor, Burwell

Surface level +1.5 m
 Water not struck
 Hand auger 152-mm diameter
 June 1977

Waste 1.0 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat with wood fragments, black	1.0	1.0
Gault	Clay, stiff, grey	0.2+	1.2

TL 56 NE 10 5635 6900 Priory Farm, Burwell

Surface level +1.5 m
 Water not struck
 Hand auger 152-mm diameter
 June 1977

Waste 2.7 m
 Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat with scattered shells, black	1.9	1.9
	Clay, silty and sandy, bluish grey	0.1	2.0
First Terrace	Sandy gravel, 'clayey' in parts Gravel: fine, chalk and flint Sand: fine to coarse, chalk and flint	0.7	2.7
Gault	Clay, stiff, pale grey	0.4+	3.1

TL 56 NE 11 5696 6871 Lodeside Drove, Burwell

Block B

Surface level +2.7 m
 Water not struck
 Hand auger 152-mm diameter
 June 1977

Overburden 1.9 m
 Mineral 1.6 m
 Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat with scattered shells and wood fragments, black	1.9	1.9
First Terrace	'Very clayey' pebbly sand Gravel: fine flint and chalk Sand: fine to coarse, 'clayey' and silty in parts; brown fines	1.6	3.5
Gault	Clay, stiff, grey	0.5+	4.0

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
30	63	7	1.9-3.5	30	34	21	8	7	0	0

TL 56 NE 12 5771 6847 Burwell Fen, Burwell

Block B

Surface level +2.1 m
 Water not struck
 Hand auger 152-mm diameter
 June 1977

Waste 1.0 m
 Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Soil on peat, black	0.8	0.8
	Clay, mottled brown, white	0.2	1.0
Gault	Clay, stiff, bluish grey	0.4+	1.4

TL 56 SW 9 5077 6292 Near Lower Farm, Stow cum Quay

Block B

Surface level +4.3 m
 Water not struck
 Percussion 152-mm diameter
 November 1977

Overburden 0.3 m
 Mineral 1.8 m
 Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy and pebbly, dark brown	0.3	0.3
Second Terrace	'Very clayey' sandy gravel Gravel: fine, subangular flint with some subrounded chalk and quartz Sand: mainly medium, subrounded quartz with coarse flint, and chalk; grey chalky fines	1.8	2.1
Lower Chalk ('Chalk Marl')	Chalk marl, soft glauconitic, white	0.5+	2.6

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
26	49	25	0.3-1.1	24	25	30	3	10	8	0
			1.1-2.1	27	10	22	11	21	9	0
			Mean	26	16	26	7	16	9	0

COMPOSITION

Depth below surface (m)	Percentages by weight in gravel fraction			
	Quartz	Chalk	Flint	Others
0.3-2.1	4	2	90	4

TL 56 SW 10 5144 6373 Near Bull's Farm, Lode

Block B

Surface level +0.6 m
 Water not struck
 Percussion 152-mm diameter
 November 1977

Overburden 0.2 m
 Mineral 1.8 m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, clayey and sandy, dark grey	0.2	0.2
First Terrace	Pebbly sand Gravel: fine, angular to subrounded, flint with chalk Sand: medium with fine and coarse, subrounded quartz and chalk with angular flint; brown fines	1.8	2.0
Lower Chalk ('Chalk Marl')	Chalk, soft, 'marly' with some flints, grey	1.4+	3.4

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
6	73	21	0.2-2.0	6	15	45	13	19	2	0

Surface level +2.8 m
 Water struck at +0.6 m
 Percussion 152-mm diameter
 November 1977

Overburden 0.2 m
 Mineral 1.2 m
 Waste 0.7 m
 Bedrock 2.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, pebbly and clayey, traces of peat	0.2	0.2
Second Terrace	'Very clayey' pebbly sand Gravel: fine, subangular flint and subrounded chalk, some firm clay 'pellets' Sand, fine to coarse, rounded chalk with some subrounded quartz and angular flint; greyish brown fines Clay: occurs as 'pellets', firm, sandy, grey	1.2	1.4
	Clay soft, contains sand and chalk, flint and quartz pebbles, with traces of carbonaceous material and mica, pale brown	0.7	2.1
Lower Chalk ('Chalk Marl')	Chalk marl, weathered, white	2.1+	4.2

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
24	57	19	0.2-1.4	24	20	26	11	17	2	0

COMPOSITION

Depth below surface (m)	Percentages by weight in gravel fraction			
	Quartz	Chalk	Flint	Others
0.2-1.4	trace	31	61	8

TL 56 SW 12 5220 6323 Lode Moors Farm, Lode

Block B

Surface level c. +1.2 m
 Water struck at +0.2 m
 Hand auger 152-mm diameter
 August 1977

Overburden 1.1 m
 Mineral 1.1 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	0.7	0.7
Barroway Drove Beds	Clay, abundant flint pebbles, yellowish brown	0.4	1.1
First Terrace	'Very clayey' sandy gravel Gravel: fine subangular flint with subrounded chalk Sand: fine to coarse flint and chalk; grey fines	1.1	2.2
Gault	Clay, pale grey	0.1+	2.3

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
22	42	36	1.1-2.2	22	10	15	17	27	9	0

TL 56 SW 13 5287 6045 The Farm, Stow cum Quy

Block C

Surface level +18.0 m
 Water struck at +16.2 m
 Percussion 152-mm diameter
 November 1977

Overburden 0.3 m
 Mineral 1.7 m
 Bedrock 1.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil sandy and clayey, brown	0.3	0.3
Fourth Terrace	'Very clayey' sandy gravel on 0.4 m of 'clayey' pebbly sand Gravel: fine and coarse, subangular flint with subrounded chalk Sand: mainly medium, subrounded quartz and chalk with some angular flint; brown fines	1.7	2.0
Lower Chalk ('Chalk Marl')	Chalk with some flint nodules	1.8+	3.8

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
24	52	24	0.3-1.6	38	18	22	4	12	16	0
			1.6-2.0	13	2	66	7	5	7	0
			Mean	24	15	32	5	10	14	0

TL 56 SW 14 5341 6466 Swaffham Poor's Fen, Lode

Surface level +1.4 m
 Water not struck
 Hand auger 152-mm diameter
 August 1977

Waste 1.4 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Soil and peat, black	1.1	1.1
First Terrace	Sandy gravel Gravel: fine, flint with some chalk Sand: fine to coarse flint and chalk; grey fines	0.3	1.4
Gault	Clay, bluish grey	0.2+	1.6

TL 56 SW 15 5345 6027 The Farm, Stow cum Quy

Block C

Surface level +16.5 m
 Water not struck
 Hand auger 152-mm diameter
 August 1977

Mineral 0.7 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Third Terrace	'Very clayey' pebbly sand Gravel: fine, angular to subangular flint Sand: fine with medium subangular, mainly flint, chalky; pale brown fines	0.7	0.7
Lower Chalk (Upper Beds)	Chalk, hard, white	0.1+	0.8

GRADING

Mean for deposit <i>percentages</i>			Depth below surface (m)	Depth below surface (m) <i>percentages</i>						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
27	61	12	0.0-0.7	27	38	19	4	9	3	0

TL 56 SE 70 5525 6470 Adventurers' Ground Farm, Swaffham Bulbeck

Surface level c. +2.0 m
 Water struck at +0.5 m
 Hand auger 152-mm diameter
 August 1977

Waste 1.5 m
 Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	1.1	1.1
Barroway Drove Beds	Silty clay, chalky, some sand and flint pebbles, greyish brown	0.4	1.5
Lower Chalk ('Chalk Marl')	Chalk, slightly sandy, grey	0.5+	2.0

TL 56 SE 71 5546 6320 Commercial End, Swaffham Bulbeck

Surface level c. +5.0 m
 Water struck at c. +3.9 m
 Hand auger 152-mm diameter
 August 1977

Waste 1.5 m
 Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, clayey, sandy and pebbly, grey	0.1	0.1
Nordelph Peat	Peat, soft, black	0.3	0.4
?Barroway Drove Beds	Silty clay, sandy with scattered pebbles, brown	0.7	1.1
First Terrace	'Clayey' sand with traces of gravel Gravel: fine, flint and chalk Sand: medium, flint and chalk; grey fines	0.4	1.5
Lower Chalk ('Chalk Marl')	Chalk, grey	0.4+	1.9

TL 56 SE 72 5552 6057 East of Bottisham

Surface level c. +12.0 m
 Water not struck
 Hand auger 152-mm diameter
 August 1977

Waste 0.3 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Soil and peat with scattered pebbles, brown	0.3	0.3
Lower Chalk ('Chalk Marl')	Chalk, rubbly with scattered flints, grey	0.2+	0.5

TL 56 SE 73 5817 6011 Four Mile Stable Farm, Swaffham Bulbeck

Block C

Surface level +50.0 m
 Water not struck
 Hand auger 152-mm diameter
 August 1977

Mineral 2.8 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Head Gravel	'Very clayey' pebbly sand Gravel: fine with coarse, angular flint with rounded quartz, quartzite and sandstone, traces of chalk Sand: fine and medium, quartz and flint with chalk; brown fines	2.8	2.8
Middle Chalk	Chalk, white	0.1+	2.9

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines	Sand		Gravel			
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
29	62	9	0.0-2.8	29	34	20	8	7	2	0

TL 56 SE 74 5921 6272 Gravelpit Farm, Swaffham Prior

Block C

Surface +44.7 m
 Water not struck
 Hand auger 152-mm diameter
 August 1977

Overburden 0.1 m
 Mineral 1.0 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, pebbly, brown	0.1	0.1
Head Gravel	'Very clayey' pebbly sand Gravel: fine and coarse, angular to subrounded flint with rounded chalk Sand: fine with medium, flint with chalk; reddish brown fines	1.0	1.1
Middle Chalk	Chalk, white	0.1+	1.2

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
28	67	5	0.1-1.1	28	44	21	2	2	3	0

TL 56 SE 75 5895 6100 New England Stud, Swaffham

Block C

Surface level +35.0 m
 Water not struck
 Hand auger 152-mm diameter
 August 1977

Waste 0.5 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, brown	0.1	0.1
Third Terrace	Sand, with scattered fine chalk and flint pebbles; brown fines	0.4	0.5
Middle Chalk	Chalk, hard, greyish white	0.1+	0.6

TL 56 SE 76 5943 6018 East of Four Mile Stable Farm, Swaffham Bulbeck

Block C

Surface level +36.8 m
 Water not struck
 Hand auger 152-mm diameter
 August 1977

Waste 0.5 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with flint and quartz pebbles	0.1	0.1
Second Terrace	Sand, clayey, with scattered fine flint pebbles; brown fines	0.4	0.5
Middle Chalk	Chalk with flint nodules, grey	0.1+	0.6

TL 57 NW 24 5007 7910 Witchford Village

Surface level c. +13.0 m
 Water struck at c. +11.0 m
 Portable powered auger 100-mm diameter
 July 1977

Waste 5.0 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Boulder clay	Sandy clay, with some fine flint and chalk gravel, dark brown	1.0	1.0
	Clay, traces of sand and pebbles, greyish brown	1.0	2.0
	Clay, soft, sandy with abundant chalk and flint pebbles, brown	3.0	5.0
Kimmeridge Clay	Clay, stiff, grey	1.0+	6.0

TL 57 NW 25 5102 7984 Long Drove, Witchford

Surface level +1.2 m
 Water not struck
 Hand auger 152-mm diameter
 July 1977

Waste 1.7 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Soil on peat, black	0.6	0.6
?Barroway Drove Beds	Clay with scattered fine flint and chalk pebbles, mottled reddish brown and grey	1.1	1.7
Kimmeridge Clay	Clay, stiff, grey	0.2+	1.9

TL 57 NW 26 5106 7944 Alderforth, Witchford

Surface level c +1.8 m
 Water not struck
 Hand auger 152-mm diameter
 July 1977

Waste 1.2 m
 Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
?Barroway Drove Beds	Clay, occasional sandy seams, fine flint and chalk pebbles scattered throughout, grey to reddish brown	1.2	1.2
Kimmeridge Clay	Clay, stiff, grey	0.3+	1.5

TL 57 NW 27 5134 7863 East of Witchford Airfield

Surface level c +15.0 m
 Water not struck
 Portable powered auger 100-mm diameter
 July 1977

Waste 1.0 m
 Bedrock 3.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Boulder clay	Sandy clay, with scattered fine chalk and flint pebbles, grey	1.0	1.0
Kimmeridge Clay	Clay, soft to stiff, scattered chalk and flint pebbles in upper 2 m, grey	3.0+	4.0

TL 57 NW 28 5187 7795 South part of Witchford Airfield

Surface level +15.8 m
 Water struck at +12.8 m
 Portable powered auger 100-mm diameter
 July 1977

Waste 3.5 m
 Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Made ground	Soil, bricks and clay	1.0	1.0
Boulder clay	Sandy clay, yellowish brown, scattered flint and chalk pebbles	2.5	3.5
Kimmeridge Clay	Clay, silty, grey	0.5+	4.0

TL 57 NW 29 5262 7953 Westfield Farm, Ely

Surface level +23.0 m
 Water struck at +20.5 m
 Portable powered auger 100-mm diameter
 July 1977

Waste 2.5 m
 Bedrock 2.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Boulder clay	Soil on sandy, clay containing fine flint pebbles, brown	2.5	2.5
?Woburn Sands	Sand, fine and medium; yellowish brown fines. Scattered flint pebbles	2.5+	5.0

TL 57 NW 30 5237 7856 North-eastern part of Witchford Airfield

Surface level c. +15.0 m
 Water struck at c. +13.5 m
 Hand auger 152-mm diameter
 July 1977

Waste 3.4 m
 Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Made ground	Clay with bricks and pebbles	0.3	0.3
Boulder clay	Clay, sandy, scattered flint, chalk and quartz pebbles, yellowish brown	1.6	1.9
	Silty clay, some soft chalk pebbles, scattered flint pebbles, grey to brown	1.5	3.4
Kimmeridge Clay	Clay, stiff, dark grey	0.4+	3.8

TL 57 NW 31 5227 7720 Bedwell Hay Farm, Thetford

Surface level +14.6 m
 Water not struck
 Hand auger 152-mm diameter
 July 1977

Waste 3.0 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Boulder clay	Soil on clay containing scattered flint and chalk pebbles, yellowish brown	1.0	1.0
	Clay, gleyed, silty, contains thin seams of chalk and flint pebbles, brown to grey	2.0	3.0
?Woburn Sands	Clay, indurated, dark grey	0.1+	3.1+

TL 57 NW 32 5277 7639 Thetford Corner, Thetford

Surface level +8.6 m
 Water struck at +2.1 m
 Portable powered auger 100-mm diameter
 August 1977

Waste 6.5 m
 Bedrock 3.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Boulder clay	Clay, sandy throughout with some sand seams between 3.5 m and 4.0 m, scattered flint and chalk pebbles throughout; yellow to greyish brown, becomes dark grey in lower part	6.5	6.5
Woburn Sands	Sand, fine, silty; khaki fines	3.5+	10.0

TL 57 NW 33 5384 7960 Near Barton Farm, Ely

Surface level +14.5 m
 Water not struck
 Portable powered auger 100-mm diameter
 July 1977

Waste 2.0 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Boulder clay	Soil on sandy and pebbly clay, yellowish brown	2.0	2.0
Kimmeridge Clay	Clay, stiff, grey	1.0+	3.0

TL 57 NW 34 5332 7767 Braham Farm, Ely

Surface level c. +6.0 m
 Water struck at c. +3.0 m
 Portable powered auger 100-mm diameter
 July 1977

Waste 7.3 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Boulder clay	Very sandy clay, firm, contains fine subangular flint and subrounded chalk pebbles, yellowish brown	7.3	7.3
Kimmeridge Clay	Clay, stiff to indurated, grey	0.2+	7.5

TL 57 NW 35 5379 7741 East of Braham Farm, Ely

Surface level +0.7 m
 Water struck at -2.3 m
 Percussion 152-mm diameter
 December 1977

Waste 6.0 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat	1.5	1.5
Barroway Drove Beds	Clay, soft, gleyed at top, sandy, some chalk pebbles in upper 1 m, brown	1.3	2.8
Boulder clay	Clay, firm, traces of flint pebbles and sand, grey	2.7	5.5
	Sand with thin clay seams Gravel: fine, mainly angular flint Sand: medium rounded quartz and coarse angular flint, some chalk Clay: sandy and pebbly, grey	0.5	6.0
Kimmeridge Clay	Clay, stiff to indurated, discrete gypsum crystals, grey	1.0+	7.0

TL 57 NW 36 5362 7695 North of Hall Fen, Thetford

Surface level +1.7 m
 Water struck at -0.7 m
 Percussion 152-mm diameter
 December 1977

Waste 6.9 m
 Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peaty soil on clayey peat	1.5	1.5
?Barroway Drove Beds	Clay, soft, sandy and silty, dark grey	0.4	1.9
First Terrace	'Very clayey' pebbly sand Gravel: fine, mainly subangular flint Sand: medium, subangular flint with some chalk; khaki coloured fines	0.3	2.2
Boulder clay	Clay, firm, abundant flint pebbles and sand, traces of chalk	3.7	5.9
	Clay, stiff, abundant chalk pebbles and sand grey	1.0	6.9
Kimmeridge Clay	Clay, stiff, numerous gypsum crystals, grey	0.3+	7.2

TL 57 NW 37 5399 7651 Lode End Bridge, Barway

Surface level -0.4 m
 Ground water conditions not recorded
 Percussion 152-mm diameter
 December 1977

Waste 5.0 m
 Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat soil on clayey peat	3.6	3.6
Barroway Drove Beds	Clay, slightly silty, grey	0.7	4.3
First Terrace	Pebbly sand Gravel: fine subangular flint and chalk Sand: fine to coarse, subangular to subrounded flint with traces of chalk	0.7	5.0
Kimmeridge Clay	Clay, sandy and chalky in upper part, pale grey	1.5+	6.5

TL 57 NW 38 5462 7914 Laburnum House, Ely

Surface level +0.2 m
 Water struck at -6.8 m
 Percussion 152-mm diameter
 December 1977

Waste 7.4 m
 Bedrock 1.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat	1.0	1.0
Barroway Drove Beds	Clay, silty and sandy, traces of peat in upper part, scattered chalk and flint pebbles in lower 4 m, pale grey	6.0	7.0
First Terrace	Sandy gravel with some thin clay seams Gravel: fine, subangular flint Sand: medium and coarse, subangular, mainly flint	0.4	7.4
Kimmeridge Clay	Clay, stiff, with numerous discrete gypsum crystals, grey	1.1+	8.5

TL 57 NW 39 5417 7869 Cawdle Fen, Ely

Surface level +1.1 m
 Water not struck
 Percussion 152-mm diameter
 December 1977

Waste 3.0 m
 Bedrock 3.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peaty topsoil	1.5	1.5
Barroway Drove Beds	Clay, soft, silty, pale grey	1.5	3.0
Kimmeridge Clay	Clay, stiff, weathered at top, gypsum crystals in lower 1.5 m, grey	3.0+	6.0

TL 57 NW 40 5449 7777 Newmarket Bridge, Ely

Surface level c. -1.5 m
 Water not struck
 Hand auger 152-mm diameter
 June 1977

Waste 4.9 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black with grey calcareous band at 0.9 m, contains 'fresh' vegetable matter below 2.8 m	3.8	3.8
	Clay, silty, bluish grey	0.2	4.0
First Terrace	'Clayey' pebbly sand Gravel: fine, flint and chalk Sand: medium with fine, flint and chalk; grey fines	0.9	4.9
Kimmeridge Clay	Clay, firm, grey	0.2+	5.1

TL 57 NW 41 5463 7704 Half Acre Drive, Barway

Surface level +4.9 m
 Water struck at +2.9 m
 Portable powered auger 100-mm diameter
 August 1977

Waste 8.0 m
 Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil on peat	1.3	1.3
Boulder clay	Clay, soft, peaty, with some sand and pebbles in lower part, dark brown becoming yellowish brown with depth	3.2	4.5
	Clay, stiff, bluish grey	1.5	6.0
	Clayey sand: fine and medium; greenish grey fines	2.0	8.0
Kimmeridge Clay	Clay, stiff, grey	2.0+	10.0

TL 57 NW 42 5428 7646 Lode End Bridge, Barway

Surface level -0.4 m
 Water struck at -1.4 m
 Hand auger 152-mm diameter
 June 1977

Waste 7.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Made ground	Peaty soil with bricks	0.1	0.1
Nordelph Peat	Peat, black	1.6	1.7
Barroway Drove Beds	Clay, peaty and silty with abundant vegetable matter, grey	1.4	3.1
	Peat, brown	0.7	3.8
	Clay, silty, gleyed, sandy and pebbly in lower part, traces of carbonaceous material in places, grey	3.4+	7.2

TL 57 NW 43 5430 7557 Barway Bridge, Barway

Surface level -0.5 m
 Water struck at -2.0 m
 Hand auger 152-mm diameter
 June 1977

Waste 4.0 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peaty and clayey soil on peat, grey	1.0	1.0
Barroway Drove Beds	Clay, soft, gleyed, abundant vegetable matter, 'buttery' at base, brown becoming bluish grey at depth	2.4	3.4
'Lower' Peat	Peat, scattered flint pebbles at base, black	0.6	4.0
Amphill Clay	Clay, stiff, bluish grey	1.0+	5.0

TL 57 NE 4 5574 7960 Back Drove, Ely

Surface level 0.0 m
 Water not struck
 Percussion 152-mm diameter
 January 1978

Waste 4.7 m
 Bedrock 1.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peaty topsoil with roots, black	0.4	0.4
	Peat, mainly wood remains, clayey matrix, brown	1.8	2.2
Barroway Drove Beds	Clay, soft, locally peaty and silty with traces of chalk sand, rare mollusc shells, pale grey	0.8	3.0
'Lower' Peat	Peat, mainly wood remains	0.7	3.7
?First Terrace	Clay, soft, silty with some medium and coarse chalk sand grains, grey	1.0	4.7
Kimmeridge Clay	Clay, firm to stiff, calcareous, dark grey	1.8+	6.5

TL 57 NE 5 5576 7916 Quanea Drove, Ely

Surface level +0.5 m
 Water struck at -0.7 m
 Portable powered auger 100-mm diameter
 June 1977

Overburden 1.2 m
 Mineral 2.8 m
 Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	0.8	0.8
Barroway Drove Beds	Clay, soft, silty and peaty, dark grey	0.4	1.2
First Terrace	'Clayey' sand Gravel: fine, flint and quartz Sand: fine and medium, flint and quartz; greenish grey fines	2.8	4.0
Kimmeridge Clay	Clay, soft to firm, bluish grey	2.0+	6.0

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
19	78	3	1.2-4.0	19	40	33	5	3	0	0

TL 57 NE 6 5541 7776 South of Stuntney, Ely

Surface level +12.1 m
 Water not struck
 Portable powered auger 100-mm diameter
 June 1977

Waste 3.5 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Boulder clay	Sandy clay, scattered fine chalk and flint pebbles, becomes very silty in lower 0.3 m, pale greyish brown	3.5	3.5
Kimmeridge Clay	Clay, stiff, calcareous with discrete gypsum crystals, greenish grey	1.0+	4.5

TL 57 NE 7 5516 7669 Half Acre Drove, Soham

Surface level +4.9 m
 Water not struck
 Portable powered auger 100-mm diameter
 June 1977

Waste 9.5 m
 Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Boulder clay	Soil on pale brown sandy clay	1.0	1.0
	Clay, sandy in parts, chalk and flint pebbles scattered throughout, grey	8.5	9.5
Kimmeridge Clay	Clay, stiff, uniform texture, dark grey	0.5+	10.0

TL 57 NE 8 5681 7955 Near Quanea Hill, Ely

Surface level +0.6 m
 Water struck at +0.8 m
 Hand auger 152-mm diameter
 August 1978

Waste 4.8 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	0.9	0.9
Barroway Drove Beds	Silty clay, very soft, mottled brown and grey	2.1	3.0
	Peat, fibrous, greyish black	0.7	3.7
	Silty clay, soft, bluish grey	0.3	4.0
	Clay, sandy with some fine flint and chalk pebbles, brownish grey	0.8	4.8
Kimmeridge Clay	Clay, stiff, grey	0.2+	5.0

TL 57 NE 9 5647 7856 Dunstalls Farm, Ely

Surface level +0.9 m
 Water not struck
 Portable powered auger 100-mm diameter
 June 1977

Waste 0.8 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	0.8	0.8
Kimmeridge Clay	Clay, soft to firm, grey	1.0+	1.8

TL 57 NE 10 5636 7592 Near Barway Level Crossing, Soham

Surface level +2.8 m
 Water struck at +1.3 m
 Portable powered auger 100-mm diameter
 June 1977

Waste 5.0 m
 Bedrock 5.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, clayey and silty with scattered flint pebbles below 1.5 m, black	3.5	3.5
Barroway Drove Beds	Clay, soft, silty, contains scattered fine flint pebbles, grey	1.5	5.0
Woburn Sands	Sand, fine grained; green coloured fines	5.0+	10.0

TL 57 NE 11 5737 7524 Soham Cotes, Soham

Surface level +5.5 m
 Water struck at +3.5 m
 Portable powered auger 100-mm diameter
 August 1977

Waste 9.1 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil with peat containing scattered flint pebbles, brown	0.5	0.5
Boulder clay	Silty clay, scattered flint and chalk pebbles, yellowish brown	8.6	9.1
Gault	Clay, firm, bluish grey	0.1+	9.2

TL 57 NE 12 5831 7964 Near Thorney Hill Farm, Ely

Surface level -0.8 m
 Water struck at -3.1 m
 Hand auger 152-mm diameter
 August 1978

Waste 2.3 m
 Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	1.1	1.1
Barroway Drove Beds	Clay, silty and soft, grey	0.5	1.6
?First Terrace	'Very clayey' pebbly sand Gravel: fine, subangular to subrounded mainly flint Sand: fine and medium, subangular quartz; grey fines	0.7	2.3
Kimmeridge Clay	Clay, very stiff, bluish grey	0.1+	2.4

TL 57 NE 13 5894 7936 Hatcher's Farm, Middle Fen, Ely

Surface level -0.8 m
 Water struck at -2.6 m
 Hand auger 152-mm diameter
 August 1978

Waste 1.7 m
 Bedrock 0.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, clayey and silty between 0.8 and 1.5 m, brownish black	1.7	1.7
Kimmeridge Clay	Clay, stiff, bluish grey	0.7+	2.4

TL 57 NE 14 5830 7860 Near Red House, Ely

Surface level +0.3 m
 Water not struck
 Hand auger 152-mm diameter
 August 1978

Waste 1.2 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	0.5	0.5
?Barroway Drove Beds	Clay, sandy, traces of fine flint gravel, mottled brown and grey	0.7	1.2
Kimmeridge Clay	Clay, stiff, bluish grey	0.1+	1.3

TL 57 NE 15 5893 7814 Near St. John's Farm, Soham

Surface level -0.9 m
 Water not struck
 Hand auger 152-mm diameter
 August 1978

Overburden 0.6 m
 Mineral 1.1 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Peat, sandy, black	0.6	0.6
First Terrace	'Clayey' sand: mainly fine grained, subangular; brown becoming greenish grey in lower part	1.1	1.7
Woburn Sands	Sand, fine, compact; greenish grey	0.1+	1.8

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
13	87	0	0.6-1.7	13	61	25	1	0	0	0

TL 57 NE 16 5956 7971 North-east of Fodder Fen Farm, Soham

Surface level -1.3 m
 Water struck at -4.0 m
 Hand auger 152-mm diameter
 August 1978

Overburden 2.7 m
 Mineral 1.0 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	0.7	0.7
Barroway Drove Beds	Silty clay, peaty in parts, soft, greyish brown	1.7	2.4
'Lower' Peat	Peat, brown	0.3	2.7
First Terrace	'Very clayey' pebbly sand Gravel: fine, mainly subangular flint Sand: fine and medium, subangular to subrounded flint and lithic grains; greenish grey fines	1.0	3.7
Woburn Sands	Sand, fine, compact; greenish grey fines	0.2+	3.9

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
23	67	10	2.7-3.7	23	32	29	6	9	1	0

TL 57 NE 17 5957 7872 Great Fen Drove, Soham

Surface level -1.3 m
 Water struck at -2.5 m
 Hand auger 152-mm diameter
 August 1978

Waste 1.7 m
 Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
?Nordelph Peat	Peat, clayey, black	0.9	0.9
First Terrace	'Clayey' pebbly sand Gravel: fine subangular flint with subrounded chalk Sand: fine with medium flint with chalk; grey fines	0.8	1.7
Kimmeridge Clay	Clay, stiff, bluish grey	0.3+	2.0

TL 57 NE 18 5971 7596 Sayer's Lake Field, Soham

Block C

Surface level +4.5 m
 Water struck at +3.0 m
 Hand auger 152-mm diameter
 August 1978

Overburden 0.2 m
 Mineral 1.6 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy and pebbly, pale brown	0.2	0.2
Second Terrace	'Very clayey' pebbly sand Gravel: fine, subangular to subrounded flint and chalk Sand: fine and medium, subangular to subrounded flint and chalk; brown fines	1.6	1.8
Gault	Clay, stiff, grey	0.2+	2.0

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
29	65	6	0.2-0.8	34	35	24	4	2	1	0
			0.8-1.2	53	14	21	6	5	1	0
			1.2-1.8	7	17	54	13	7	2	0
			Mean	29	23	34	8	5	1	0

TL 57 NE 19 5906 7550 North Field, Soham

Block C

Surface level +6.8 m
 Water not struck
 Percussion 152-mm diameter
 December 1977

Waste 2.0 m
 Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Third Terrace	Clay, sandy with fine chalk pebbles throughout, seam 0.1 m thick of pebbly sand at base, dark brown to grey	1.6	2.0
Gault	Clay, stiff, grey	1.4+	3.4

TL 57 NE 20 5971 7532 Sayer's Lake Drove, Soham

Block C

Surface level +2.8 m
 Water struck at +1.1 m
 Hand auger 152-mm diameter
 August 1978

Overburden 0.2 m
 Mineral 1.5 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, pebbly, brown	0.2	0.2
First Terrace	'Very clayey' sandy gravel Gravel: fine and coarse, mainly subangular flint Sand: fine to coarse, mainly subangular flint; brown fines	1.5	1.7
Gault	Clay, stiff, grey	0.1+	1.8

GRADING

Mean for deposit <i>percentages</i>			Depth below surface (m)	<i>percentages</i>						
Fines	Sand	Gravel		Fines			Sand		Gravel	
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
27	51	22	0.2-0.9	23	29	17	12	9	10	0
			0.9-1.7	33	17	15	9	15	11	0
			Mean	27	24	16	11	11	11	0

TL 57 SW 9 5093 7242 Stow Bridge Farm, Stretham

Surface level +0.6 m
 Water struck at -0.3 m
 Hand auger 152-mm diameter
 September 1978

Waste 2.1 m
 Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Alluvium	Clay, silty, locally sandy and pebbly, brown and grey	0.9	0.9
Nordelph Peat	Peat, black	0.9	1.8
?Barroway Drove Beds	Clay, occasional thin sand seams, mottled bluish grey	0.3	2.1
?Woburn Sands	Clay, sandy with traces of fine gravel, greenish grey	0.6+	2.7

TL 57 SW 10 5118 7499 Windmill, Stretham

Surface level +17.0 m
 Water not struck
 Portable powered auger 100-mm diameter
 August 1977

Waste 2.9 m
 Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Boulder clay	Pebbly clay, pebbles mainly subangular flint and rounded chalk, yellowish brown	2.9	2.9
Gault	Clay, stiff, bluish grey	0.3+	3.2

TL 57 SW 11 5161 7241 Stow Bridge, Stretham

Surface level +0.5 m
 Water struck at -1.5 m
 Percussion 152-mm diameter
 December 1977

Waste 2.0 m
 Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, clayey, black	1.4	1.4
Barroway Drove Beds	Clay, soft, pale grey	0.6	2.0
Woburn Sands	Sand, mainly fine subrounded lithic grains; olive green fines	2.0+	4.0

TL 57 SW 12 5166 7192 East of Chittering Farm, Stretham

Block A

Surface level +1.1 m
 Water struck at -0.9 m
 Percussion 152-mm diameter
 December 1977

Overburden 0.5 m
 Mineral 1.0 m
 Bedrock 1.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy and pebbly	0.5	0.5
First Terrace	'Very clayey' pebbly sand Gravel: fine, subangular flint with some rounded chalk and limestone Sand: medium, mainly subangular flint; brown fines	1.0	1.5
Woburn Sands	Clay, firm, some mudstone concretions, greenish brown	0.5	2.0
	Very clayey sand, mainly subrounded fine to medium lithic grains and scattered pebbles; olive brown fines	0.6+	2.6

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines	Sand	Gravel				
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	$+1-4$	$+4-16$	$+16-64$	$+64$
22	74	4	0.5-1.5	22	39	30	5	4	0	0

TL 57 SW 13 5148 7089 Radical Farm, Waterbeach

Surface level +0.9 m
 Water struck at -1.2 m
 Percussion 152-mm diameter
 December 1977

Waste 2.6 m
 Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, fibrous, scattered gastropod shells, brown	1.4	1.4
Barroway Drove Beds	Sandy clay, peaty in upper part, becomes very sandy below 1.7 m, buff to grey	0.7	2.1
?First Terrace	'Very clayey' sand, mainly fine subrounded quartz and lithic grains; brown fines	0.5	2.6
Gault	Clay, gleyed in upper part, numerous gypsum crystals below, grey	1.4+	4.0

TL 57 SW 14 5277 7295 Fidwell Fen Farm, Stretham

Surface level +1.0 m
 Water struck at -2.0 m
 Percussion 152-mm diameter
 December 1977

Waste 2.8 m
 Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil with scattered pebbles	0.8	0.8
Shell Marl	Shell marl, buff	0.5	1.3
Nordelph Peat	Peat, clayey and crumbly	1.5	2.8
Woburn Sands	Very clayey sand, medium grained, mainly lithic grains; olive green fines	0.6+	3.4

TL 57 SW 15 5241 7164 Railway Farm, Stretham

Surface level +0.6 m
 Water struck at -1.3 m
 Percussion 152-mm diameter
 December 1977

Waste 2.0 m
 Bedrock 1.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
?Nordelph Peat	Soil on soft peat with 0.1 m thick gravel seam at base	2.0	2.0
Gault	Clay, stiff, gleyed at top, gypsum crystals in lower part, grey	1.8+	3.8

TL 57 SW 16 5228 7021 Little Farm, Waterbeach

Surface level +1.5 m
 Water struck at -1.1 m
 Percussion 152-mm diameter
 December 1977

Waste 3.3 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, clayey, scattered flint pebbles throughout, dark brown	1.8	1.8
Barroway Drove Beds	Clay, very soft, gleyed, 5 cm thick gravel seam at base, dark grey	0.8	2.6
	Clay, gleyed, firm, contains coarse flint sand and fine flint pebbles, grey to brown	0.7	3.3
Gault	Clay, weathered at top, stiff, pale grey	1.0+	4.3

TL 57 SW 17 5351 7485 Reed Fen, Thetford

Surface level +2.4 m
 Water not struck
 Percussion 152-mm diameter
 December 1977

Waste 3.4 m
 Bedrock 2.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Made ground	Clay with roots, brick and rubble in parts	1.0	1.0
Nordelph Peat	Peat, woody and fibrous, abundant gastropod shells in upper 0.5 m, clayey near base, brown	2.1	3.1
	Clay, gleyed, very soft, pale greenish grey	0.3	3.4
Kimmeridge Clay	Clay, stiff, abundant discrete gypsum crystals; buff in upper part, grey below	2.1	5.5

TL 57 SW 18 5302 7468 Holt Fen Bridge, Thetford

Surface level +1.5 m
 Water not struck
 Percussion 152-mm diameter
 December 1977

Waste 2.0 m
 Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peaty clay with rootlets, fibrous, firm, dark brown	1.3	1.3
?Barroway Drove Beds	Peat, clayey with 'buttery' texture, dark brown	0.4	1.7
	Clay, gleyed, very soft, pale greenish grey	0.3	2.0
Kimmeridge Clay	Clay, weathered brown at top, stiff, contains discrete gypsum crystals, grey	2.0+	4.0

TL 57 SW 19 5372 7432 Cross Bank Drove, Wicken

Surface level +0.3 m
 Water struck at -2.7 m
 Percussion 152-mm diameter
 December 1977

Waste 3.8 m
 Bedrock 1.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peaty topsoil	1.0	1.0
Barroway Drove Beds	Silty clay, very soft, peaty, grey	1.0	2.0
'Lower' Peat	Peat, silty, very soft, dark brown	0.9	2.9
	Clay, gleyed, firm, pale grey	0.1	3.0
First Terrace	Sandy gravel Gravel: fine, subangular flint with some subrounded chalk Sand: medium and coarse, subangular flint with subrounded chalk	0.8	3.8
Woburn Sands	Sand, medium, subrounded lithic grains; olive green fine	1.7+	5.5

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
6	53	41	3.0-3.8	6	11	20	22	38	3	0

COMPOSITION

Depth below surface (m)	Percentages by weight in gravel fraction			
	Quartz	Chalk	Flint	Others
3.0-3.8	1	11	76	12

TL 57 SW 20 5310 7367 East of Gravel Farm, Stretham

Block A

Surface level +1.0 m
 Water struck -0.6 m
 Percussion 152-mm diameter
 December 1977

Overburden 1.6 m
 Mineral 0.9 m
 Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Soil on soft peat, black	1.2	1.2
Barroway Drove Beds	Clay, soft, gleyed, pale grey	0.4	1.6
First Terrace	'Clayey' sandy gravel Gravel: fine, subangular to subrounded flint with traces of rounded chalk Sand: medium with coarse and fine, mainly subangular flint with some rounded chalk and lithic grains; olive green fines	0.9	2.5
Woburn Sands	Clayey sand, medium grained, rounded to well rounded quartz with lithic grains; olive green fines	0.5+	3.0

GRADING

Mean for deposit <i>percentages</i>			Depth below surface (m)	<i>percentages</i>						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
15	62	23	1.6-2.5	15	11	30	21	21	2	0

TL 57 SW 21 5387 7294 Fodder Fen, Wicken

Surface level +1.2 m
 Water struck at -0.2 m
 Percussion 152-mm diameter
 December 1977

Waste 3.2 m
 Bedrock 2.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Alluvium	Soil, clayey	0.2	0.2
?Nordelph Peat	Clay, peaty, numerous gastropod shells, brown Peat with some clayey bands, numerous gastropod shells throughout, dark brown	1.5	1.7
Woburn Sands	Clay, contains some coarse lithic sand grains, khaki brown Sand, clayey in parts, locally cemented, mainly subrounded quartz and lithic fragments; khaki fines	2.2	5.4
		0.6+	6.0

TL 57 SW 22 5363 7191 South of Dimmock's Cote, Wicken

Surface level +0.2 m
 Water struck at -2.7 m
 Percussion 152-mm diameter
 December 1977

Waste 3.5 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, fibrous, clayey and sandy in parts, black	1.3	1.3
Barroway Drove Beds	Clay, generally silty, sandy near base, pale grey becoming cream coloured in lower part	2.2	3.5
Woburn Sands	Sand, medium, predominantly quartz grains, becomes indurated at base, thin seams of green clay in parts	1.0+	4.5

TL 57 SW 23 5387 7141 Fodder Fen, Wicken

Surface level +1.7 m
 Water struck at -3.1 m
 Percussion 152-mm diameter
 December 1977

Waste 3.2 m
 Bedrock 1.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Soil on brown clay with gastropod shells	0.6	0.6
	Peat, soft, scattered gastropod shells, dark brown	2.6	3.2
Woburn Sands	Clay, some coarse sand, greenish grey	1.2	4.4
	Very clayey sand with traces of gravel, comprises mainly quartz and lithic fragments; dark khaki green fines	0.6+	5.0

TL 57 SW 24 5325 7137 North-east of Middle Farm, Waterbeach

Surface level +0.6 m
 Water struck at 1.1 m
 Percussion 152-mm diameter
 December 1977

Waste 2.0 m
 Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, clayey, contains thin seams of buff coloured shell sand in parts, black	1.5	1.5
	Clay, gleyed, sandy with some fine rounded soft chalk pebbles, pale grey	0.2	1.7
First Terrace	'Clayey' pebbly sand Gravel: fine, mainly subangular flint Sand: fine to coarse, subrounded quartz with angular flint and rounded chalk; brown fines	0.3	2.0
Gault	Clay, weathered in upper part, dark grey	1.5+	3.5

TL 57 SW 25 5307 7048 Near Middle Farm, Waterbeach

Surface level +1.2 m
 Water struck -0.8 m
 Percussion 152-mm diameter
 December 1977

Waste 2.2 m
 Bedrock 1.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, fibrous, brown	1.5	1.5
First Terrace	Clay, firm, slightly sandy, grey	0.3	1.8
	'Clayey' pebbly sand	0.4	2.2
	Gravel: fine, mainly flint with some chalk		
	Sand: fine to coarse, flint with traces of chalk; buff-grey fines		
Gault	Clay, stiff, gleyed in upper part, mudstone concretions in places, grey	1.6+	3.8

TL 57 SW 26 5484 7470 Old Fordey Farm, Barway

Surface level +4.0 m
 Water struck at +1.0 m
 Portable powered auger 100-mm diameter
 June 1977

Waste 6.9 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil on clayey peat, brownish black	1.0	1.0
Boulder clay	Clay, soft becoming stiff in lower 2 m, sandy especially in lower 4 m, scattered fine flint pebbles throughout, chalky in parts, yellowish brown becoming grey at base	5.9	6.9
Amphill Clay	Clay, stiff, contains some lithic fragments, grey	0.2+	7.1

TL 57 SW 27 5420 7404 Black Bank Drove, Wicken

Surface level +0.6 m
 Water struck at -3.4 m
 Portable powered auger 100-mm diameter
 June 1977

Waste 3.0 m
 Bedrock 7.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
?Nordelph Peat	Peat, black	3.0	3.0
Woburn Sands	Sand, fine to medium, mainly lithic grains, locally cemented; olive green fines	7.0+	10.0

TL 57 SW 28 5413 7339 Near High Fen Farm, Wicken

Surface level +0.1 m
 Water struck at -1.3 m
 Percussion 152-mm diameter
 December 1977

Waste 5.1 m
 Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph peat	Peat, silty and clayey with scattered gastropod shells, black	1.4	1.4
Barroway Drove Beds	Clay, very soft, peaty with traces of sand and gastropod shells, buff Clay, stiff, pale green	1.0 2.7	2.4 5.1
?Woburn Sands	Sand, mainly medium subrounded quartz, clayey in parts; olive green fines	0.3+	5.4

TL 57 SE 2 5595 7478 Sedge Fen, Soham

Surface level +0.0 m
 Water struck at -3.0 m
 Portable powered auger 100-mm diameter
 June 1977

Waste 5.0 m
 Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	2.8	2.8
Barroway Drove Beds	Silty clay, very soft, occasional fine flint and chalk pebbles, grey to olive green	2.2	5.0
Gault	Clay, soft becoming stiff at depth, grey	1.2+	6.2

TL 57 SE 3 5532 7336 Ash Tree Farm, Wicken

Surface level +5.2 m
 Water not struck
 Portable powered auger 100-mm diameter
 June 1977

Mineral 2.5 m
 Waste 0.6 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Boulder clay	'Very clayey' sand Gravel: fine subangular to subrounded flint with chalk Sand: fine to coarse	2.5	2.5
	Sandy clay, soft, scattered flint pebbles, brown	0.6	3.1
Upware Limestone	Limestone, indurated, buff	0.1+	3.2

GRADING

Mean for deposit <i>percentages</i>			Depth below surface (m)	Depth below surface (m) <i>percentages</i>						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
28	69	3	0.0-2.5	28	25	33	11	3	0	0

TL 57 SE 4 5568 7179 Spinney Abbey, Wicken

Surface level +7.6 m
 Water not struck
 Portable powered auger 100-mm diameter
 June 1977

Overburden 1.5 m
 Mineral 1.3 m
 Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Boulder clay	Clay, sandy with scattered pebbles, pale brown	1.5	1.5
	'Clayey' pebbly sand Gravel: fine flint with some chalk Sand: fine to coarse quartz with coarse flint and chalk; yellowish brown fines	1.3	2.8
Gault	Clay, weathered at top, firm, bluish grey	1.2+	4.0

GRADING

Mean for deposit <i>percentages</i>			Depth below surface (m)	Depth below surface (m) <i>percentages</i>						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	$+1-4$	$+4-16$	$+16-64$	$+64$
15	73	12	1.5-2.8	15	21	38	14	6	6	0

TL 57 SE 5 5516 7090 Spinney Drove, Wicken

Surface level c. +2.0 m
 Water struck at c. -0.5 m
 Portable powered auger 100-mm diameter
 June 1977

Waste 2.7 m
 Bedrock 1.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, black	2.7	2.7
Gault	Clay, stiff, traces of sand, dark grey	1.3+	4.0

TL 57 SE 6 5611 7289 Wicken Dolvers, Wicken

Surface level +0.5 m
 Water not struck
 Portable powered auger 100-mm diameter
 June 1977

Waste 1.5 m
 Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, with 0.2 m thick clay seam at base, black	1.5	1.5
Woburn Sands	Clayey sand, fine; olive green fines	0.6+	2.1

TL 57 SE 7 5650 7080 Wicken Lodge, Wicken

Surface level +7.9 m
 Water struck at +5.9 m
 Portable powered auger 100-mm diameter
 August 1977

Waste 3.0 m
 Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Boulder clay	Clay, sandy and chalky in lower part, pale brown	3.0	3.0
Gault	Clay, stiff, bluish grey	1.5+	4.5

TL 57 SE 8 5715 7387 Great Drove, Soham Mere, Soham

Surface level +0.0 m
 Water not struck
 Hand auger 152-mm diameter
 September 1978

Waste 1.6 m
 Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Lacustrine Deposits	Clay, soft, whitish grey	0.8	0.8
Nordelph Peat	Peat, silty, greyish brown	0.8	1.6
Gault	Clay, soft to firm, bluish grey	0.3+	1.9

TL 57 SE 9 5879 7422 Longmere Lane, north-west of Soham

Surface level +8.2 m
 Water not struck
 Hand auger 152-mm diameter
 August 1978

Block C

Mineral 2.1 m
 Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Third Terrace	'Very clayey' pebbly sand Gravel: fine with coarse, flint with some chalk Sand: fine and medium, quartz with some flint and chalk; brown fines	2.1	2.1
Gault	Clay, stiff, grey	0.1+	2.2

GRADING

Mean for deposit percentages			Depth below surface (m)	Depth below surface (m) percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	$+1-4$	$+4-16$	$+16-64$	$+64$
29	62	9	0.0-2.1	29	28	29	5	6	3	0

TL 57 SE 10 5954 7478 Croft House, north of Soham

Block C

Surface level +6.5 m
 Water not struck
 Percussion 152-mm diameter
 December 1977

Overburden 1.5 m
 Mineral 0.6 m
 Water 0.4 m
 Mineral 0.6 m
 Bedrock 1.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Second Terrace	Pebbly soil on brown sandy clay	1.5	1.5
	a 'Very clayey' pebbly sand Gravel: fine and coarse flint with some chalk Sand: fine to medium mainly rounded quartz with some angular flint and rounded chalk	0.6	2.1
	Clay, some flint and chalk pebbles with chalk sand, buff	0.4	2.5
	b 'Very clayey' pebbly sand Gravel: fine and coarse flint with some chalk Sand: fine to medium mainly rounded quartz with some angular flint and rounded chalk	0.6	3.1
Gault	Clay, stiff, pale grey	1.1+	4.2

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines			Sand			Gravel
					- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
a	26	63	11	1.5-2.1	26	34	23	6	7	4	0
b	26	63	11	2.5-3.1	26	34	23	6	7	4	0
a+b	26	63	11	Mean	26	34	23	6	7	4	0

TL 57 SE 11 5978 7345 The Weatheralls, Soham

Block C

Surface level +5.2 m
 Water not struck
 Percussion 152-mm diameter
 December 1977

Overburden 2.4 m
 Mineral 0.9 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Peaty topsoil	1.2	1.2
	Clay, soft, chalky, scattered pebbles, pale brown	1.2	2.4
Second Terrace	'Clayey' sandy gravel Gravel: fine and coarse flint with some fine chalk Sand: fine to coarse, quartz with chalk and some flint	0.9	3.3
Gault	Clay, very stiff, grey	1.0+	4.3

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines			Sand			Gravel
					- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
	15	47	38	2.4-3.3	15	14	22	11	18	20	0

TL 57 SE 12 5899 7217 Mill Drove, south-west of Soham

Block C

Surface level +3.5 m
 Water not struck
 Hand auger 152-mm diameter
 August 1978

Mineral 0.9 m
 Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Second Terrace	'Very clayey' pebbly sand Gravel: fine and coarse mainly angular flint Sand: fine, mainly quartz with some flint; brown fines	0.9	0.9
Gault	Clay, stiff, pale grey	0.2+	1.1

GRADING

Mean for deposit <i>percentages</i>			Depth below surface (m)	<i>percentages</i>						
Fines	Sand	Gravel		Fines			Sand		Gravel	
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64
32	61	7	0.0-0.9	32	40	18	3	4	3	0

TL 57 SE 13 5989 7214 Cherry Tree Lane, Soham

Block C

Surface level +5.7 m
 Water not struck
 Percussion 152-mm diameter
 December 1977

Waste 1.3 m
 Bedrock 2.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Second Terrace	Soil, clayey and chalky, scattered flint pebbles, reddish brown	1.3	1.3
Lower Chalk	Chalk, marly, scattered flint pebbles, white	1.2	2.5
Gault	Clay, stiff, pale grey	1.7+	4.2

APPENDIX G

CONVERSION TABLE, METRES TO FEET (to nearest 0.5 ft)

m	ft	m	ft	m	ft	m	ft	m	ft
0.1	0.5	6.1	20	12.1	39.5	18.1	59.5	24.1	79
0.2	0.5	6.2	20.5	12.2	40	18.2	59.5	24.2	79.5
0.3	1	6.3	20.5	12.3	40.5	18.3	60	24.3	79.5
0.4	1.5	6.4	21	12.4	40.5	18.4	60.5	24.4	80
0.5	1.5	6.5	21.5	12.5	41	18.5	60.5	24.5	80.5
0.6	2	6.6	21.5	12.6	41.5	18.6	61	24.6	80.5
0.7	2.5	6.7	22	12.7	41.5	18.7	61.5	24.7	81
0.8	2.5	6.8	22.5	12.8	42	18.8	61.5	24.8	81.5
0.9	3	6.9	22.5	12.9	42.5	18.9	62	24.9	81.5
1.0	3.5	7.0	23	13.0	42.5	19.0	62.5	25.0	82
1.1	3.5	7.1	23.5	13.1	43	19.1	62.5	25.1	82.5
1.2	4	7.2	23.5	13.2	43.5	19.2	63	25.2	82.5
1.3	4.5	7.3	24	13.3	43.5	19.3	63.5	25.3	83
1.4	4.5	7.4	24.5	13.4	44	19.4	63.5	25.4	83.5
1.5	5	7.5	24.5	13.5	44.5	19.5	64	25.5	83.5
1.6	5	7.6	25	13.6	44.5	19.6	64.5	25.6	84
1.7	5.5	7.7	25.5	13.7	45	19.7	64.5	25.7	84.5
1.8	6	7.8	25.5	13.8	45.5	19.8	65	25.8	84.5
1.9	6	7.9	26	13.9	45.5	19.9	65.5	25.9	85
2.0	6.5	8.0	26	14.0	46	20.0	65.5	26.0	85.5
2.1	7	8.1	26.5	14.1	46.5	20.1	66	26.1	85.5
2.2	7	8.2	27	14.2	46.5	20.2	66.5	26.2	86
2.3	7.5	8.3	27	14.3	47	20.3	66.5	26.3	86.5
2.4	8	8.4	27.5	14.4	47	20.4	67	26.4	86.5
2.5	8	8.5	28	14.5	47.5	20.5	67.5	26.5	87
2.6	8.5	8.6	28	14.6	48	20.6	67.5	26.6	87.5
2.7	9	8.7	28.5	14.7	48	20.7	68	26.7	87.5
2.8	9	8.8	29	14.8	48.5	20.8	68	26.8	88
2.9	9.5	8.9	29	14.9	49	20.9	68.5	26.9	88.5
3.0	10	9.0	29.5	15.0	49	21.0	69	27.0	88.5
3.1	10	9.1	30	15.1	49.5	21.1	69	27.1	89
3.2	10.5	9.2	30	15.2	50	21.2	69.5	27.2	89
3.3	11	9.3	30.5	15.3	50	21.3	70	27.3	89.5
3.4	11	9.4	31	15.4	50.5	21.4	70	27.4	90
3.5	11.5	9.5	31	15.5	51	21.5	70.5	27.5	90
3.6	12	9.6	31.5	15.6	51	21.6	71	27.6	90.5
3.7	12	9.7	32	15.7	51.5	21.7	71	27.7	91
3.8	12.5	9.8	32	15.8	52	21.8	71.5	27.8	91
3.9	13	9.9	32.5	15.9	52	21.9	72	27.9	91.5
4.0	13	10.0	33	16.0	52.5	22.0	72	28.0	92
4.1	13.5	10.1	33	16.1	53	22.1	72.5	28.1	92
4.2	14	10.2	33.5	16.2	53	22.2	73	28.2	92.5
4.3	14	10.3	34	16.3	53.5	22.3	73	28.3	93
4.4	14.5	10.4	34	16.4	54	22.4	73.5	28.4	93
4.5	15	10.5	34.5	16.5	54	22.5	74	28.5	93.5
4.6	15	10.6	35	16.6	54.5	22.6	74	28.6	94
4.7	15.5	10.7	35	16.7	55	22.7	74.5	28.7	94
4.8	15.5	10.8	35.5	16.8	55	22.8	75	28.8	94.5
4.9	16	10.9	36	16.9	55.5	22.9	75	28.9	95
5.0	16.5	11.0	36	17.0	56	23.0	75.5	29.0	95
5.1	17	11.1	36.5	17.1	56	23.1	76	29.1	95.5
5.2	17	11.2	36.5	17.2	56.5	23.2	76	29.2	96
5.3	17.5	11.3	37	17.3	57	23.3	76.5	29.3	96
5.4	17.5	11.4	37.5	17.4	57	23.4	77	29.4	96.5
5.5	18	11.5	37.5	17.5	57.5	23.5	77	29.5	97
5.6	18.5	11.6	38	17.6	57.5	23.6	77.5	29.6	97
5.7	18.5	11.7	38.5	17.7	58	23.7	78	29.7	97.5
5.8	19	11.8	38.5	17.8	58.5	23.8	78	29.8	98
5.9	19.5	11.9	39	17.9	58.5	23.9	78.5	29.9	98
6.0	19.5	12.0	39.5	18.0	59	24.0	78.5	30.0	98.5

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THE SAND AND GRAVEL RESOURCES OF THE COUNTRY
BETWEEN ELY AND CAMBRIDGE, CAMBRIDGESHIRE
(RESOURCE SHEET TL 56 AND TL 57)

Scale 1:25 000 or about 2 1/4 Inches to 1 Mile

ORDNANCE SURVEY
SHEETS TL56 & TL57
PROVISIONAL EDITION

THE SAND AND GRAVEL RESOURCES OF THE COUNTRY
BETWEEN ELY AND CAMBRIDGE, CAMBRIDGESHIRE
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This map should be read in conjunction with the accompanying Report
which contains details of the assessment of resources.

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EXPLANATION OF SYMBOLS AND ABBREVIATIONS

DRIFT	Terrington Beds - silts and fine-grained sand	TB-1
	Shell Marl - shelly calcareous mud	SM-4
	Alluvium - silt and clay	A-35
	Peat, comprising Nordelph Peat and 'Lower' Peat (see Report)	P-9
	Barroway Drive Beds - clays and silts, locally sandy, (proved in borholes only)	BD-2
	First Terrace - clayey pebbly sands	1T-28
	Second Terrace - sandy gravel	2T-20
	Third Terrace - clayey sandy gravel	3T-16
	Fourth Terrace - sandy gravel	4T-10
	Head Gravel - clayey sandy gravel	H-30
	Glacial Sand and Gravel - clayey sand	GS-52
	Boulder Clay - pebbly sandy clay with some thin seams of sand and gravel	BC-28

SOLID	Middle Chalk - greyish white chalk	
	Lower Chalk - white chalk	
	Gault - dark grey clay	
	Woburn Sands - glauconitic sand with some 'coprolite' seams	
	Kimmeridge Clay - bluish grey clay	
	Amphill Clay - greyish black clay, some limestone seams	
	Upware Limestone - oolitic and coralline limestone	

Areas worked for sand and gravel	WO-13
BOUNDARY LINES	
Geological boundary, Drift	
Geological boundary, Solid	
Fault at surface; crossmark indicates downthrow side	
Resource Block boundary	
Inferred boundary between recognised categories of deposits	
Broken lines denote uncertainty	

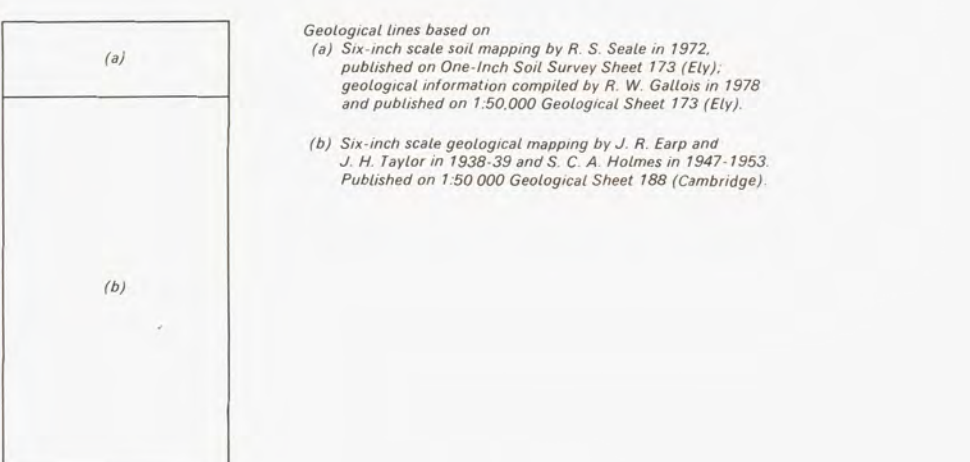
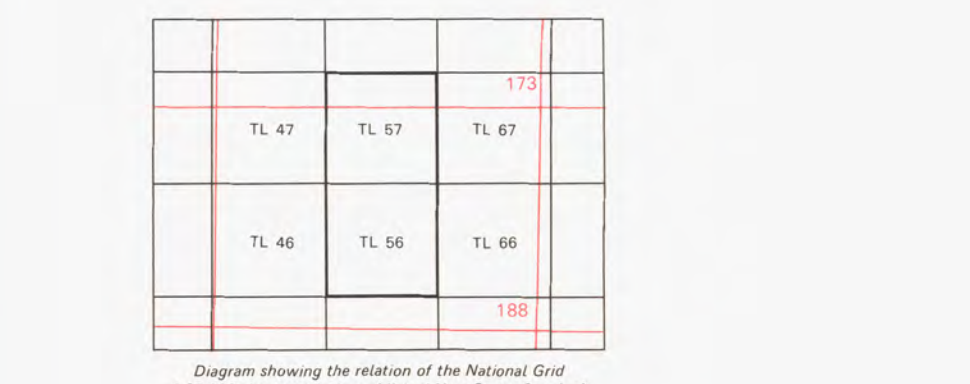
BORHOLE DATA	
SITE LOCATIONS	
Industrial Minerals Assessment Unit (I.M.A.U.) Borholes	
Other Borholes	
I.M.A.U. BORHOLES	
Each I.M.A.U. borhole is identified by a Registration Number, e.g. 56 SW 2.	
The first number and letters refer to the quarter sheet, and the second number to the I.G.S. serial number for that quarter. The unique designation for borhole 56 SW 2 in TL 56 SW 2.	
Grading Diagrams	
Each grading diagram shows the mean particle-size distribution in a distinct deposit of mineral.	

OTHER BORHOLES	
The layout of information is the same as for I.M.A.U. borholes although data available may not be as comprehensive. They are registered in the same series.	
EXPOSURE RECORDS	
Information from the inspection of exposures is shown in the same way as for borholes but they are located by an asterisk, thus * Reference number and details of thickness are shown.	

CATEGORIES OF DEPOSITS	
Exposed mineral, assessed	CAT-E2
Continuous or almost continuous spreads of mineral beneath overburden	CAT-C1
Sand and gravel either not potentially workable (see Report) or absent	CAT-A2
Sand and gravel not assessed	CAT-N1

RESOURCE BLOCKS
For the purpose of assessment the mineral is divided into Resource Blocks (see report). Each is designated by a letter.
Horizontal sections drawn along lines A, B, and C, constitute Fig 2 of the Report.

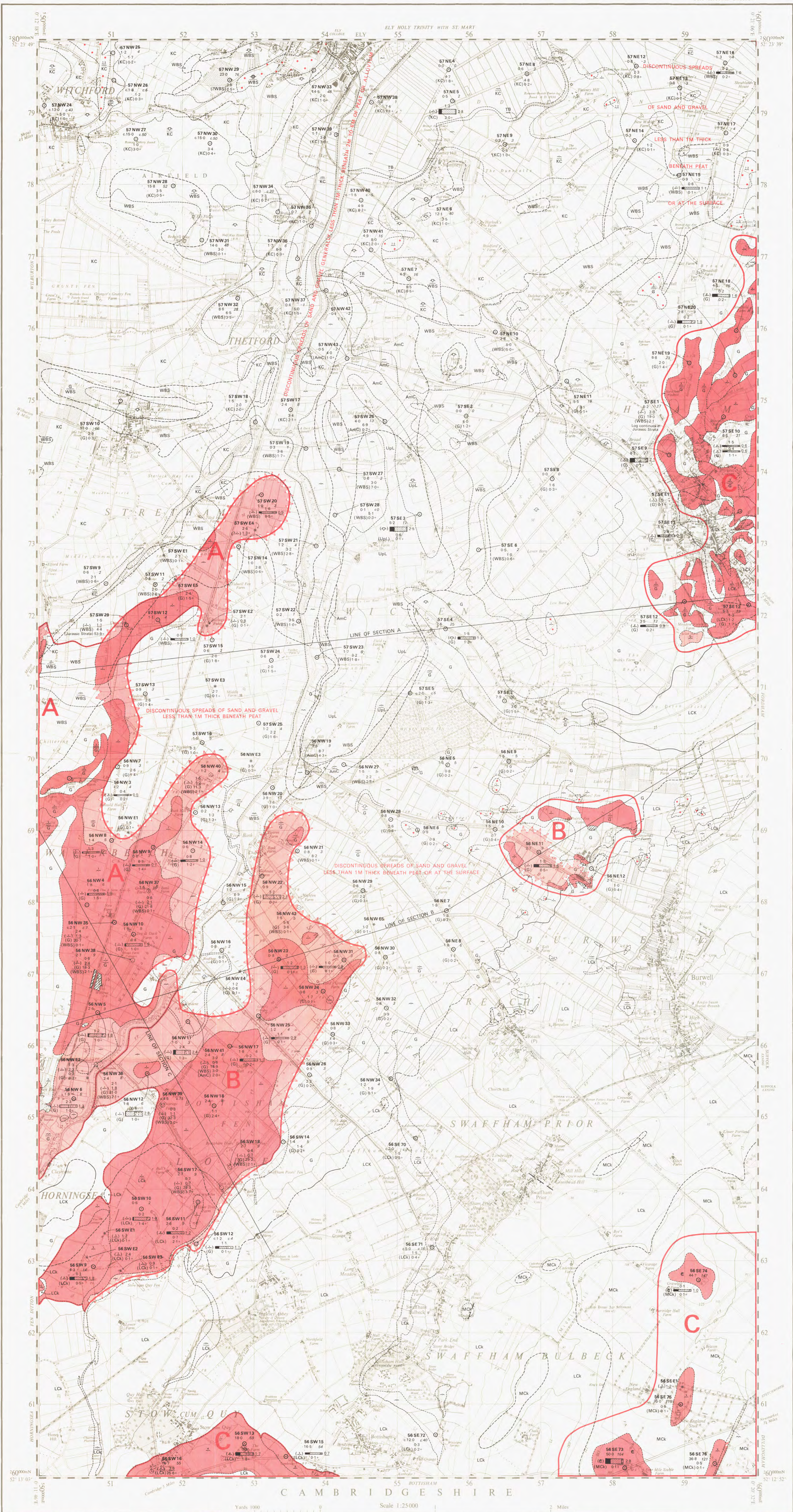
Detailed records may be consulted on application to the Head, Industrial Minerals Assessment Unit, Institute of Geological Sciences, Keyworth, Nottingham, NG12 5GG.



Sand and gravel names by A. R. Claxton and C. E. Carter 1977-8. R. G. Thurler, Head, Industrial Minerals Assessment Unit.

1:25,000 Sand and Gravel Resource Sheet published 1981. G. M. Brown, DSc, F.R.S., Director, Institute of Geological Sciences.

Made and published by the Director General of the Ordnance Survey, Southampton, for the Institute of Geological Sciences, Natural Environment Research Council, 1981.



Data quoted for an individual borhole refer strictly to that site. Reliable conclusions cannot be drawn about the thickness and grading attributes in the deposit, particularly in material as variable as sand and gravel. However, estimates of the volume and mean grading of the mineral in a strata in each Resource Block are given in the Report.