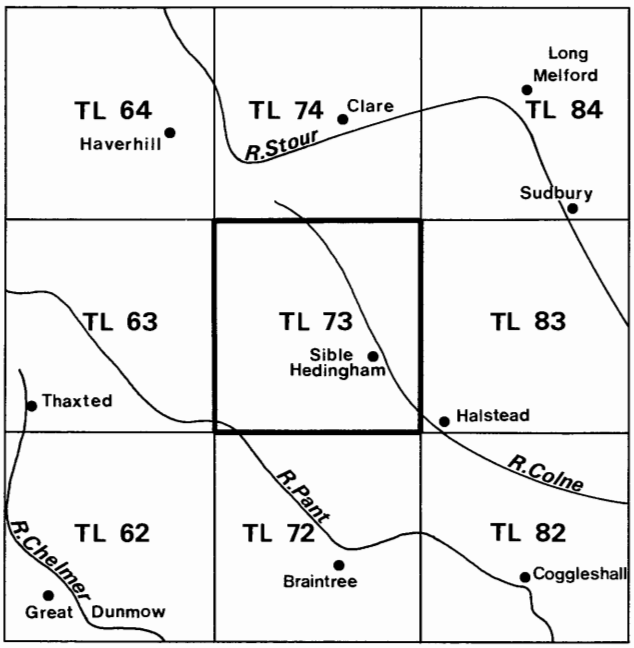
INSTITUTE OF GEOLOGICAL SCIENCES

Natural Environment Research Council

Mineral Assessment Report 82



The sand and gravel resources of the country around Sible Hedingham, Essex

Description of 1:25 000 resource sheet TL 73

R. J. Marks and D. W. Murray

ISBN 0 11 884205 6*

London Her Majesty's Stationery Office 1981

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 No. 13 and subsequent reports appear as Mineral Assessment Reports of the Institute.

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

Any enquiries concerning this report may be addressed to Head, Industrial Minerals Assessment Unit, Institute of Geological Sciences, Keyworth, Nottingham NG12 5GG.

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 feasability 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 resources of the sand and gravel of the country around Sible Hedingham, Essex, shown on the accompanying 1:25 000 resource map. The survey was conducted in 1978 by Mr R. J. Marks who was assisted in the drilling and sampling programme by Mr P. M. Hopson, Mr D. Murray and Mr J. H. Lovell. The work is based on a geological survey at 1:10 000 carried out by Mr M. J. Heath and Mr S. R. Mills in 1974-75. Mr J. W. Gardner, CBE (Land Agent) has been responsible for negotiating access to land for drilling. The ready cooperation of land owners and tenants in the work is gratefully acknowledged.

G. M. Brown
Director

Institute of Geological Sciences
Exhibition Road
London SW7 2DE

1 July 1981.

CONTENTS

The sand and gravel resources of the country around Sible Hedingham, Essex

Description of 1:25 000 resource sheet TL 73

R. J. MARKS and D. W. MURRAY

SUMMARY

The geological maps of the Institute of Geological Sciences, pre-existing borehole information, and 80 boreholes drilled for the Industrial Minerals Assessment Unit form the basis of the assessment of the sand and gravel resources of the country around Sible Hedingham, Essex.

All the deposits in the district that 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 four resource blocks, containing between 4.9 and 22.9 km^2 of sand and gravel. For each block the geology of the deposits is described, and the mineral-bearing area, the mean thickness 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.

Notes

Each borehole registered with the Institute is identified by a four-element alphanumeric descriptor (e.g. TL 73 NW 12). The first two elements define the 10-km square (of the National Grid) in which the borehole is situated; the third element defines a quadrant of that square, and the fourth is the accession number of the borehole. In the text of the report the borehole is normally referred to by the last two elements alone (e.g. NW 12).

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, four- and six-figure grid references are used for more extensive locations, for example for farms).

Bibliographical reference

MARKS, R. J., and MURRAY, D. W. 1981. The sand and gravel resources of the country around Sible Hedingham, Essex: description of 1:25 000 resource sheet TL 73. **Miner. Assess. Rep. Inst. Geol. Sci.,** No. 82.

Authors

R. J. Marks, BSc, and D. W. Murray, BSc
Institute of Geological Sciences, Keyworth, Nottingham NG12 5GG

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, neither the economic nor the social factors used to decide whether a deposit may be workable in the future can 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 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 that 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.

Pre-Pleistocene rocks, which are usually consolidated and devoid of potentially workable sand and gravel, are referred to as 'bedrock'; 'waste' is any material other than bedrock or mineral; 'overburden' is waste that occurs between the surface and an underlying body of mineral.

For the particular needs of assessing sand and gravel resources, a grain-size classification based on the geometric scale 1/16 mm, ¼ mm, 1 mm, 4 mm, 16 mm, 64 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 1/16 mm and 4 mm respectively (see Appendix C).

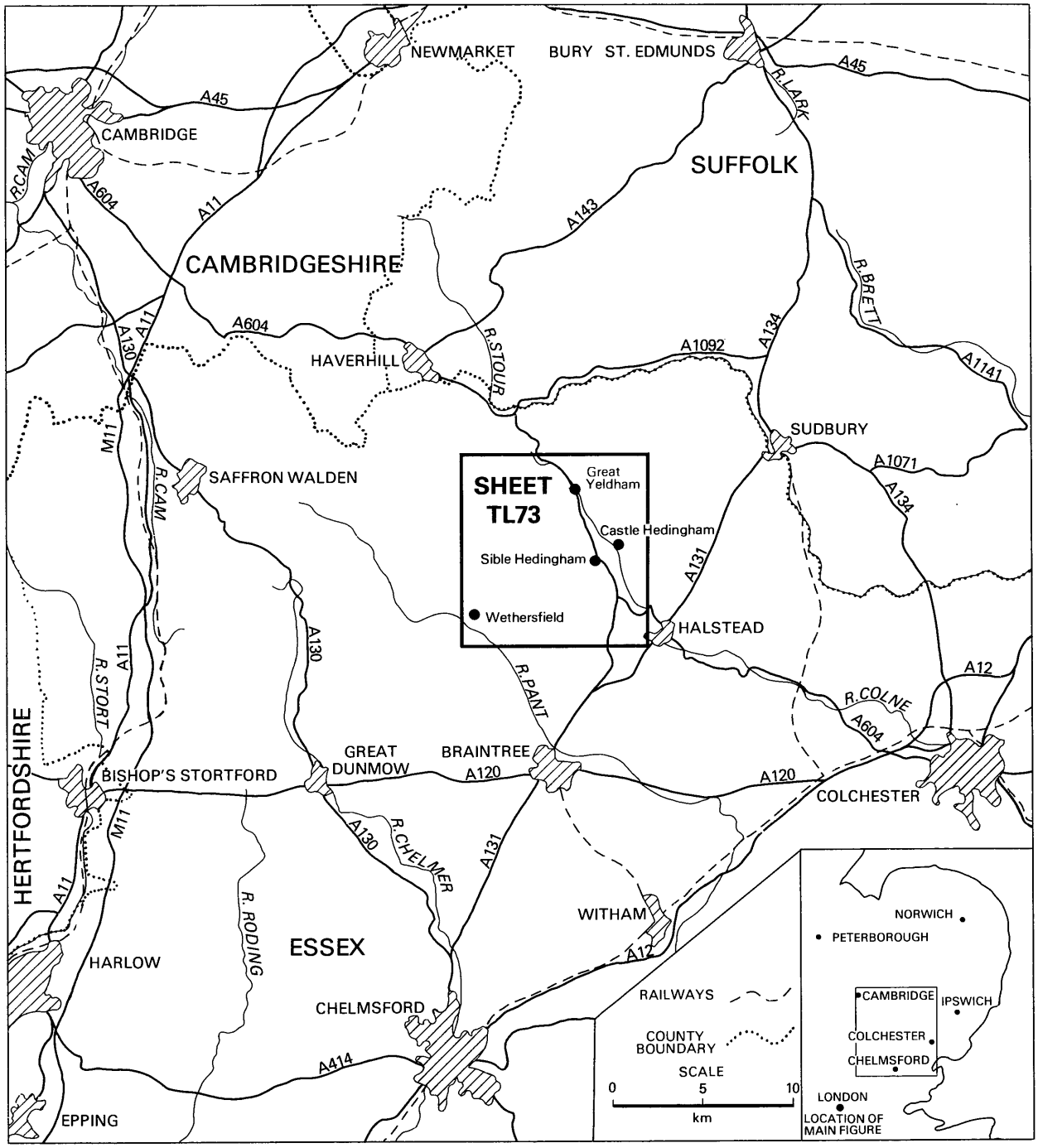


Figure 1 Map showing the location of the resource sheet.

The volume and other characteristics are assessed within resource blocks, each of which, ideally, contains approximately 10 km^2 of sand and gravel. No account is taken of any factors, for example roads, villages or land of 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 mineral in parts of a block, except in the immediate vicinity of the actual sample points.

DESCRIPTION OF THE DISTRICT

The area assessed covers 100 km^2 of rural country in north Essex (Figure 1), with Sible Hedingham lying in the Colne valley on the main Cambridge to Colchester road (A604). Great Yeldham, Castle Hedingham and Wethersfield (Figure 2) are the largest of several villages scattered over this intensively farmed countryside; cereals are the main crop, reflecting the favourable combination of heavy soils and relatively low rainfall. While sand and gravel has been extracted from a number of small pits in the Colne valley in the past, only the Foxborough Hill Pit remains in operation.

The principal objective of this survey is to assess the mineral content of the sand and gravel deposits. The borehole programme proved mineral resouces in the south, south-east and to the north in the Colne valley, covering an area of 48.6 km^2. Statistical assessments are offered for these areas which comprise four resource blocks (Figure 2).

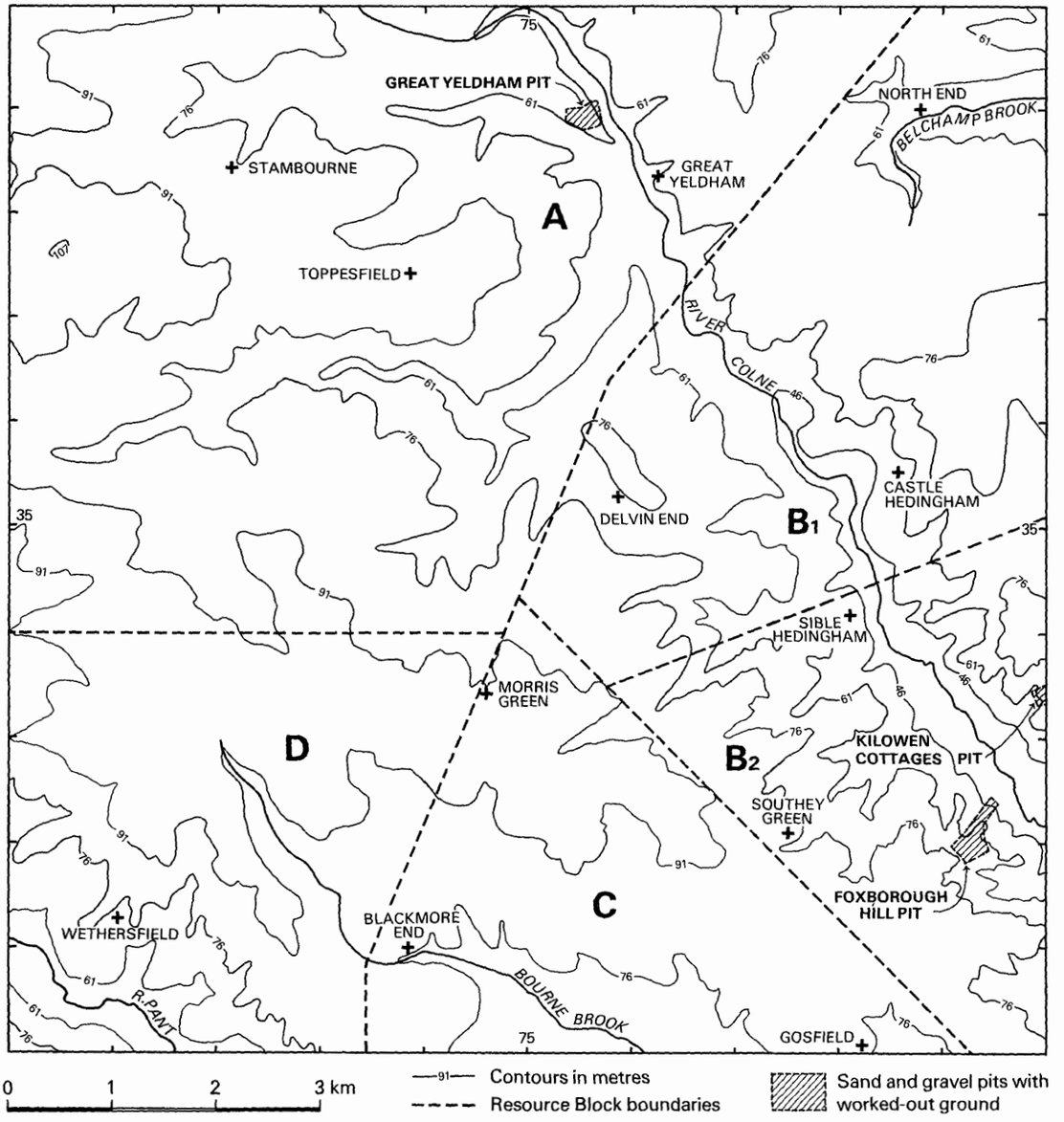


Figure 2 Topography of the district.

TOPOGRAPHY

This district forms part of the gently undulating north Essex and west Suffolk plateau; the ground falls from 107 m above OD in the north-west to 84 m above OD in the south-east (Figure 2). The gentle slope coincides with the direction of the main rivers which dissect the plateau. The valley of the River Colne with its tributaries drains most of the district. The river flows from an elevation of 63 m above OD in the north, through Great Yeldham and Sible Hedingham to the south-east, where it has developed a floodplain at 38 m above OD. In the north-east the headwaters of the Belchamp Brook flow through North End and out of the district to the east, while the River Pant flows south-eastwards across the south-west corner of the district and the upper reaches of the Bourne Brook drain the area around Blackmore End and Gosfield.

GEOLOGY

The Old-Series Geological sheet 47 and memoir (Whitaker and others, 1878) describe the geology of the area. The northern quarter is also covered by the New-Series 1:63 360 sheet 206 (Sudbury) and corresponding memoir (Boswell, 1929). More recently, however, the area has been resurveyed for the purpose of this assessment at a scale of 1:10 000 by M. J. Heath and S. R. Mills of the Institute's Land Geological Survey in 1974-75.

The geological sequence is summarised in Table 1, where the deposits are listed, as far as possible, in order of increasing age. The relationships between the deposits are illustrated in the geological sections (Figure 3), the lines of which are shown on the resource map.

Due to the difficulty of distinguishing deposits of sand and gravel of varying age where they lie adjacent to one another, the Red Crag, Kesgrave Sands and Gravels, Barham Sands and Gravels, and Glacial Sand and Gravel, upper, have been mapped as an undivided unit (see map and legend). Some Glacial Sand and Gravel, upper, and Red Crag have been mapped separately but only where a positive identification could be made. In the IMAU borehole records it was possible to differentiate between

Table 1 Geological sequence.

DRIFT	
Recent and **Pleistocene**	Alluvium
	River Terrace Deposits
	Head
	Head Gravel
	Boulder Clay
	Glacial Silt
	Glacial Sand and Gravel, upper
	Barham Sands and Gravels
	Kesgrave Sands and Gravels
SOLID	
Pleistocene	Red Crag
Eocene	London Clay
Palaeocene	Lower London Tertiaries
	Woolwich and Reading Beds
	Thanet Beds
Cretaceous	Upper Chalk

these deposits and clearly demonstrate, in the south and south-east, a relatively consistent tripartite division: Red Crag, Kesgrave Sands and Gravels and Barham Sands and Gravels. Outcrops on the lower slopes and to the north in the Colne Valley proved to be solely of Glacial Sand and Gravel, upper.

SOLID

The extensive cover of thick superficial deposits restricts exposure of the solid rocks to the valleys of the Colne, Pant and Bourne, but they are recorded elsewhere in several boreholes. The form of the pre-Red Crag surface is shown in Figure 4. The district is underlain by Upper Chalk, Lower London Tertiaries and London Clay, which all have a regional dip of a few degrees to the south-south-east. These formations are overlain, mainly in the south and south-east, by Red Crag.

Upper Chalk This soft white flint-bearing limestone does not crop out at the surface in the area though it is proved in boreholes to sub-crop beneath the drift in the north, north-west and down the buried valley of the Colne as far south as Sible Hedingham. To the south it dips beneath the Lower London Tertiaries and younger rocks. Typically the Upper Chalk contains flint courses or bands and, where proved in IMAU boreholes, is commonly water-saturated at its contact with the overlying drift deposits, giving it a putty-like consistency.

Lower London Tertiaries These strata comprise two formations, the Thanet Beds and the Woolwich and Reading Beds (Hester, 1965). The latter are exposed in the old railway cutting [7875 3401] east of Sible Hedingham and there is a small outcrop of Lower London Tertiaries north-east of the disused railway station [7806 3477]. The subcrop of the Lower London Tertiaries bisects the district from east to west (Figure 4) and varies in width between one and two kilometres, with small subcrops proved in boreholes NE 26 and 33; London Clay overlies this formation to the south-east. The buried channel of the Colne valley causes the subcrop to narrow and to vee down the valley as far south as the Foxborough Hill Pit.

The Thanet Beds consist of olive-grey to greenish grey micaceous glauconitic sands and silts. They are overlain by the Woolwich and Reading Beds, which are sands and silts at the base passing up into mottled red and brown stiff waxy clays.

London Clay There are several old brickworkings in an extensive outcrop [787 345] of London Clay on the eastern side of the Colne valley, with similar outcrops in the Pant valley and smaller ones in the head-waters of the Bourne Brook and western tributaries of the River Colne. However, over most of the south and south-east of the district the London Clay subcrops beneath the Red Crag and drift deposits.

The basal 10 to 15 m of the London Clay consists of bluish black silty sands and clays. These pass up into the more characteristic London Clay lithology, a homogenous, stiff, olive-grey clay, micaceous in parts and locally containing calcareous nodules (race) and selenite crystals. At outcrop the London Clay weathers brown and orange-brown to a depth of several metres, while beneath the Drift the weathering is limited to about 0.3 m.

Red Crag Except in boreholes NE 31 and 36, where Red Crag overlies Lower London Tertiaries, this deposit rests on London Clay and underlies the drift sequence. It varies in recorded thickness up to 10.0 m (in borehole NE 36) with a mean thickness of 4.9 m. The Red Crag is proved in most boreholes in the south and south-east though it is absent in the Colne valley. The only separately mapped outcrop [702 314] is west of Wethersfield and it was only in this area (at borehole SW 15) that both lithological facies of the Red Crag were proved. The base of the formation is unoxidised and forms a greenish grey sand which contains shell fragments and includes diagnostic well-rounded fine pebbles of phosphate nodules and flint. This is overlain by reddish brown ferruginous sands, the more common oxidised facies, which contains similar pebbles but not the shell debris which characterises the basal beds. In several boreholes the sands have been found to be leached to orange and yellow especially near the top of the deposit.

DRIFT

The main deposits of the drift are the Kesgrave Sands and Gravels, Barham Sands and Gravels, Glacial Sand and Gravel, upper, and Boulder Clay, which together form a sequence which is commonly between 15 and 30 m thick over most of the district. These drift deposits have been the subject of a number of regional studies, of which the most recently published are by Bristow and Cox (1973), Rose and Allen (1977), and Hey (1980).

Figure 4 illustrates the buried valley of the Colne, which is deeper to the south of the main Upper Chalk subcrop. The valley is much shallower to the north-west where it crosses a second such feature which runs from south of Toppesfield to North End.

Kesgrave Sands and Gravels This deposit is widespread beneath the plateau in the south and south-east resting on Red Crag and overlain by Barham Sands and Gravels and Boulder Clay. It has a mean thickness of 7.1 m and a maximum recorded thickness at borehole SE 45 of 12.6 m. It has extensive outcrops in the sides of the Colne valley south of Castle Hedingham, in the Pant valley and in that part of the Bourne Brook between Blackmore End and Gosfield. In the north and north-west it appears to be thin or absent.

The Kesgrave Sands and Gravels are typically a yellow, orange-yellow or light grey medium and fine sand, often micaceous with greenish grey clay laminae developed in many places. However, the top of the sequence proved to be a sandy gravel between Blackmore End and Southerly Green. Due to this marked variation the deposit is divided, in the section on the composition of the sand and gravel, into the more common sandy facies and the locally developed sandy gravel facies.

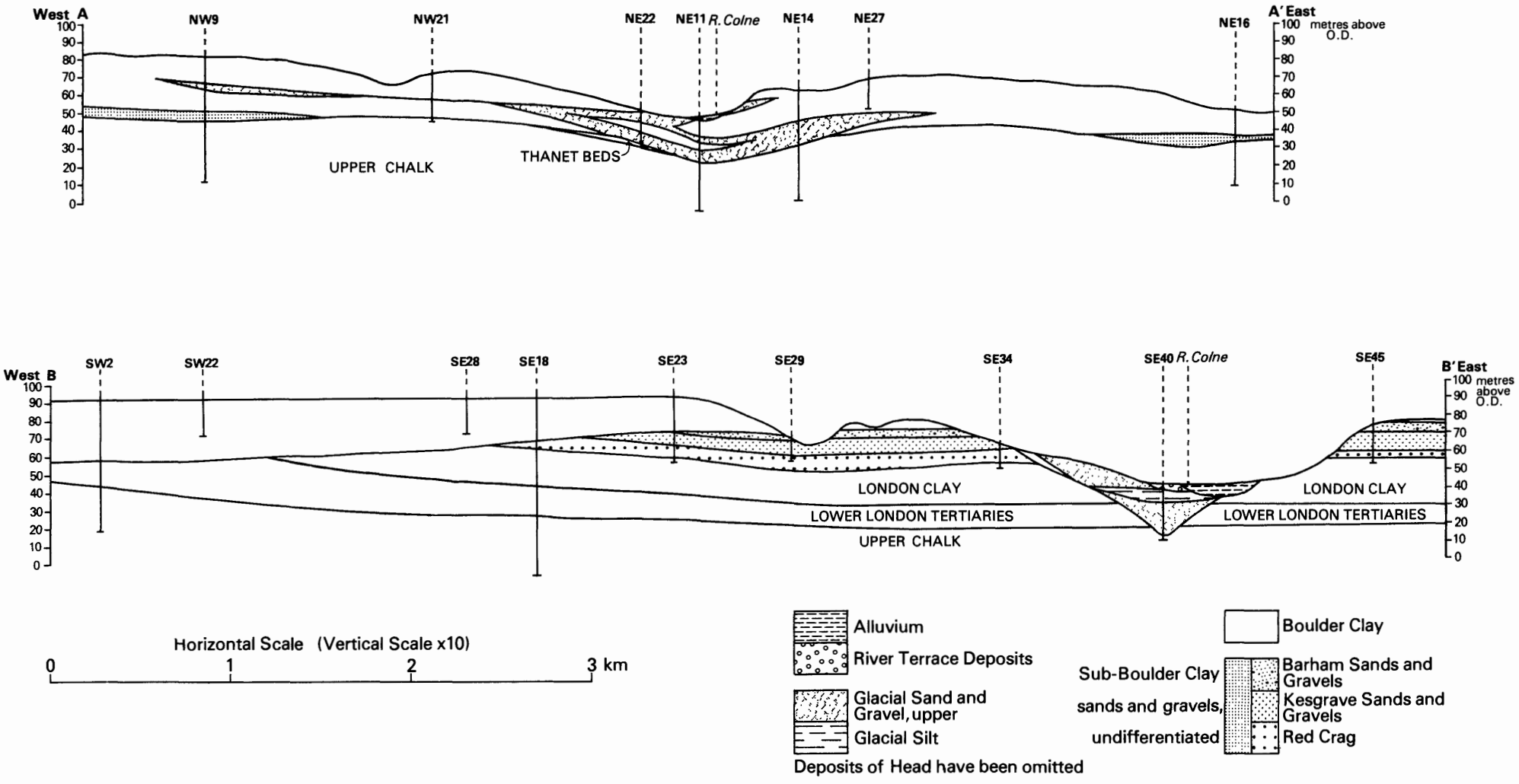


Figure 3 Schematic sections showing the relationship between the drift deposits and solid formations. The lines of section are shown on the resource map.

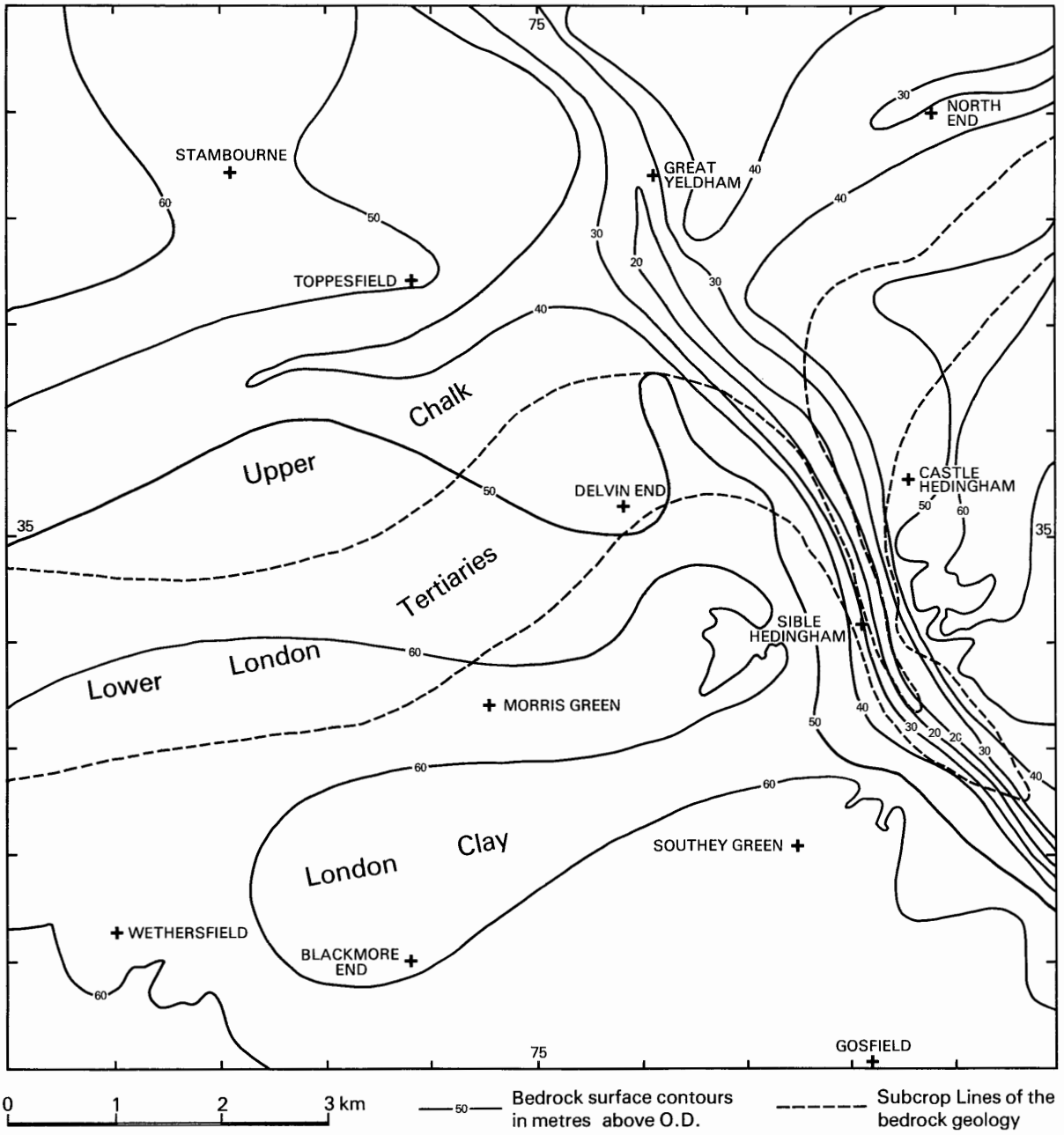


Figure 4 Map showing contours on the bedrock surface.

There are numerous small exposures in this deposit on the east of the Colne valley south of Castle Hedingham with a larger exposure at the Foxborough Hill Pit where there is a 9-m face of yellowish orange medium sand with gravel stringers. The reinstated pit at Kilowen Cottages exhibited well developed cross bedding and planar bedding in a fine and medium light grey soft quartz sand with some light grey clay laminae.

Barham Sands and Gravels This deposit underlies the Boulder Clay and, as with the Kesgrave Sands and Gravels and Red Crag below, it thins and disappears to the north and north-west. Its recorded thickness ranges up to 6 m in boreholes NE 30 and 31, while its mean thickness is 2.7 m. The lithology is variable, though generally consisting of an orange brown, brown or brownish red 'clayey' pebbly sand. The deposit is exposed beneath the Boulder Clay in the Foxborough Hill Pit as 3 m of reddish brown and light grey coarse sandy clay with some pebbles. This deposit has been mapped within the undivided sandy drift unit and is therefore likely to form the upper portion of this outcrop. The Barham Sands and Gravels have been taken in this report to include the "rubified **sol lessivé**" and associated deposits of Rose and Allen (1977) where they occur.

Glacial Sand and Gravel, upper This deposit is developed within the Boulder Clay sequence and is associated with the Colne valley drift complex, forming an integral part of the sequence of glacial drift that fills the buried valley and which is largely obscured by fluvial deposits and Head. Assessment boreholes have shown this thick glacial sequence to be largely composed of alternating beds of Boulder Clay and Glacial Sand and Gravel, upper. In addition, beds of Glacial Silt have been recorded. The Glacial Sand and Gravel, upper, is commonly a light grey 'clayey' sandy gravel, composed largely of flint and chalk pebbles. Less frequently it is a chalk gravel or sand but it often contains subordinate light grey clay and clayey sand seams. Three small outcrops have been distinguished from the undivided unit where it is exposed [773 362 and 779 353] in railway cuttings west of Castle

Hedingham. The Glacial Sand and Gravel, upper, also characteristically forms more extensive outcrops on the lower, western slopes of the Colne valley at Sible Hedingham. IMAU borehole records clearly show that it also constitutes the mapped deposits of sand and gravel around Great Yeldham.

Glacial Silt This deposit is restricted in occurrence to the general region of the Colne valley. Here it commonly occurs in the buried valley sequence resting on or within Glacial Sand and Gravel, upper, and is overlain by River Terrace Deposits (Figure 3). It has a variable lithology ranging from silty peat to pebbly sandy silt with some chalk and flint pebbles but is typically grey laminated clayey silt. It has a mean thickness of 4.5 m.

Boulder Clay This till blankets the undulating plateau where it generally overlies Barham Sands and Gravels; along with seams of Glacial Sand and Gravel, upper, it also fills the buried channel of the Colne where it rests, in places, directly on Upper Chalk and where it is largely overlain by Head and River Terrace Deposits (Figure 3).

This firm to stiff, slightly sandy silty clay typically contains abundant pebbles of rounded chalk, much angular flint, some quartz and quartzite and other minor erratics of igneous and metamorphic rocks and sandstones. Thin seams of laminated silt, and of sand and gravel (sometimes exclusively of chalk) are developed within the deposit. At outcrop the upper four metres is commonly weathered to an orange-brown colour. In the upper part of the weathered zone, decalcification to a sandy clay with flint pebbles is universal. Below, the Boulder Clay becomes grey with additional pebbles of shale and mudstone. At the base it becomes particularly sandy and gravelly in places; rounded flint and quartzite pebbles and an absence of chalk were recorded at the Foxborough Hill Pit. In the buried valley the deposit is characterised by the absence of many of the less common erratics, making the chalk particularly prominent. A maximum overall thickness of 38.1 m is recorded at Gainsford Hall [7268 3498]; while the deposit thins to the south and south-east, it forms thick sequences in the buried valley.

Head Gravel Two small outcrops of Head Gravel overlie Boulder Clay immediately east and south-west of Kirkby Hall [7772 3728] where the deposit is a brown gravelly clay with chalk and flint pebbles as seen in borehole NE 34. The only other occurrence is at Wethersfield where a similar lithology encountered immediately beneath the soil becomes less clayey with depth to form a 'clayey' sandy gravel. Here the deposit, with a total thickness of 1.9 m, overlies Barham Sands and Gravels in borehole SW 14.

Head This deposit forms spreads on many of the lower valley slopes and is characterised by a very variable lithology. Commonly it consists of orange brown sandy clay with much angular flint as seen in a railway cutting exposure [7716 3628] west of Castle Hedingham. Here the deposit clearly shows a multiphase origin probably due to repeated solifluxion. To the east of Sible Hedingham the deposit has a more silty and fine-sandy lithology in common with the local London Clay from which it undoubtedly has been derived.

River Terrace Deposits These deposits are found only in the Colne valley where two terrace levels occur at 1.2 to 1.5 m and 2.4 to 3.7 m above the floodplain. The higher Second Terrace forms features south of Pool Farm [7660 3700], at Castle Hedingham, and south of Sible Hedingham, where borehole SE 40 proved a thickness of 1.5 m of sandy silty clay capping 'very clayey' sandy gravel resting on Glacial Silt.

The First Terrace forms conspicuous features east and west of the river as far north as Pool Farm where borehole NE 29 proved pebbly sandy clay overlying 'clayey' sandy gravel with peat seams. Borehole SE 39 at Sible Hedingham showed a similar thickness, 3.6 m, of sandy gravel beneath pebbly, sandy clay.

Alluvium This deposit forms the floodplain feature that floors all the major valleys and tributary valleys in the district and reaches a maximum width of 400 m in the Colne valley between the Hedinghams. This essentially clayey sandy silt with freshwater gastropod and bivalve shells commonly contains silty peat and peat seams and often overlies sandy gravel, as seen in borehole SE 46, where the Alluvium has a total thickness of 5.3 m.

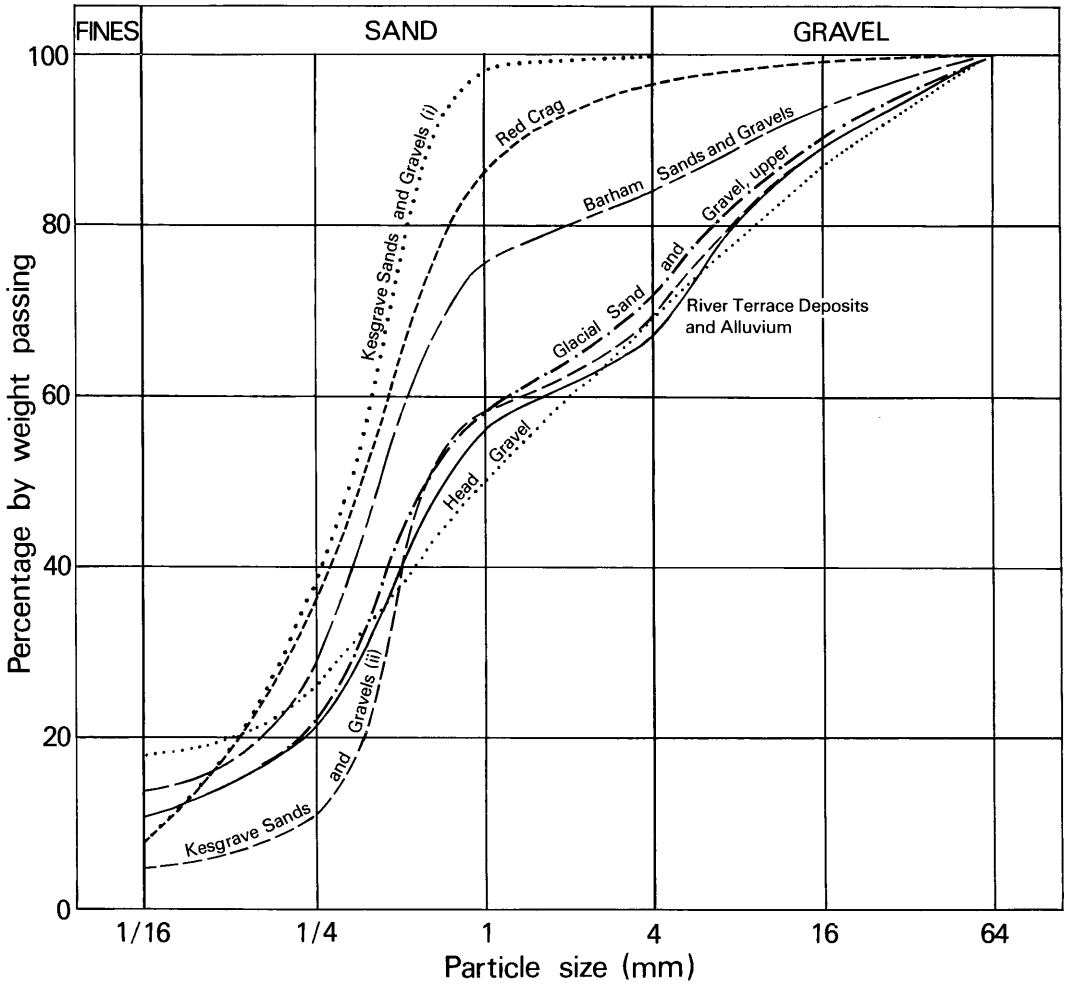
COMPOSITION OF THE SAND AND GRAVEL DEPOSITS

Potentially workable sand and gravel is present in the Red Crag, Kesgrave Sands and Gravels, Barham Sands and Gravels, Glacial Sand and Gravel, upper, Head Gravel, River Terrace Deposits, and Alluvium. Each deposit is considered separately in this section, whereas in the resource block descriptions they are grouped and assessed as a unit of sand and gravel where the deposits overlie one another. These deposits mostly form sands (Figure 5) but also include pebbly sands, 'clayey' pebbly sands, sandy gravels and 'clayey' sandy gravels. The

Table 2 Mean composition of the gravel (+4 mm) fraction of the mineral-bearing deposits.

Deposit	Percentage by weight								
	Angular flint	Well rounded flint	Quartz	Quartzite	Chalk	Phosphatic nodules	Ironstone	Sandstone	Others‡
Alluvium	67	6	4	2	10	-	1	4	6
First Terrace	70	9	5	2	6	1	trace	3	3
Second Terrace	46	19	24	1	-	-	-	2	8
Head Gravel	38	7	3	6	44	-	trace	1	1
Glacial Sand and Gravel, upper	53	2	5	7	21	1	trace	3	8
Barham Sands and Gravels	47	13	23	9	1	1	1	3	2
Kesgrave Sands and Gravels*	37	20	27	11	-	trace	-	2	3
Kesgrave Sands and Gravels†	42	13	28	7	-	2	3	2	2
Red Crag	38	18	11	5	-	12	12	3	1

* Sandy gravel facies.
† Sandy facies.
‡ 'Others' includes Igneous and Metamorphic rocks, Mudstone and Fossil debris.



Deposit	Percentage by weight passing					
	$\frac{1}{16}$ mm	$\frac{1}{4}$ mm	1 mm	4 mm	16 mm	64 mm
River Terrace Deposits & Alluvium	11	21	56	67	89	100
Head Gravel	18	26	62	69	87	100
Glacial Sand and Gravel, upper	11	22	58	72	90	100
Barham Sands and Gravels	14	29	76	84	94	100
Kesgrave Sands and Gravels (sandy gravel facies)	5	11	58	69	89	100
Kesgrave Sands and Gravels (sandy facies)	8	38	98	100	100	100
Red Crag	8	36	86	96	99	100

Figure 5 Mean particle size distribution of the mineral-bearing deposits.

gravel fraction is largely composed of flint (Table 2) but also includes quartz and quartzite with chalk, phosphate nodules and ironstone forming substantial proportions in certain deposits. Sandstone, mudstone, igneous and metamorphic rocks, fossil debris and limestone are generally present in small amounts. Although the Lower London Tertiaries could in places be classified as mineral (and their lithology has been fully described in the borehole logs), this resource has not been assessed in the context of this survey due to several limiting factors: the sand and gravel lithologies have a limited area of subcrop beneath the drift, they are generally thin with excessive overburden in most places, and they are typically rather clayey with a high proportion of fine sand.

Red Crag This deposit typically consists of sand with a wide range of grain-size; the mean grading is fines 8%, sand 83% and gravel 4 %. Its lithology varies from pebbly sand in borehole SE 43 to 'clayey' sand in borehole NE 33. Iron-pan layers are common in this typically ferruginous deposit with other clayey and silty seams in places, while the basal 0.2 m commonly becomes more gravelly. The sands tend to become more clayey around the

Hedinghams and have a slightly higher percentage of gravel in the south and south-west.

The gravel fraction (+4 mm) is predominantly fine (+4 mm -16 mm) and composed largely of angular with well rounded flint, well rounded phosphatic nodules, tabular ironstone, rounded quartz, quartzite and mudstone pebbles. However, borehole SW 15 contained a substantial proportion of shell debris in the basal 0.3 m. The average grading of the sand fraction (+0.063 mm - 4 mm), which is largely composed of subangular to subrounded iron-stained quartz grains, is fine sand 32 %, medium sand 57 % and coarse sand 11 %.

Kesgrave Sands and Gravels This potentially workable deposit is characteristically a sand with a mean grading of fines 8 % and sand 92 %. However, boreholes SE 25, SE 24, 31 and 37 proved the top 0.7 to 3.0 m of the deposit to be a sandy gravel (depicted separately in Figure 5 and Table 2) with a mean grading of fines 5 %, sand 64 %, and gravel 31 %. In some boreholes the presence of clay laminae in the sand category raises the fines content above 10 %, causing the deposit to be termed 'clayey'.

Where present, the gravel fraction is fine and coarse and composed largely of angular flint and rounded quartz with well-rounded flint and rounded quartzite. The sand fraction is composed almost exclusively of subrounded quartz, with some white mica present in the sand facies and flint in the sandy gravel facies.

Barham Sands and Gravels This deposit is 'clayey' pebbly sand overall with a mean grading of fines 14 %, sand 70 % and gravel 16 % and it ranges from 'very clayey' sand to sandy gravel. The mainly fine gravel fraction includes a trace of cobbles and is composed of angular flint with rounded quartz, well rounded flint, rounded quartzite and a small percentage of sandstone, chalk, phosphatic nodules, ironstone, igneous and metamorphic erratics. The sand is predominantly medium with fine and coarse subrounded quartz and may include a proportion of chalk in some places. Seams of clay and silt about 10 cm thick are occasionally developed within the sequences.

Glacial Sand and Gravel, upper This deposit is more poorly sorted, generally forming 'clayey' sandy gravel or 'clayey' pebbly sand. Only boreholes NW 23, NE 22, 29 and SE 40 proved gradings with less than 10 % fines. Overall, the deposit has a mean grading of fines 11 %, sand 61 % and gravel 28 %. The gravel is fine and coarse with some cobbles and composed of a wide range of lithologies dominated by angular flint with rounded chalk and includes some quartzite, quartz, sandstone, mudstone, fossil debris, limestone, well rounded flint, igneous and metamorphic rock types. The predominantly medium with coarse and fine sand, while commonly composed of subrounded quartz, often includes chalk which becomes dominant at some localities; sandy clay seams (as recorded in borehole NE 28) are developed in places.

Head Gravel This deposit has proved to be of mineral grading only at Wethersfield where borehole SE 14 proved 0.6 m of 'clayey' sandy gravel, with a grading of fines 18 %, sand 51 %, and gravel 31 %. Its gravel fraction (+4 mm) is composed of rounded chalk and angular flint with some well rounded flint, rounded quartzite, quartz, sandstone and fossil debris. The sand fraction, which is predominantly of medium grade, includes chalk, quartz and flint.

River Terrace Deposits and Alluvium Potentially workable sand and gravel within these deposits is restricted to the Second and First Terrace and Alluvium of the Colne valley and the Alluvium of the Bourne Brook. This mineral grades as 'clayey' sandy gravel with a mean grading of fines 11 %, sand 56 % and gravel 33 %. The gravel fraction is mostly fine but includes some cobbles; it consists of angular and well rounded flint, rounded quartz, chalk and some sandstone, quartzite, mudstone, igneous and metamorphic rocks (Table 2). The chalk is rather sporadic in occurrence. The Second Terrace has a relatively low percentage of flint, of which a high proportion is well rounded. The sand fraction has a sharp texture and is mostly of medium grade. Though largely composed of subangular to subrounded quartz, it contains significant proportions of subangular flint especially in the coarse fraction. Some subrounded chalk is present.

THE MAP

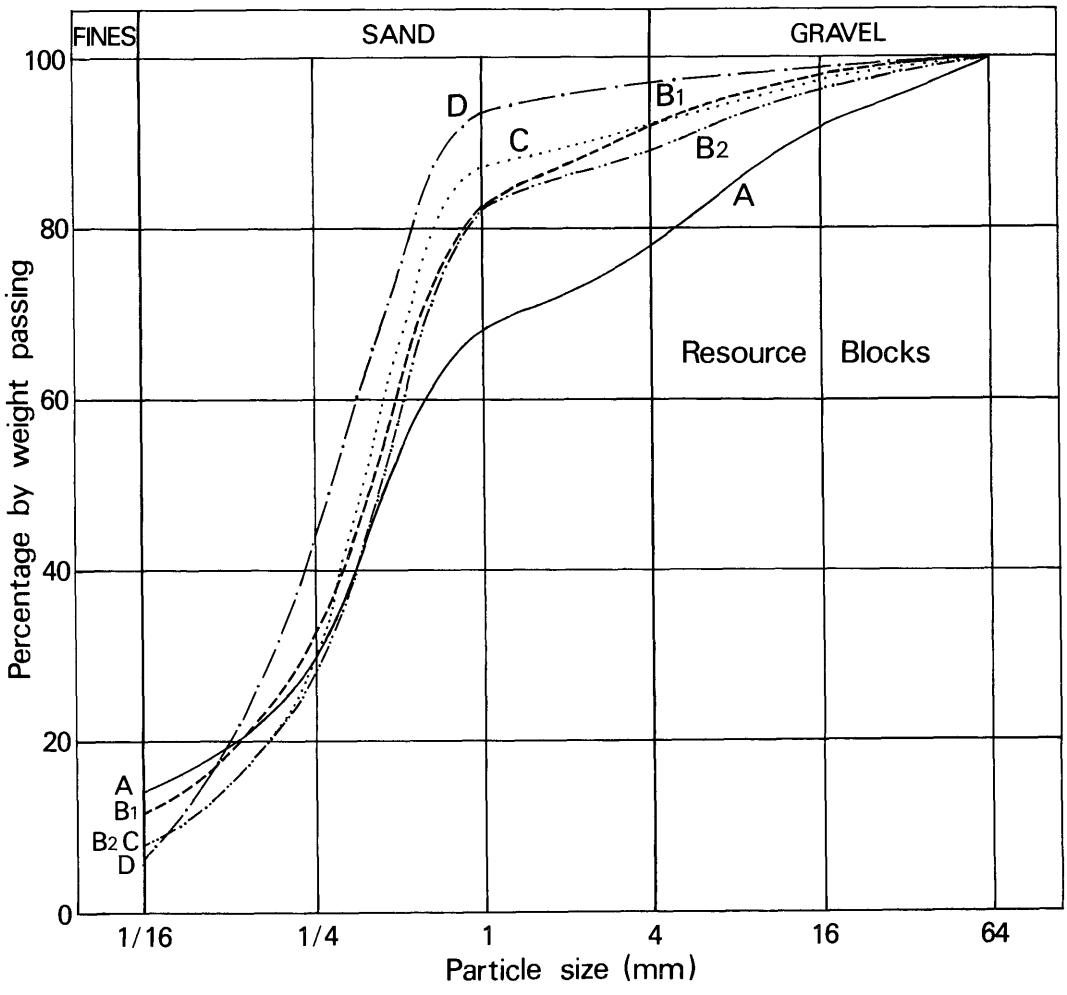
The sand and gravel resource map is folded into the pocket at the end of this report. The base map is the Ordnance Survey 1:25 000 Outline Edition in grey, on which the topography is shown by contours in green, the geological data in black and the mineral resource information in shades of red.

Geological data The geological boundary lines, symbols, etc., shown are taken from the geological map of this area, which was surveyed recently at the scale of 1:10 000. This information was obtained by detailed application of field mapping techniques by the field staff in the Institute's East Anglia and South-East England Unit. Borehole data, which include the stratigraphic relations, thicknesses and mean particle size distribution of the sand and gravel samples collected during the assessment survey, are also shown.

Mineral resource information The mineral-bearing ground is divided into resource blocks (see Appendix A). Within a resource block the mineral is subdivided into areas where it is exposed, that is where the overburden averages less than 1 m in thickness, and areas where it is present in continuous spreads beneath overburden. The mineral is identified as 'exposed' where the overburden, commonly consisting only of soil and subsoil, averages less than 1.0 m in thickness. Beneath overburden the mineral may be continuous (or almost continuous) or discontinuous. The recognition of these categories is dependent upon the importance attached to the proportion of boreholes which did not find potentially workable sand and gravel and the distribution of barren boreholes within a block. The mineral is described as 'almost continuous' if it is present in 75 per cent or more of the boreholes in a resource block. The 'discontinuous' category has not been recognised on this sheet.

Areas where bedrock outcrops, where boreholes indicate absence of sand and gravel beneath cover and where sand and gravel beneath cover is interpreted to be not potentially workable, are uncoloured on the map; where appropriate, the relevant criterion is noted. In such cases it has been assumed that mineral is absent except in infrequent and relatively minor patches that can neither be outlined nor assessed quantitatively in the context of this survey. Areas of unassessed sand and gravel, for example in built-up areas, are indicated by a red stipple.

The area of the mineral-bearing ground is measured, where possible, from the mapped geological boundary lines. The whole of this area is considered as mineral-bearing, even though it may include small areas where sand and gravel is not present or is not potentially workable. Inferred boundaries have been inserted to delimit areas where sand and gravel beneath cover is interpreted to be not potentially workable or absent. Such boundaries are drawn primarily for the purpose of volume estimation. The zigzag symbol used indicates an approximate location within a likely zone of occurrence rather than representing the breadth of the zone, its size being determined only by cartographic considerations. For the purpose of measuring areas the centre line of the symbol is used.



Resource block	Percentage by weight passing					
	$\frac{1}{16}$ mm	$\frac{1}{4}$ mm	1 mm	4 mm	16 mm	64 mm
A	14	30	68	78	92	100
B_1	12	33	82	92	98	100
B_2	8	28	82	89	96	100
C	8	30	87	92	97	100
D	7	43	93	97	99	100

Figure 6 Mean particle size distribution for the assessed thickness of sand and gravel in the resource blocks.

RESULTS

The statistical results are summarised in Table 3. Fuller grading particulars are shown in Figures 5 and 6 and Tables 4 to 8.

Accuracy of results For each of the blocks, the accuracy of the results at the symmetrical 95 per cent probability level (that is, the probablility that 19 times out of 20, the true volume of mineral present lies within the stated limits) varies between 15 per cent and 41 per cent (Appendix B). However, the true volumes are more likely to be nearer the figure estimated than either of the limits. Moreover, it is probable that roughly the same percentage limits would apply for the statistical estimate of mineral volume within 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 quotation of reserves, data from more sample points would be required, even if the area were quite small. This point can be illustrated by considering the whole of the potentially workable sand and gravel in blocks A to D. The total volume (505 million m^3) can be estimated to limits of $\pm$ 13 per cent at the 95 per cent probability level by a calculation based on the data from the 81 sample points spread across the four resource blocks. However, it must be emphasised that the quoted volume of mineral has no simple relationship with the amount that could be extracted in practice, as no allowance has been made in the calculations for any restraints (such as existing buildings and roads) on the use of the land for mineral working.

Table 3 Assessment of resources: summary of statistical results.

Block	Area		Mean thickness		Volume of sand and gravel			Mean grading percentage		
	Block	Mineral	Over-burden	Mineral		Limits at the 95% probability level		Fines $-\frac{1}{16}$ mm	Sand $+\frac{1}{16}$ -4 mm	Gravel +4 mm
	km^2	km^2	m	m	$m^3 \times 10^6$	$\pm$ %	$\pm m^3 \times 10^6$			
A	38.7	4.9	5.5	6.7	33	41	14	14	64	22
B_1	20.2	11.9	6.8	8.5	101	26	26	12	80	8
B_2	12.0	11.0	3.7	10.2	112	31	35	8	81	11
C	13.4	12.1	7.3	11.6	140	30	42	8	84	8
D	15.7	8.7	5.5	14.9	130	15	19	7	90	3
Blocks A-D	100.0	48.6	5.8	10.4	505	13	67	9	83	8

Table 4 Block A: data from IMAU boreholes used in the assessment.

Borehole	Recorded thickness (m)		Mean grading percentage					
	Mineral	Over-burden	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	Coarse gravel +16 mm
NW 17	2.9	2.4	15	9	45	9	16	6
NW 19	8.9	15.4	21	31	28	7	8	5
NW 23	3.2	8.6	7	8	74	6	3	2
NE 21	6.0	0.8	17	14	24	13	20	12
NE 22	6.2	5.3	5	8	49	11	16	11
NE 28	1.8	0.2	19	6	25	11	27	12
Mean	6.7	5.5	14	16	38	10	14	8

Table 5 Block B_1: data from IMAU boreholes used in the assessment.

Borehole	Recorded thickness (m)		Mean grading percentage					
	Mineral	Over-burden	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	Coarse gravel +16 mm
NE 29	12.7	4.2	9	5	29	18	28	11
NE 30	6.0	9.5	15	16	33	23	10	3
NE 31	11.7	4.4	16	26	50	7	1	0
NE 33	6.4	9.6	17	13	49	16	4	1
NE 34	4.3	11.5	12	17	54	13	4	0
NE 35	absent							
NE 36	15.5	2.2	8	21	57	10	3	1
NE 38	11.8	13.5	14	44	37	4	1	0
NE 40	2.8	12.0	22	27	43	7	1	0
NE 41	8.2	8.2	8	30	58	4	0	0
NE 42	5.4	3.4	16	6	29	14	24	11
SE 22	7.0	18.0	15	9	70	4	2	0
SE 27	8.1	10.6	13	23	52	9	2	1
SE 28	8.9	7.0	10	20	56	10	3	1
SE 33	12.9	0.7	11	20	61	7	1	0
Mean	8.5	6.8	12	21	49	10	6	2

Table 6 Block B_2: data from IMAU boreholes used in the assessment.

Borehole	Recorded thickness (m)		Mean grading percentage					
	Mineral	Over-burden	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	Coarse gravel +16 mm
SE 29	15.6	9.4	9	30	45	4	8	4
SE 34	12.1	0.3	8	35	44	9	3	1
SE 35	14.4	3.2	7	15	68	7	2	1
SE 36	13.4	3.7	7	11	73	6	2	1
SE 39	7.5	1.4	5	7	35	12	27	14
SE 40	13.2	0.6	6	5	43	17	18	11
SE 41	3.3	3.2	4	19	65	2	6	4
SE 42	16.7	9.0	9	14	67	5	4	1
SE 44	10.8	2.3	12	29	55	3	1	0
SE 45	21.7	2.7	12	39	40	4	3	2
SE 46	3.4	2.4	7	11	27	11	27	17
SE 47	1.9	3.2	4	14	29	14	25	16
SE 48	10.7	9.8	8	13	64	8	5	2
Mean	10.2	3.7	8	20	54	7	7	4

Table 7 Block C: data from IMAU boreholes used in the assessment.

Borehole	Recorded thickness (m)		Mean grading percentage					
	Mineral	Over-burden	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	Coarse gravel +16 mm
SW 25	21.5	0.6	6	36	46	4	4	4
SW 29	16.4	8.6	10	15	67	6	1	1
SW 30	4.8	10.9	5	13	29	12	26	15
SE 23	13.8	9.3	9	20	60	6	3	2
SE 24	8.7	16.3	6	31	58	3	2	0
SE 25	14.4	5.4	8	23	59	5	3	2
SE 26	1.4	1.8	18	38	30	11	3	0
SE 30	9.3	15.7	10	18	70	1	1	0
SE 31	12.5	8.4	6	16	61	7	7	3
SE 32	2.3	1.6	10	4	30	16	23	17
SE 37	13.3	11.7	8	24	53	4	7	4
SE 38	12.6	3.9	6	11	77	2	2	2
SE 43	13.5	3.9	10	22	52	6	7	3
Mean	11.6	7.3	8	22	57	5	5	3

Table 8 Block D: data from IMAU boreholes used in the assessment.

Borehole	Recorded thickness (m)		Mean grading percentage					
	Mineral	Over-burden	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	Coarse gravel +16 mm
SW 13	13.3	1.9	4	24	65	5	1	1
SW 14	10.2	1.7	7	37	40	8	5	3
SW 15	15.0	1.4	7	37	46	5	3	2
SW 18	18,0	0.6	10	37	47	5	1	0
SW 19	11.3	0.4	5	61	29	2	1	2
SW 20	13.8	11.6	9	12	73	6	0	0
SW 21	17.3	8.5	9	36	49	5	1	0
SW 23	14.6	12.0	9	28	56	5	1	1
SW 24	20.3	4.7	7	47	43	2	1	0
SW 26	18.3	6.7	5	38	50	2	2	3
Mean	14.9	5.5	7	36	50	4	2	1

NOTES ON THE RESOURCE BLOCKS

The district is divided into four resource blocks (Figure 2), the boundaries of which have been drawn primarily to separate, where possible, the various deposits of sand and gravel. Blocks C and D enclose areas of potentially workable Barham Sands and Gravels, Kesgrave Sands and Gravels and Red Crag; these deposits overlie one another as a continuous unit of sand and gravel. Block A, however, encompasses mineral only from the Glacial Sand and Gravel, upper, while Block B, a complex area, includes mineral from most of the potentially workable deposits.

Block A

This north-western part of the district includes the dissected plateau country around Stambourne and Toppesfield along with the Colne valley immediatedly north and south of Great Yeldham and the higher ground to the east about North End. The 4.9 km^2 of mineral (Table 3) in this block is confined to the Colne valley and is composed solely of Glacial Sand and Gravel, upper. On the plateau to the west and east the thick Boulder Clay usually in excess of 18 m, renders any underlying sand and gravel 'not potentially workable'; where bottomed, the drift sequence generally shows only thin and patchy deposits of sub-Boulder Clay sand and gravel.

The mineral-bearing Glacial Sand and Gravel, upper, occurs mainly within the Boulder Clay sequence. As might be expected, the ground where it is classified as potentially workable extends along the valley of the Colne and its two major tributary valleys (as proved by boreholes NW 17 and 23), where the Boulder Clay overburden has been partially or completely removed by erosion. The deposits thin to nothing on either side of the Colne valley (Figure 3), thus necessitating the use of an inferred boundary to separate the mineral and non-mineral areas. The deposit appears to occur as discontinuous beds within the Boulder Clay. For example, borehole NE 28 shows a thin seam of Glacial Sand and Gravel, upper, at the surface with a continuous sequence of Boulder Clay below resting on Upper Chalk, whereas borehole NE 22, at a lower elevation only one kilometre to the north-west, proves two sequences of Glacial Sand and Gravel, upper, separated by Boulder Clay. There is also a marked variability in the thickness, grading and composition of the deposit.

Six IMAU boreholes and four other borehole records have been used to assess the potentially workable Glacial Sand and Gravel, upper, which has a maximum recorded thickness of 11.6 m in borehole NE 12 and a mean thickness of 6.7 m. The overburden of Alluvium, Head and Boulder Clay ranges in recorded thickness up to 15.9 m with a mean of 5.5 m. Overall the deposit forms a 'clayey' sandy gravel with a mean grading of fines 14 %, sand 64 % and gravel 22 % and an estimated volume of 33 million $m^3 \pm 41$ % (Table 4).

The worked-out ground at Great Yeldham, now reinstated, is the site of a pit in Glacial Sand and Gravel, upper, which, while classified as mineral, generally has a high percentage of deleterious material, largely chalk, making it unsuitable for many applications.

Block B

This block encompasses the southern portion of the Colne valley and the plateau immediately to the west and east. It includes Castle Hedingham and Sible Hedingham and has a total area of 32.2 km^2, of which 22.9 km^2 is mineral-bearing. While geologically this block is difficult to divide, the large area of mineral warrants its subdivision for practical purposes. It has been described as a single block while the data and statistics have been divided into the sub-blocks B_1 and B_2 (Figure 2).

The sub-Boulder Clay tripartite sequence of Barham Sands and Gravels, Kesgrave Sands and Gravels, and Red Crag forms the main resource of this block; the deposits are situated on the plateau and interfluves of the Colne valley. This resource abuts and possibly underlies potentially workable Glacial Sand and Gravel, upper, which is confined to the buried valley of the Colne, so forming an almost continuous area of mineral over much of the block. As all these depostis are mapped as a single undivided unit of sand and gravel, it is not possible to separate these resources, though greater detail is given below. Superimposed on this complex mineral-bearing sequence are the Terraces and Alluvium, which are also classified as mineral in this block.

In the north, the ground proved to be not potentially workable around boreholes NE 32 and 37 (which proved Boulder Clay in excess of 18 m thick) and borehole NE 39, which proved a relatively thin sequence of Barham Sands and Gravels beneath Thick Boulder Clay, such that the 3:1 overburden ratio is exceeded (see p. 1). To the south, the sub-Boulder Clay sands and gravels generally thicken; conversely the Boulder Clay overburden thins. The inferred boundary symbol is used in this area to separate what are considered to be mineral and non-mineral areas. Potentially workable deposits from the tripartite sub-Boulder Clay sequence of sands and gravels crop out high on the valley sides between Sheepcot Farm [799 330] and Wallace Farm [799 330]. London Clay crops out downslope from these deposits, so separating them in this area from the potentially workable Glacial Sand and Gravel, upper. Borehole NE 42 illustrates an atypical sequence, proving 4.3 m of Glacial Sand and Gravel, upper, within the Boulder Clay and the absence of Kesgrave Sands and Gravels and Red Crag.

A similar setting is seen to the west of the Colne valley where the sub-Boulder Clay tripartite deposit of sands and gravels is regarded as non-mineral west of Delvin End due to excessive overburden (see p. 1). Several outcrops of London Clay between Rookwoods Rough [773 350] and Great Spansey Wood [798 304] form a bench feature with the sub-Boulder Clay sands and gravels proved on either side. However, on the lower valley slopes it is likely that the exposed mineral is composed of Glacial Sand and Gravel, upper. The asymmetry of the present valley and the divergence of the axis of the buried valley from that of the present valley are illustrated in section BB' (Figure 3).

On the floor and lower valley slopes of the Colne valley, 8.3 m and 12.0 m of potentially workable Glacial Sand and Gravel, upper, is proved in IMAU boreholes NE 29 and SE 40 respectively, overlain by Terrace Deposits. Deposits of Second Terrace proved to be exposed mineral in boreholes NE 3 and SE 40 with 5.8 and 1.2 m of mineral respectively; while the First Terrace proved to comprise 4.4 and 7.5 m of mineral in boreholes NE 29 and SE 39 respectively. Borehole SE 46 proved 3.4 m of mineral in the Alluvium, whereas borehole NE 35 proved an exceptional sequence of 17.9 m of peats and silts overlying Boulder Clay. As a result, the First Terrace and Alluvium are considered as continuous spreads of mineral beneath overburden whereas the Second Terrace is exposed mineral.

The potentially workable sands and gravels of Sub-block B_1 have been assessed by 17 IMAU boreholes and 2 other borehole records. They give a mean grading of fines 12 %, sand 80 % and gravel 8 % (Table 5) with an estimated volume of 101 million $m^3 \pm 26$ %. The mineral has a mean thickness of 8.5 m and the overburden a mean thickness of 6.8 m. 16 IMAU boreholes, 2 other borehole records and an exposure have been used in the assessment of Sub-block B_2. The mineral has an overall grading of fines 8 %, sand 81 % and gravel 11 % (Table 6) and an estimated volume of 112 million $m^3 \pm 31$ %. This potentially workable sand and gravel has a mean thickness of 10.2 m and carries overburden of mean thickness 3.7 m. The Foxborough Hill Pit has worked an estimated 0.1 km^2 of sand and gravel and is at present producing mortar sands from the Kesgrave Sands and Gravels.

Block C

This block encloses the headwaters of the Bourne Brook stretching between Blackmore End, Morris Green and Gosfield. Potentially workable Barham Sands and Gravels, Kesgrave Sands and Gravels and Red Crag underlie the Boulder Clay over much of the area. They become non-mineral in the north around Morris Green where the overburden exceeds 18 m (the arbitrary maximum considered in this survey), while to the south they outcrop on the sides of the valley with London Clay outcropping lower downslope. Borehole SE 26 proved mineral-bearing Alluvium in the higher reaches of the Bourne Brook which was probably derived from local reworking of the sub-Boulder Clay sands and gravels. Within the mineral, minor impersistent waste bands 0.6 and 1.1 m thick are present in the south-east, in boreholes SE 28 and 43 respectively. Over the centre and north-east of the resource block, boreholes SW 29, SE 24, 30 and 37 were abandoned at 25 m depth, and so did not prove the full thickness of the sand and gravel deposits. In boreholes SE 24 and 30 the Kesgrave Sands and Gravels were not bottomed and the presence of the Red Crag was not proved. This is due, at least in part, to the local thickening of overburden in this area. Boreholes SW 30 and SE 32 proved 4.8 and 2.3 m of mineral respectively and indicated a localised thinning of the resource in this vicinity. All four boreholes that proved the atypical occurrence of sandy gravel at the top of the Kesgrave Sands and Gravels are in this block.

Records of 13 IMAU boreholes (Table 7) and one other borehole were used in the assessment. The mineral grades overall as a pebbly sand with a mean grading of fines 8 % sand 84 % and gravel 8 %. Its mean thickness is 11.6 m but the maximum recorded thickness (in borehole SW 25) is 21.5 m. Overburden ranges up to 16.3 m thick in borehole SE 24 with a mean thickness for the block of 7.3 m. There is an estimated 140 million $m^3 \pm 30$ % of potentially workable sand and gravel covering an area of 12.1 km^2 in this block.

Block D

This block occupies the south-west of the district and includes the valley of the Pant with Wethersfield and the surrounding area across to Morris Green in the north-east. As in Block C, the major resource in this area is that of the sub-Boulder Clay sands and gravels; borehole SW 14 also proved mineral-bearing Head Gravel.

Potentially workable sands and gravels from the Barham Sands and Gravels, Kesgrave Sands and Gravels and Red Crag are present beneath overburden over the central part of the area, whereas in the north the Boulder Clay overburden becomes excessive (see p. 1); in the south and south-west these deposits are exposed. The sands and gravels were not bottomed in boreholes SW 20, 21, 23, 24 and 26 which were terminated at 25 m depth in the Red Crag. London Clay outcrops on the lower slopes and floor of the Pant valley. The boundary with the undivided sand and gravel outcrop higher on the valley sides is often masked by deposits of Head, so necessitating the use of an inferred boundary to differentiate between areas of mineral and non-mineral. In borehole SW 14 only 0.6 m of Head Gravel proved to be of mineral grade; it lay directly over potentially workable Barham Sands and Gravels.

Data from ten IMAU boreholes (Table 8) and one other borehole record have been used in the assessment of this block. The estimated volume of mineral is 130 million $m^3 \pm 15$ % (covering an area of 8.7 km^2) with a mean grading of fines 7 %, sand 90 % and gravel 3 %. The mineral has a mean thickness of 14.9 m and a maximum recorded thickness of 20.3 m in borehole SW 24; the overburden reaches a maximum of 12.0 m in borehole SW 23 and has a calculated mean thickness of 5.5 m.

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 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.

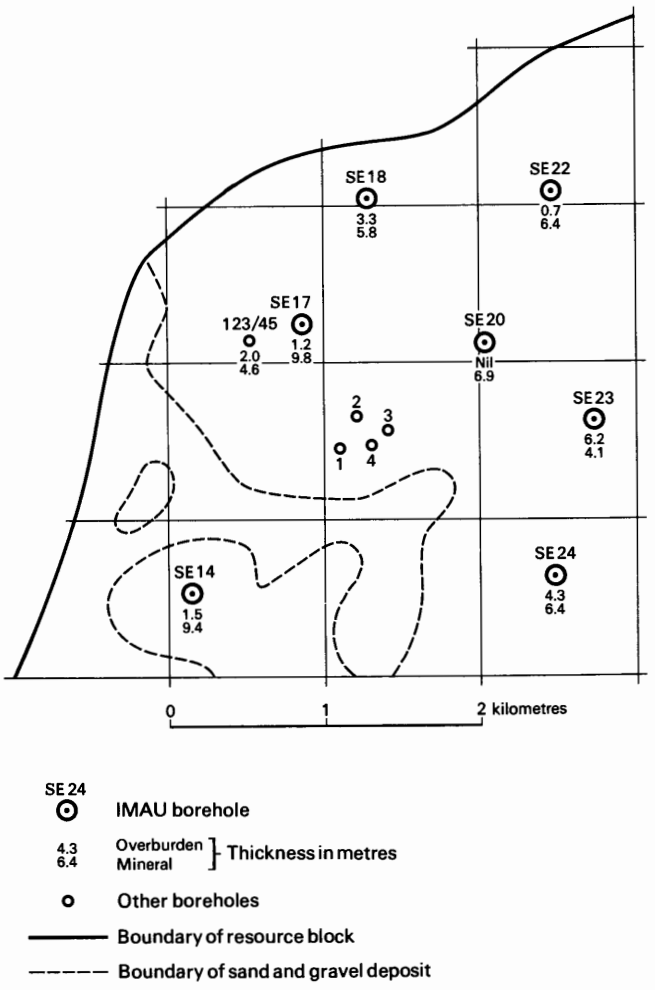
The drilling machine employed should be capable of providing a continuous sample representative of all unconsolidated deposits, so that the in-situ grading can be determined, if necessary, to a depth of 30 m (100 ft) at a diameter of about 200 mm (8 in), beneath different types of overburden. It should 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.

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 B.S. 1337 (British Standards Institution, 1967). Random checks of 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 E.

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



Example of resource block assessment: map of a fictitious block

APPENDIX B

STATISTICAL PROCEDURE

Statistical assessment

1 A statistical assessment is made of an area of mineral greater than 2 km^2, if there are at least 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 (Hull, 1981). Conventional symmetrical confidence limits are calculated for the 95 per cent probability level, that is, on average nineteen out of every twenty sets of limits constructed in this way contain the true value for the volume of mineral.

3 The volume estimate (V) for the mineral in a given block is the product of 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

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

4 The above relationship may be transposed such that

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

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 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 $l_{m_1}, l_{m_2}, \ldots l_{m_n}$, then the best estimate of mean thickness, $\bar{l}_m$, is given by

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

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 a 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 $S_A / S_{\bar{l}_m} \leqq 0.\dot{3}$ is assumed in all cases. It follows from Equation [2] that

$$S_{\bar{l}_m} \leqq S_V \leqq 1.05\ S_{\bar{l}_m} \qquad [3]$$

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 $(n-1)$ 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:

n	t	n	t
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 in *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:

$$L_{\bar{l}_m} \leqq L_V \leqq 1.05\, L_{\bar{l}_m}.$$

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

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

per cent,

and when n is greater than 20, as

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

per cent.

11 The application of this procedure to a fictitious area is illustrated in the accompanying Figure and example of a block calculation.

Inferred assessment

12 If the sampled area of mineral in a resource block is between 0.25 km^2 and 2 km^2, an assessment is inferred on the basis of 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 km^2.

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 needs to 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 with the zone as the weighting factor.

Block calculation

Scale: 1:25 000
Block: Fictitious

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 l_o	Overburden wl_o	Mineral l_m	Mineral wl_m	Remarks
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	½	1.2	1.6	9.8	7.2	
123/45	½	2.0		4.6		Hydrogeology Unit record
1	¼	2.7	2.6	7.3	5.8	Close group of four boreholes (commercial)
2	¼	4.5		3.2		
3	¼	0.4		6.8		
4	¼	2.8		5.9		
Totals	$\Sigma w = 8$	$\Sigma wl_o = 20.2$		$\Sigma wl_m = 52.0$		
Means		$\overline{wl}_o = 2.5$		$\overline{wl}_m = 6.5$		

Calculation of confidence limits

wl_m	$\lvert(wl_m - \overline{wl}_m)\rvert$	$(wl_m - \overline{wl}_m)^2$
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

$\Sigma(wl_m - \overline{wl}_m)^2 = 15.82$

$n = 8$

$t = 2.365$

L_V is calculated as

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

$= 1.05 \times (2.365/6.5)\ \sqrt{[15.82/(8 \times 7)]} \times 100$

$= 20.3$

$\simeq 20$ per cent.

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 (< $\frac{1}{16}$ mm) and coarser than pebbles (> 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 considered to be not 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 the accompanying Figure). The procedure is as follows:

1 Classify according to the ratio of sand to gravel.
2 Describe the 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 Appendix D)

Many differing proposals have been made 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 (see the accompanying table), which is used in the 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 Standards Institution, 1967). In this report the grading is tabulated on the borehole record sheets (Appendix E), 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 roughly 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 constitutents 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. Origninal 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: not 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.

Classification of gravel, sand and fines

Size limits	Grain-size description	Qualification	Primary classification
	Cobble		
64 mm			
		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

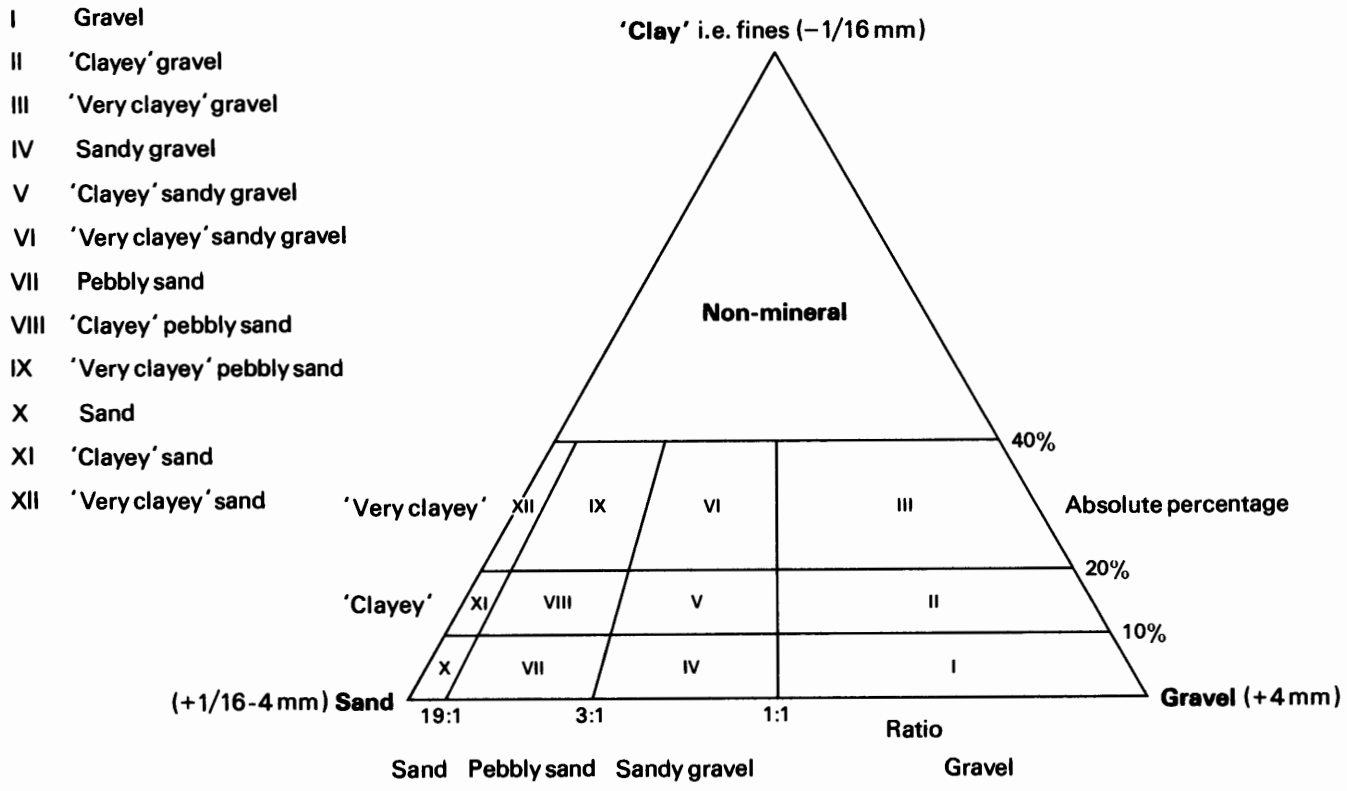


Diagram showing the descriptive categories used in the classification of sand and gravel

APPENDIX D

EXPLANATION OF THE BOREHOLE RECORDS

Annotated example

TL 73 SE 38 **7756 3054** **Orange Hall**[1] **Block C**

Surface level +81.2 m (+266 ft)[2]
Water struck at +68.2 m[3]
152 mm, Shell and auger[4]
September 1978

Overburden 3.9 m
Mineral 1.0 m
Waste 0.6 m
Mineral 11.6 m
Bedrock 0.9+ m[5]

LOG

Geological classification	Lithology[6]	Thickness m	Depth m
	Made ground	1.4	1.4
Boulder Clay	Clay, sandy, silty, brown with flint pebbles, becoming mottled with chalk; pebbles of flint and quartz	1.4	2.8
	Clay, very sandy, silty with pebbles of flint and quartz	1.1	3.9
Barham Sands and Gravels	**a** Sandy gravel, with clay seams Gravel: fine and coarse, angular flint and rounded quartz with quartzite, some phosphatic nodules and well rounded flint Sand: medium and coarse with fine	1.0	4.9
	Silt and clay, yellow-orange with flint pebbles	0.6	5.5
Kesgrave Sands and Gravels	**b** Sand, with clayey seams Sand: medium with fine and a trace of coarse, orange-yellow	9.0	14.5
Red Crag	**c** Sand Gravel: fine and coarse, angular with well-rounded flint, rounded quartz, phosphatic nodules, some quartzite and angular ironstone Sand: medium with fine and coarse, quartz, brown	2.6	17.1
London Clay	Clay, micaceous, blue-grey, top weathered to brown	0.9+	18.0

GRADING[7]

	Mean for deposit percentages			Depth below surface (m)[8]	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 mm
a	9	49	42	3.9-4.9	9	4	30	15	25	17	0
b	6	94	0	5.5-6.5	13	28	58	1	0	0	0
				6.5-7.5	4	11	84	1	0	0	0
				7.5-8.5	8	14	77	1	0	0	0
				8.5-9.5	6	10	83	1	0	0	0
				9.5-10.5	4	9	87	0	0	0	0
				10.5-11.5	2	10	88	0	0	0	0
				11.5-12.5	7	6	87	0	0	0	0
				12.5-13.5	6	16	78	0	0	0	0
				13.5-14.5	2	22	76	0	0	0	0
				Mean	6	14	80	0	0	0	0
c	3	95	2	14.5-15.5	3	7	89	1	0	0	0
				15.5-16.5	3	7	80	7	2	1	0
				16.5-17.1	3	4	83	6	2	2	0
				Mean	3	6	84	5	1	1	0
a+b+c	6	90	4	Mean	6	11	77	2	2	2	0

COMPOSITION[9]

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	3.9-4.9	46	4	33	9	4	0	0	4
c	14.5-17.1	36	23	17	5	16	2	0	1

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

1 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 lies is stated.

2 Surface level
The surface level at the borehole site is given in metres and feet above Ordnance Datum. All measurements were made in metres; approximate conversions to feet are given in brackets.

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

4 Type of drill and date of drilling
The type of drilling machine, the external diameter of the casing used and the month and year of completion of the borehole are stated.

5 Thickness
All measurements were made in metres to the nearest 0.1 m. The plus sign (+) indicates that the base of the deposit was not reached during drilling.

6 Lithological description
When sand and gravel is recorded a general description based on the mean 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. Where more than one mineral deposit is recognised, each is designated by a letter, e.g. **a**, **b**, etc.

7 Mean grading for deposit
The grading of each mineral deposit identified in the log is the mean of the individual sample gradings weighted by the thicknesses represented. The classification used is shown in Appendix C. Due to the diameter of the casing (152 mm), gravel larger than 64 mm, which is rarely present in this district, is likely to be unrepresentatively sampled.

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 proportions of fines and coarse gravel (+16 mm) may be lower.

8 Sampling
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 in the sand and gravel or at every 1 m of depth.

9 Composition
Details are given of the composition on a percentage by weight basis of the gravel fraction (+4 mm). The 'angular flint' category includes flint with an angularity from angular to subrounded. The category of 'Others' includes igneous, metamorphic and sedimentary rocks which occur in trace amounts.

APPENDIX E

INDUSTRIAL MINERALS ASSESSMENT UNIT BOREHOLE AND SECTION RECORDS AND LIST OF OTHER REGISTERED BOREHOLES

TL 73 NW 12 **7056 3973** **Park Wood** **Block A**

Surface level +91.2 m (+299ft)
Water struck at +73.2 m
152 mm, Shell and auger
October 1978

Waste 18.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, silty, orange-brown, becoming grey with pebbles of flint and chalk from 0.8 m. Passing down into clay, stiff, grey, with pebbles of chalk, flint, shale and quartzite from 4.2 m	17.7+	18.0

TL 73 NW 13 **7097 3770** **New Barn** **Block A**

Surface level + 101.9 m (+334 ft)
Water struck at +98.9 m
152 mm, Shell and auger
October 1978

Waste 18.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Boulder Clay	Clay, silty, mottled brown and grey, becoming pale grey with chalk pebbles from 3.6 . Passing down into clay, stiff, grey with pebbles of chalk, flint shale and quartzite	17.6+	18.0

TL 73 NW 14 **7072 3543** **Mill Farm** **Block A**

Surface level +81.7 m (+268 ft)
Water struck at +79.9 m
152 mm, Shell and auger
October 1978

Waste 18.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Boulder Clay	Clay, silty, grey-brown with chalk pebbles, becoming clay, mottled brown and grey with additional pebbles of flint and shale. Passing down into clay, silty, stiff brown-grey with pebbles of chalk, flint, shale and quartzite from 4.8 m.	17.6+	18.0

TL 73 NW 15 **7176 3901** **Hill Farm** **Block A**

Surface level +74.4 m (+244 ft)
Water not encoutered
152 mm, Shell and auger
October 1978

Waste 19.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.8	0.8
Alluvium	Clay, mottled brown and olive-grey with seams of clayey sand	0.7	1.5
Boulder Clay	Clay, stiff, grey-brown with pebbles of chalk, flint and shale, becoming grey with additional pebbles of quartzite from 3.8 m	17.5+	19.0

TL 73 NW 16 **7275 3938** **Pettyfield Wood** **Block A**

Surface level +66.3 m (+217 ft)
Water struck at +63.2 m
152 mm, Shell and auger
September 1978

Waste 15.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Alluvium	Clay, silty, brown	1.6	1.7
Boulder Clay	Clay, sandy, yellow-brown with pebbles of chalk and flint, becoming grey from 3.5 m	13.3+	15.0
	Borehole terminated due to technical difficulties		

TL 73 NW 17 **7387 3904** **Weybridge Farm** **Block A**

Surface level +61.8 m (+203 ft)
Water struck at +59.5 m
152 mm, Shell and auger
September 1978

Overburden 2.4 m
Mineral 2.9 m
Waste 8.5 m
Bedrock O.5+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, silty, sandy, brown with flint pebbles, becoming mottled brown and grey with additional pebbles of chalk from 0.7 m	2.1	2.4
Glacial Sand and Gravel, upper	'Clayey' sandy gravel Gravel: fine and coarse, rounded chalk and angular flint with ironstone, well rounded flint and some rounded quartz Sand: medium with coarse and fine, quartz with some chalk, brown	2.9	5.3
Boulder Clay	Clay, silty, grey with pebbles of chalk and flint, becoming brown from 11.5 m	8.5	13.8
Upper Chalk	Chalk, soft with flints	0.5+	14.3

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 mm
15	63	22	2.4-3.5	16	9	28	9	27	11	0
			3.5-5.3	14	9	55	9	10	3	0
			Mean	15	9	45	9	16	6	0

COMPOSITION

Depth below surface (m)	percentages by weight in gravel fraction							
	Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
2.4-5.3	34	10	2	0	0	13	37	4

TL 73 NW 18 **7359 3644** **Cust Hall** **Block A**

Surface level +60.7 m (+199 ft)
Water struck at +59.6 m
152 mm, Shell and auger
October 1978

Waste 19.1+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, sandy, orange-brown with flint pebbles	0.7	1.0
	Sand and gravel, clayey, brown, pebbles of chalk and flint	0.7	1.7
	Clay, sandy, mottled red-brown and light grey with pebbles of flint and quartz, becoming grey with additional pebbles of chalk from 2.8 m	17.4+	19.1

TL 73 NW 19 **7455 3988** **Oaker Bridge** **Block A**

Surface level +61.4 m (+201 ft)
Water struck at +46.0 m
152 mm, Shell and auger
October 1978

Overburden 15.4 m
Mineral 8.9 m
Waste 2.1+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Boulder Clay	Clay, sandy, brown with chalk pebbles, becoming grey with additional pebbles of flint from 3.0	15.0	15.4
Glacial Sand and Gravel, upper	'Very clayey' pebbly sand Gravel: fine and coarse, rounded chalk and angular flint with some quartzite, quartz and angular ironstone Sand: fine and medium with coarse, quartz with chalk and flint, pale grey	8.9	24.3
Boulder Clay	Clay, sandy, grey with pebbles of chalk, limestone and flint	2.1+	26.4

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 mm
21	66	13	15.4-16.4	8	10	19	14	29	20	0
			16.4-17.4	13	15	25	11	20	16	0
			17.4-18.4	12	19	35	14	13	7	0
			18.4-19.4	30	51	17	2	0	0	0
			19.4-21.4	34	40	22	2	1	1	0
			21.4-24.3	19	34	39	6	1	1	0
			Mean	21	31	28	7	8	5	0

COMPOSITION

Depth below surface (m)	percentages by weight in gravel fraction							
	Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
15.4-24.3	34	trace	2	5	0	1	41	17

TL 73 NW 20 **7482 3912** **Man's Cross** **Block A**

Surface level +59.1 m (+194 ft)
Water Struck at +54.0 m
152 mm, Shell and auger
October 1978

Waste 7.5 m
Bedrock 0.8+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.9	0.9
Boulder Clay	Clay,sandy, silty, brown with pebbles of chalk and flint	0.6	1.5
Glacial Silt	Silt, sandy, brown, laminated, becoming grey from 4.0 m	3.6	5.1
Boulder Clay	Clay, sandy, grey with chalk pebbles	2.4	7.5
Upper Chalk	Chalk, soft	0.8+	8.3

TL 73 NW 21 **7435 3844** **Gunce's Farm** **Block A**

Surface level +63.4 m (+208 ft)
Water Struck at +56.7 m
152 mm, Shell and auger
October 1978

Waste 17.6 m
Bedrock 0.7+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Boulder Clay	Clay,silty, sandy, orange-brown with flint pebbles, becoming brown with additional pebbles of chalk from 1.3 m, passing to grey from 3.0 m	17.1	17.6
Upper Chalk	Chalk, soft	0.7+	18.3

TL 73 NW 22 **7460 3698** **Toppesfield Hall** **Block A**

Surface level +73.2 m (+240 ft)
Water not encountered
152 mm, Shell and auger
October 1978

Waste 19.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Boulder Clay	Clay, sandy, orange-brown with flint pebbles, becoming brown with additional pebbles of chalk from 0.7 m. Passing down into olive-grey from 3.8 m	18.6+	19.0

TL 73 NW 23 **7472 3588** **Lewsey's Farm** **Block A**

Surface level +56.6 m (+186 ft)
Water Struck at +48.8 m
152 mm, Shell and auger
October 1978

Overburden 8.6 m
Mineral 3.2 m
Waste 0.3 m
Bedrock 4.9+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Boulder Clay	Clay, silty, brown, becoming grey with pebbles of chalk and flint from 2.7 m	8.1	8.6
Glacial Sand and Gravel, upper	Pebbly sand Gravel: fine and coarse, angular flint and rounded chalk with rounded quartzite, some well rounded flint and rounded quartz Sand: medium with fine and coarse, quartz, grey	3.2	11.8
Boulder Clay	Silt, laminated, grey with flint pebbles	0.3	12.1
Upper Chalk	Chalk, soft	4.9+	17.0

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 mm
7	88	5	8.6-11.8	7	8	74	6	3	2	0

COMPOSITION

Depth below surface (m)	percentages by weight in gravel fraction							
	Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
8.6-11.8	32	8	5	17	0	0	26	12

TL 73 NE 21 **7535 3982** **Tilbury Hill** **Block A**

Surface level +60.4 m (+198 ft)
Water struck at +50.9 m
152 mm, Shell and auger
October 1978

Overburden 0.8 m
Mineral 1.0 m
Waste 6.7 m
Mineral 5.0 m
Waste 4.4 m
Bedrock 0.6+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, silty, sandy, pale-brown with pebbles of flint and chalk	0.5	0.8
Glacial Sand and Gravel, upper	**a** 'Clayey' gravel Gravel: fine and coarse, rounded chalk and angular flint with some rounded quartzite, quartz and phosphatic nodules Sand: medium with coarse and fine, quartz with chalk, orange-brown	1.0	1.8
Boulder Clay	Clay, brown with pebbles of chalk and flint, becoming grey from 3.5 m	6.7	8.5
Glacial Sand and Gravel, upper	**b** Clayey sandy gravel, with silt and clay seams from 10.5 m Gravel: fine and coarse, rounded chalk and angular flint with some rounded quartzite, quartz and sub-angular ironstone Sand: medium with coarse and fine, chalk with quartz, grey	5.0	13.5
Boulder Clay	Clay, sandy, silty, grey with pebbles of chalk and flint	4.4	17.9
Upper Chalk	Chalk, soft	0.6+	18.5

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 mm
a	17	41	42	0.8-1.8	17	5	26	10	24	18	0
b	17	53	30	8.5-9.5	7	4	17	19	32	21	0
				9.5-10.5	8	6	28	17	28	13	0
				10.5-11.5	17	20	30	14	13	6	0
				11.5-12.5	19	23	26	11	14	7	0
				12.5-13.5	33	27	14	9	8	9	0
				Mean	17	16	23	14	19	11	0
a + b	17	51	32	Mean	17	14	24	13	20	12	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	0.8-1.8	35	Trace	3	4	3	0	47	8
b	8.5-13.5	31	0	1	4	0	1	43	20

TL 73 NE 22 **7553 3842** **Great Yeldham Hall** **Block A**

Surface level +55.6 m (+182 ft)
Water struck at +50.4 m
152 mm, Shell and auger
September 1978

Overburden 5.3 m
Mineral 1.8 m
Waste 6.4 m
Mineral 4.4 m
Waste 1.1+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Boulder Clay	Clay, silty, sandy, brown with flint pebbles and chalk pebbles from 1.8 m, becoming grey from 3.5 m	4.7	5.3
Glacial Sand and Gravel, upper	**a** Sandy gravel Gravel: fine and coarse, angular flint with rounded chalk, quartzite, some rounded quartz and well rounded flint Sand: medium and coarse with fine, chalk and flint with quartz, olive-grey	1.8	7.1
Boulder Clay	Clay, silty, pale grey with pebbles of chalk and flint becoming grey from 8.1 m. Passing down into clay, sandy pale grey with pebbles of chalk and flint. Seam of chalk from 11.9 to 12.4	6.4	13.5
Glacial Sand and Gravel, upper	**b** Pebbly sand Gravel: fine and coarse, angular flint with rounded quartz, quartzite and well rounded flint Sand: medium with coarse and fine, quartz with some flint, pale brown	4.4	17.9
Boulder Clay	Clay, sandy, silty, olive-grey with pebbles of quartz and flint	1.1+	19.0

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 mm
a	7	48	45	5.3-7.1	7	9	24	15	27	18	0
b	4	76	20	13.5-15.0	7	9	69	9	4	2	0
				15.0-16.0	2	8	62	6	17	5	0
				16.0-17.0	3	8	48	13	18	10	0
				17.0-17.9	2	6	48	8	14	22	0
				Mean	4	8	59	9	12	8	0
a + b	5	68	27	Mean	5	8	49	11	16	11	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	5.3-7.1	67	4	5	6	0	0	14	4
b	13.5-17.9	65	8	17	8	0	0	0	2

TL 73 NE 23 **7528 3755** **Scotneys Farm** **Block A**

Surface level +63.5 m (+208 ft)
Water struck at +53.5 m
152 mm, Shell and auger
September 1978

Waste 19.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, silty, sandy, brown with flint pebbles, becoming mottled brown and grey with additional pebbles of chalk from 0.8 m. Passing down into clay, silty, grey with pebbles of chalk, flint, quartz and sandstone below 2.8 m	10.1	10.4
Glacial Sand and Gravel, upper	'Clayey' sandy gravel, with silt seams in the uppermost 0.5 m Gravel: fine and coarse with some cobbles, rounded chalk with angular flint, some rounded quartz, quartzite and well rounded flint Sand: medium and coarse with fine, quartz and flint with some chalk	1.6	12.0
Boulder Clay	Clay, silty, grey with pebbles of chalk and flint	7.0+	19.0

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 mm
11	45	44	10.4-11.4	14	13	20	19	29	5	0
			11.4-12.0	5	5	16	13	23	35	3
			Mean	11	10	18	17	27	16	1

COMPOSITION

Depth below surface (m)	percentages by weight in gravel fraction							
	Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
10.4-12.0	21	1	2	1	0	0	66	9

TL 73 NE 24 **7543 3687** **Redbeard's Wood** **Block A**

Surface level +51.5 (+169 ft)
Water struck at +50.2 m
152 mm, Shell and auger
October 1978

Waste 6.5 m
Bedrock 4.4+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Alluvium	Silt, clayey, brown with flint pebbles and seams of peat from 1.3 m	2.5	2.8
Boulder Clay	Clay, silty, grey with pebbles of chalk and flint	1.8	4.6
Glacial Sand and Gravel, upper	Gravel Gravel: fine and coarse, angular flint with rounded chalk, quartzite and quartz. Sand: medium and coarse with fine, chalk, flint and quartz.	1.4	6.0
Boulder Clay	Clay, olive-grey with pebbles of chalk, shale and fossil debris.	0.5	6.5
Upper Chalk	Chalk, soft	4.4+	10.9

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	$+1-4$	$+4-16$	$+16-64$	$+64$ mm
4	40	56	4.6-6.0	4	7	21	12	35	21	0

COMPOSITION

Depth below surface (m)	percentages by weight in gravel fraction							
	Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
4.6-6.0	57	0	6	6	0	0	21	10

TL 73 NE 25 **7616 3982** **Tilbury Court** **Block A**

Surface level +74.1 m (+243 ft)
Water not encountered
152 mm, Shell and auger
October 1978

Waste 20.3+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Boulder Clay	Clay, sandy, silty mottled brown and pale grey with pebbles of chalk and flint, becoming grey with additional pebbles of shale from 4.2 m	19.7+	20.3

TL 73 NE 26 **7650 3917** **Mill Cottage** **Block A**

Surface level +64.1 m (+210 ft)
Water struck at +57.7 m
152 mm, Shell and auger
September 1978

Waste 19.7 m
Bedrock 0.1+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Boulder Clay	Clay, silty, brown with pebbles of flint and quartz, becoming mottled brown and grey with additional pebbles of chalk from 1.8 m, passing to grey below 4.4 m	19.3	19.7
Thanet Beds	Sand: fine, grey-green	0.1+	19.8

TL 73 NE 27 **7681 3843** **Highland's Farm** **Block A**

Surface level +70.1 m (+230 ft)
Water struck at +61.1 m
152 mm, Shell and auger
September 1978

Waste 19.1+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.9	0.9
Boulder Clay	Clay, silty, mottled brown and grey with pebbles of flint and chalk, becoming grey from 2.6 m. Seam of chalk from 8.3 to 8.5 m	18.2+	19.1

TL 73 NE 28 **7650 3790** **Spaynes's Hall** **Block A**

Surface level +63.1 m
Water struck at +42.3 m
152 mm, Shell and auger
October 1978

Overburden 0.2 m
Mineral 1.8 m
Waste 18.8 m
Bedrock 0.2+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Glacial Sand and Glavel, upper	'Clayey' sandy gravel, with sandy clay seams Gravel: fine and coarse, rounded chalk with angular flint, some rounded quartz, quartzite and well-rounded flint Sand: medium with coarse and fine, predominantly chalk	1.8	2.0
Boulder Clay	Clay, brown with pebbles of chalk and flint, becoming grey from 7.0 m	18.8	20.8
Upper Chalk	Chalk, soft	0.2+	21.0

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 mm
19	42	39	0.2-1.2	20	6	24	13	29	8	0
			1.2-2.0	17	5	26	10	24	18	0
			Mean	19	6	25	11	27	12	0

COMPOSITION

Depth below surface (m)	percentages by weight in gravel fraction							
	Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
0.0-2.0	25	1	1	1	0	0	64	8

TL 73 NE 29 **7672 3692** **Pool Farm** **Block B**

Surface level +46.9 m (+154 ft)
Water struck at +42.7 m
152 mm, Shell and auger
September 1978

Overburden 4.2 m
Mineral 4.4 m
Waste 1.6 m
Mineral 8.3 m
Waste 0.8 m
Bedrock 0.8+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
First Terrace	Clay, silty, sandy, brown with some flint pebbles	4.0	4.2
	a 'Clayey' sandy gravel, with seams of peat. Gravel: fine with coarse, angular with well rounded flint, rounded quartz, some phospatic nodules, and angular ironstone Sand: medium with coarse and fine, quartz with some flint, grey	4.4	8.6
Glacial Silt	Peat, with gastropod shells, seeds, wood debris and some flint pebbles, becoming silt, peaty, black with some flint pebbles	1.6	10.2
Glacial Sand and Gravel, upper	**b** Gravel Gravel: fine and coarse, angular flint with rounded quartzite, chalk, some quartz and well rounded flint Sand: coarse and medium with fine, quartz flint and some chalk	8.3	18.5
Boulder Clay	Clay, silty, sandy, grey, becoming a chalky sand with flint cobbles from 19.0 m	0.8	19.3
Upper Chalk	Chalk, soft with angular flints	0.8+	20.1

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 mm
a	18	61	21	4.2-5.3	38	6	33	9	11	3	0
				5.3-6.5	7	6	40	19	22	6	0
				6.5-7.8	15	4	47	12	20	2	0
				7.8-8.6	12	7	52	10	12	7	0
				Mean	18	6	43	12	17	4	0
b	5	47	48	10.2-11.2	6	6	18	12	35	23	0
				11.2-12.2	9	9	24	15	27	16	0
				12.2-13.2	4	8	27	20	28	13	0
				13.2-14.2	3	7	39	14	25	12	0
				14.2-15.2	4	8	26	26	31	5	0
				15.2-16.2	5	3	15	28	41	8	0
				16.2-17.2	2	1	11	26	43	17	0
				17.2-18.5	5	2	12	24	39	17	1
				Mean	5	5	21	21	34	14	0
a + b	9	52	39	Mean	9	5	29	18	28	11	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	4.2-8.6	70	8	9	Trace	4	1	0	8
b	10.2-18.5	68	3	4	9	0	Trace	6	10

TL 73 NE 30 **7611 3645** **Redbeard's Wood** **Block B**

Surface level +66.0 m (+216 ft)
Water not encountered
152 mm, Shell and auger
October 1978

Overburden 9.5 m
Mineral 6.0 m
Bedrock 6.5+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Boulder Clay	Clay, mottled brown and grey with pebbles of flint and chalk	2.2	2.6
Glacial Sand and Gravel, upper	**a** 'Very clayey' gravel Gravel: coarse and fine, angular flint with rounded quartz, chalk, some phosphatic nodules, angular ironstone, rounded quartzite and well rounded flint Sand: medium with coarse and fine	0.8	3.4
Boulder Clay	Clay, grey with pebbles of chalk and flint	6.1	9.5
Barham Sands and Gravels	**b** 'Clayey' pebbly sand, with silt laminae Gravel: fine with coarse, angular with well rounded flint, rounded phosphatic nodules quartzite, quartz and angular ironstone Sand: medium, coarse and fine	6.0	15.5
Thanet Beds	Clay, very sandy, laminated, micaceous, brown, becoming dark green	3.6	19.1
Upper Chalk	Chalk, soft with flints	2.9+	22.0

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 mm
a	23	34	42	2.6-3.4	23	4	23	8	19	23	0
b	14	77	9	9.5-10.5	15	19	39	18	8	1	0
				10.5-11.5	11	20	43	19	6	1	0
				11.5-12.5	15	15	37	25	7	1	0
				12.5-13.5	16	19	32	21	11	1	0
				13.5-14.5	14	14	31	34	7	0	0
				14.5-15.5	13	19	26	31	11	0	0
				Mean	14	18	34	25	8	1	0
a + b	15	72	13	Mean	15	16	33	23	10	3	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	2.6-3.4	64	2	9	4	5	4	6	6
b	9.5-15.5	44	23	8	8	10	6	0	1

TL 73 NE 31 **7655 3597** **Grassall's Wood** **Block B**

Surface level +61.7 m (+202 ft)
Water not encountered
152 mm, Shell and auger
October 1978

Overburden 4.4 m
Mineral 11.7 m
Bedrock 4.2+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Head	Clay, sandy, orange-brown with some flint pebbles	1.4	1.7
Boulder Clay	Clay, brown with pebbles of chalk and flint	2.7	4.4
Barham Sands and Gravels	**a** 'Clayey' sand Gravel: fine with a trace of coarse, well rounded with angular flints, rounded phosphatic nodules and quartz Sand: fine and medium with coarse, subrounded quartz, orange	6.0	10.4
Red Crag	**b** 'Clayey' sand Gravel: fine with a trace of coarse, rounded quartz, well rounded with angular flint, angular ironstone, rounded phosphatic nodules and some quartzite Sand: medium with fine and coarse, quartz, red-brown	5.7	16.1
Thanet Beds	Silt, sandy, orange-brown becoming olive-black	2.2	18.3
Upper Chalk	Chalk, soft	2.0+	20.3

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 mm
a	19	80	1	4.4-5.4	9	27	45	15	3	1	0
				5.4-6.4	14	43	34	8	1	0	0
				6.4-7.4	20	53	20	5	1	1	0
				7.4-8.4	18	28	48	6	0	0	0
				8.4-9.4	26	46	24	3	1	0	0
				9.4-10.4	24	21	41	14	0	0	0
				Mean	19	37	35	8	1	0	0
b	13	85	2	10.4-11.4	10	18	61	7	3	1	0
				11.4-12.4	13	9	71	5	2	0	0
				12.4-13.4	15	12	61	7	5	0	0
				13.4-14.4	12	9	72	7	0	0	0
				14.4-16.1	13	20	61	6	0	0	0
				Mean	13	14	65	6	2	0	0
a + b	16	83	1	Mean	16	26	50	7	1	0	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	4.4-10.4	15	64	7	0	11	trace	trace	3
b	10.4-16.1	13	31	34	4	6	8	0	4

TL 73 NE 32 **7756 3788** **Wrenpark Wood** **Block B**

Surface level +72.9 m (+239 ft)
Water struck at +70.1 m
152 mm, Shell and auger
September 1978

Waste 19.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, silty, mottled brown and grey with pebbles of flint and chalk, becoming grey with additional pebbles of quartz, quartzite and shale from 3.6 m	8.9	9.2
Glacial Silt	Silt, clayey, sandy, laminated, pale grey	4.7	13.9
Boulder Clay	Clay, silty, grey with pebbles of chalk, flint and shale	5.1+	19.0

TL 73 NE 33 **7705 3724** **Butler's Farm** **Block B**

Surface level +63.0 m (+207 ft)
Water not encountered
152 mm, Shell and auger
September 1978

Overburden 9.6 m
Mineral 6.4 m
Bedrock 2.1+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Boulder Clay	Clay, silty, mottled brown and grey with pebbles of chalk and flint, becoming grey with additional pebbles of shale from 2.1 m	9.4	9.6
Barham Sands and Gravels	**a** 'Clayey' pebbly sand, with clay seams Gravel: fine with coarse, angular and well rounded flint with rounded quartz, quartzite, ironstone and some phosphatic nodules Sand: medium and coarse with fine, quartz with some flint, brown	1.0	10.6
Red Crag	**b** 'Clayey' sand, with clay seams and ironpan Gravel: fine with coarse, angular and well rounded flint with rounded quartz, quartzite phosphatic nodules and some angular ironstone Sand: medium with coarse and fine, quartz with some flint, orange-brown	5.4	16.0
Thanet Beds	Silt, clayey, sandy mottled brown and olive-green with flint cobbles at the base	1.0	17.0
Upper Chalk	Chalk, soft with some flint pebbles	1.1+	18.1

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines	Sand			Gravel		
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	$+1-4$	$+4-16$	$+16-64$	$+64$ mm
a	15	71	14	9.6-10.6	15	8	40	23	11	3	0
b	17	79	4	10.6-11.6	24	14	44	11	3	4	0
				11.6-12.6	14	16	51	15	4	0	0
				12.6-13.6	16	18	46	16	4	0	0
				13.6-14.6	15	9	58	18	0	0	0
				14.6-15.6	18	16	54	9	2	1	0
				15.6-16.0	18	11	53	15	2	1	0
				Mean	17	14	51	14	3	1	0
a + b	17	78	5	Mean	17	13	49	16	4	1	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	9.6-10.6	41	26	19	7	2	5	0	0
b	10.6-16.0	42	26	11	9	7	1	0	3

TL 73 NE 34 **7786 3729** **Kirby Hall** **Block B**

Surface level +67.0 m (+220 ft)
Water not encountered
152 mm, Shell and auger
September 1978

Overburden 11.5 m
Mineral 4.3 m
Bedrock 3.8+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Head Gravel	Clay, sandy, silty, brown with flint pebbles	0.9	1.2
Boulder Clay	Clay, silty, mottled brown and grey with pebbles of chalk and flint, becoming grey with additional pebbles of quartz and shale	10.3	11.5
Barham Sands and Gravels	**a** 'Clayey' pebbly sand Gravel: fine, angular ironstone, flint and rounded quartz with quartzite and some well rounded flint Sand: medium and fine with coarse, quartz	1.0	12.5
Red Crag	**b** 'Clayey' sand Gravel: fine, angular ironstone and flint with rounded phosphatic nodules, well rounded flint, rounded quartz and some quartzite Sand: medium with fine and coarse, quartz with some ironstone	3.3	15.8
Woolwich and Reading Beds	Silt, clayey, mottled yellow, orange and brown, micaceous	3.5	19.3
Thanet Beds	Sand, fine, very silty, olive-green, micaceous	0.3+	19.6

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 mm
a	13	79	8	11.5-12.5	13	28	35	16	8	0	0
b	11	86	3	12.5-13.5	10	16	55	14	5	0	0
				13.5-14.5	12	16	61	8	3	0	0
				14.5-15.5	11	9	63	14	3	0	0
				15.5-15.8	14	16	60	10	0	0	0
				Mean	11	14	60	12	3	0	0
a + b	12	84	4	Mean	12	17	54	13	4	0	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	11.5-12.5	26	2	24	7	0	38	0	3
b	12.5-15.8	27	9	6	4	12	40	0	2

TL 73 NE 35 **7757 3618** **Castle Hedingam** **Block B**

Surface level +44.9 m (+147 ft)
Water struck at +43.6 m
152 mm, Shell and auger
September 1978

Waste 19.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Alluvium	Silt, clayey, olive-grey, becoming a silty peat with gastropod shells, wood debris and rootlets from 2.0 m. Passing down into silt, clayey, grey with shells from 15.0 m	17.5	17.8
Boulder Clay	Clay, silty, grey with pebbles of chalk and flint	1.2+	19.0

TL 73 NE 36 **7707 3539** **Rookwood's Rough** **Block B**

Surface level +71.9 m (+236 ft)
Water struck at +55.1 m
152 mm, Shell and auger
September 1978.

Overburden 2.2 m
Mineral 15.5 m
Bedrock 1.6+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, sandy, brown with pebbles of flint and chalk	1.9	2.2
Barham Sands and Gravels	**a** 'Clayey' pebbly sand, with clay seams Gravel: coarse and fine, angular flint with rounded quartz, quartzite, phosphatic nodules and some well-rounded flint Sand: medium with fine and coarse, red-brown	0.5	2.7
Kesgrave Sands and Gravels	**b** Sand Gravel: trace of fine angular flint Sand: medium with fine and some coarse, quartz yellow-orange.	5.0	7.7
Red Crag	**c** Pebbly sand Gravel: fine with coarse, angular with well rounded flint, rounded phosphatic nodules quartzite, quartz and angular ironstone Sand: medium and fine with coarse, quartz, orange-brown	10.0	17.7
Woolwich and Reading Beds	Clay, mottled purple and grey with race nodules	1.6+	19.3

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 mm
a	14	65	21	2.2-2.7	14	12	46	7	7	14	0
b	6	94	0	2.7-3.7	5	14	80	1	0	0	0
				3.7-4.7	8	18	73	1	0	0	0
				4.7-5.7	4	21	70	5	0	0	0
				5.7-6.7	7	27	64	2	0	0	0
				6.7-7.7	8	16	71	4	1	0	0
				Mean	6	19	72	3	0	0	0
c	7	78	5	7.7-8.7	9	25	55	9	2	0	0
				8.7-9.7	6	27	53	10	3	1	0
				9.7-10.7	7	36	43	12	2	0	0
				10.7-11.7	14	24	48	6	6	2	0
				11.7-12.7	9	21	60	7	2	1	0
				12.7-13.7	9	18	57	12	4	0	0
				13.7-14.7	8	23	41	25	3	0	0
				14.7-15.7	7	27	57	9	0	0	0
				15.7-16.7	9	21	45	22	3	0	0
				16.7-17.7	4	9	45	28	11	3	0
				Mean	7	24	50	14	4	1	0
a + b +c	8	88	4	Mean	8	21	57	10	3	1	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	2.2-2.7	57	2	19	7	7	0	0	8
c	7.7-17.7	43	14	6	11	15	7	0	4

TL 73 NE 37 **7854 3816** **Priestfields Farm** **Block B**

Surface level +64.7 m (+212 ft)
Water struck at +58.1 m
152 mm, Shell and auger
September 1978

Waste 19.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Boulder Clay	Clay, silty, mottled brown and grey with pebbles of flint and chalk, becoming grey from 2.8 m. Seam of chalk from 9.6 to 9.8 m. Passing down into clay sandy, brown with flint pebbles from 18.7 m	18.8+	19.0

TL 73 NE 38 **7853 3673** **Rushley Green** **Block B**

Surface level +74.9 m (+246 ft)
Water not encountered
152 mm, Shell and auger
October 1978

Overburden 13.5 m
Mineral 11.8+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, sandy, brown with flint pebbles, becoming grey with additional pebbles of chalk from 5.0 m	8.0	8.3
	Clay, very, sandy, orange-brown with pebbles of chalk and flint	5.2	13.5
Barham Sands and Gravels	**a** Very 'clayey' sand, with gravel in the uppermost 1 m Gravel: fine with a trace of coarse, angular flint and rounded quartz with some quartzite and well-rounded flint Sand: medium and fine with some coarse, quartz, orange-brown	3.0	16.5
Kesgrave Sands and Gravels	**b** 'Clayey'sand: medium with fine and some coarse, quartz, yellow	4.0	20.5
Red Crag	**c** 'Clayey' sand Gravel: fine and coarse, angular flint with rounded quartz, phosphatic nodules, quartzite, well rounded flint and angular ironstone Sand: fine and medium with coarse, quartz, orange	4.8+	25.3

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 mm
a	23	75	2	13.5-14.5	25	38	30	2	4	1	0
				14.5-15.5	21	32	45	2	0	0	0
				15.5-16.5	23	26	45	6	0	0	0
				Mean	23	32	40	3	2	0	0
b	13	87	0	16.5-17.5	17	36	45	2	0	0	0
				17.5-18.5	12	47	38	3	0	0	0
				18.5-19.5	11	44	44	1	0	0	0
				19.5-20.5	10	38	51	1	0	0	0
				Mean	13	41	44	2	0	0	0
c	11	87	2	20.5-21.5	13	25	51	9	2	0	0
				21.5-22.5	10	34	39	8	6	3	0
				22.5-23.5	10	47	34	7	2	0	0
				23.5-25.3	10	82	7	1	0	0	0
				Mean	11	47	33	6	2	1	0
a+b+c	14	85	1	Mean	14	44	37	4	1	0	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	13.5-16.5	55	1	34	5	0	0	0	5
c	20.5-25.3	46	7	16	8	16	5	0	2

TL 73 NE 39 **7952 3780** **Park Farm** **Block B**

Surface level +69.4 m(+228 ft)
Water not encountered
152 mm, Shell and auger
September 1978.

Waste 20.5 m
Bedrock 1.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Boulder Clay	Clay, silty, mottled grey and brown with pebbles of chalk and flint, becoming grey from 6.0 m. Seam of chalk from 8.0 to 8.1 m	16.8	17.0
Barham Sands and Gravels	'Clayey' pebbly sand Gravel: fine with coarse and cobbles, angular flint and rounded quartz with quartzite, some well-rounded flint and rounded phosphatic nodules. Sand: medium and fine with coarse, quartz with some flint, orange-brown.	3.5	20.5
Thanet Beds	'Clayey' sand, with clayey and silty seams Sand: predominantly fine, quartz, mottled olive-green and orange-brown.	1.0+	21.5

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 mm
12	79	9	17.0-18.0	14	24	41	17	4	0	0
			18.0-19.0	9	23	53	11	4	0	0
			19.0-20.5	14	17	39	14	9	4	3
			Mean	12	21	44	14	6	2	1

COMPOSITION

Depth below surface (m)	percentages by weight in gravel fraction							
	Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
17.0-20.5	43	4	32	11	2	trace	0	8

TL 73 NE 40 **7954 3660** **Great Lodge Farm** **Block B**

Surface level +77.4 m(+254 ft)
Water struck at +65.4 m
152 mm, Shell and auger
October 1978

Overburden 12.0 m
Mineral 2.8 m
Bedrock 3.6+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.8	0.8
Boulder Clay	Clay, sandy, mottled brown and grey with pebbles of chalk and flint, becoming olive-grey from 9.3 m	11.2	12.0
Barham Sands and Gravels	Very 'clayey' sand Gravel: fine, angular flint with rounded quartz, quartzite, well rounded flint and some phosphatic nodules Sand: medium and fine with coarse, brown	2.8	14.8
London Clay	Clay, olive-grey, top weathered to brown	3.6+	18.4

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 mm
22	77	1	12.0-13.0	23	27	41	7	2	0	0
			13.0-14.8	21	27	45	7	0	0	0
			Mean	22	27	43	7	1	0	0

COMPOSITION

Depth below surface (m)	percentages by weight in gravel fraction							
	Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
12.0-14.8	47	7	23	17	2	0	trace	4

TL 73 NE 41 **7906 3563** **Hedingham Castle** **Block B**

Surface level +78.3 m (+257 ft)
Water struck at +65.8 m
152 mm, Shell and auger
October 1978

Overburden 8.2 m
Mineral 8.2 m
Bedrock 1.2+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.8	0.8
Boulder Clay	Clay, silty, sandy, brown with pebbles of chalk and flint	2.6	3.4
	Chalk, soft	1.2	4.6
	Clay, sandy, olive-brown with pebbles of chalk and flint	3.6	8.2
Kesgrave Sands and Gravels	**a** Sand, with clay laminae Sand: medium with fine and some coarse, quartz, yellow	4.3	12.5
Red Crag	**b** Sand, with clay laminae Gravel: fine, angular with well rounded flint, rounded quartz, some phosphatic nodules, quartzite and angular ironstone Sand: medium and fine with some coarse, quartz, brown	3.9	16.4
London Clay	Clay, silty, olive-grey, top weathered to brown	1.2+	17.6

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 mm
a	6	94	0	8.2-9.5	8	11	79	2	0	0	0
				9.5-10.5	4	11	84	1	0	0	0
				10.5-11.5	6	61	32	1	0	0	0
				11.5-12.5	7	21	67	5	0	0	0
				Mean	6	25	67	2	0	0	0
b	9	90	1	12.5-13.5	7	33	53	6	1	0	0
				13.5-14.5	6	37	48	8	1	0	0
				14.5-15.5	15	29	51	4	1	0	0
				15.5-16.4	6	45	44	4	1	0	0
				Mean	9	36	49	5	1	0	0
a + b	8	92	0	Mean	8	30	58	4	0	0	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
b	12.5-16.5	39	17	18	4	6	2	0	14

TL 73 NE 42 **7991 3546** **Little Lodge Farm** **Block B**

Surface level +70.3 m (+321 ft)
Water struck at +64.0 m
152 mm, Shell and auger
September 1978

Overburden 3.4 m
Mineral 4.3 m
Waste 2.6 m
Mineral 1.1 m
Bedrock 4.7+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, sandy, brown with chalk and flint pebbles	3.1	3.4
Glacial Sand and Gravel, upper	**a** 'Clayey' sandy gravel Gravel: fine and coarse, angular flint and rounded chalk with quartzite, quartz and some well rounded flint Sand: medium and coarse with fine, flint, quartz and chalk, brown	4.3	7.7
Boulder Clay	Chalk, soft	0.4	8.1
	Clay, silty, grey with pebbles of chalk and flint	2.2	10.3
Barham Sands and Gravels	**b** 'Clayey' sandy gravel, with clay laminae Gravel: fine and coarse, angular flint with rounded chalk, quartzite, quartz and some well rounded flint Sand: medium with coarse and fine, predominantly quartz, orange-brown	1.1	11.4
London Clay	Clay, silty, olive-brown, becoming sand, dark grey from 15.4 m	4.7+	16.1

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 mm
a	17	48	35	3.4-4.4	22	5	22	15	29	7	0
				4.4-5.4	21	7	32	14	24	2	0
				5.4-6.3	18	12	27	14	18	11	0
				6.3-7.7	11	5	25	15	25	19	0
				Mean	17	7	26	15	24	11	0
b	13	53	34	10.3-11.4	13	4	37	12	23	11	0
a + b	16	49	35	Mean	16	6	29	14	24	11	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	3.4-7.7	50	2	5	9	0	0	31	4
b	10.3-11.4	63	2	9	7	0	0	10	9

TL 73 SW 12 **7038 3441** **Coleman's Farm** **Block A**

Surface level +87.4 m (+287 ft)
Water struck at +69.4 m
152 mm, Shell and auger
October 1978

Waste 18.6 +m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, sandy, brown, becoming clay, grey with pebbles of chalk, flint and shale from 1.3 m	18.3+	18.6

TL 73 SW 13 **7040 3205** **Tilekiln** **Block D**

Surface level +82.5 m (+271 ft)
Water struck at +71.1 m
152 mm, Shell and auger
September 1978

Overburden 1.9 m
Mineral 13.3 m
Bedrock 0.8+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Boulder Clay	Clay, brown with pebbles of chalk and flint	1.8	1.9
Kesgrave Sands and Gravels	**a** Sand, with gravel in the lower 1 m Gravel: fine with a trace of coarse, angular ironstone with some flint, rounded quartz, well-rounded flint and rounded quartzite Sand: medium and fine with some coarse, quartz orange	9.5	11.4
Red Crag	**b** Sand Gravel: fine with coarse, angular ironstone and flint with well rounded flint, rounded quartz, phosphatic nodules and quartzite Sand: medium with fine and coarse, quartz	3.8	15.2
London Clay	Clay, silty, olive-grey, top weathered to brown	0.8+	16.0

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 mm
a	5	94	1	1.9-3.8	4	4	90	2	0	0	0
				3.8-5.5	4	7	88	1	0	0	0
				5.5-7.5	4	47	48	1	0	0	0
				7.5-9.8	4	43	53	0	0	0	0
				9.8-11.4	9	28	54	3	3	3	0
				Mean	5	27	66	1	1	0	0
b	4	92	4	11.4-13.0	4	19	68	8	1	0	0
				13.0-14.4	3	16	62	13	4	2	0
				14.4-15.2	4	14	51	24	5	2	0
				Mean	4	17	62	13	3	1	0
a + b	4	94	2	Mean	4	24	65	5	1	1	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	1.9–11.4	7	2	6	1	0	84	0	trace
b	11.4–15.2	25	9	8	5	7	45	0	1

TL 73 SW 14 **7069 3103** **Wethersfield** **Block D**

Surface level +72.8 m (+239 ft)
Water struck at +66.5 m
152 mm, Shell and auger
October 1978

Overburden 1.7 m
Mineral 10.2 m
Bedrock 1.1+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Head Gravel	Clay, brown with pebbles of chalk and flint	1.3	1.7
	a 'Clayey', sandy gravel Gravel: fine and coarse, rounded chalk and angular with well rounded flint, rounded quartzite, some quartz and angular ironstone. Sand: medium with fine and coarse, chalk, quartz and flint.	0.6	2.3
Barham Sand and Gravels	**b** Sand: medium and fine with some coarse, quartz, orange	2.0	4.3
Kesgrave Sands and Gravels	**c** Sand Gravel: fine with a trace of coarse, angular flint with rounded quartz, well rounded flint, rounded quartzite and angular ironstone Sand: fine and medium with coarse, quartz, orange		
Red Crag	**d** Pebbly sand Gravel: fine and coarse, angular flint and rounded phosphatic nodules with well rounded flint, rounded quartzite, some quartz and angular ironstone Sand: fine and medium with coarse, quartz, orange-brown	3.6	11.9
London Clay	Clay, silty, grey, top weathered to brown	1.1+	13.0

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 mm
a	18	52	30	1.7-2.3	18	9	36	7	17	13	0
b	6	94	0	2.3-3.3	7	31	61	1	0	0	0
				3.3-4.3	6	33	60	1	0	0	0
				Mean	6	33	60	1	0	0	0
c	6	92	2	4.3-6.3	8	44	44	2	1	1	0
				6.3-8.3	4	52	32	10	2	0	0
				Mean	6	48	38	6	2	0	0
d	6	80	15	8.3-9.3	5	34	37	18	4	2	0
				9.3-10.3	8	33	29	18	10	2	0
				10.3-11.9	5	33	28	11	10	13	0
				Mean	6	33	31	15	8	7	0
a+b+c +d	7	85	8	Mean	7	37	40	8	5	3	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	1.7-2.3	31	8	3	6	0	1	47	4
c	4.3-8.3	33	15	20	12	0	10	0	10
d	8.3-11.9	35	21	4	10	26	3	0	1

TL 73 SW 15 **7060 3006** **Ashwell Hall** **Block D**

Surface level +73.2 m (+240 ft)
Water struck at +64.6 m
152 mm, Shell and auger
November 1978

Overburden 1.4 m
MIneral 15.0 m
Bedrock 0.6+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, sandy, silty, brown with pebbles of flint and chalk	1.1	1.4
Barham Sands and Gravels	**a** 'Clayey' pebbly sand Gravel: fine and coarse, angular flint with rounded chalk, quartz, well rounded flint and rounded quartzite Sand: medium with fine and coarse, quartz, orange-brown	3.2	4.6
Kesgrave Sands and Gravels	**b** Sand Gravel: fine with coarse, angular ironstone with angular flint, some well rounded flints, rounded quartz and phosphatic nodules Sands: fine and medium with some coarse, quartz, yellow-grey	6.0	10.6
Red Crag	**c** Sand, with shell debris from 16.1 m Gravel: fine with a trace of coarse, angular flint with rounded quartz, well rounded flint, rounded phosphatic nodules and some quartzite Sand: medium and fine with coarse, quartz, orange-brown, becoming grey-green from 16.1 m	5.8	16.4
London Clay	Clay, silty, olive-grey	0.6+	17.0

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 mm
a	12	77	11	1.4-2.2	15	7	52	7	11	8	0
				2.2-3.0	7	7	84	1	1	0	0
				3.0-3.8	18	10	40	6	14	12	0
				3.8-4.6	6	8	85	1	0	0	0
				Mean	12	8	65	4	6	5	0
b	5	92	3	4.6-6.6	7	78	14	1	0	0	0
				6.6-8.6	3	51	39	3	3	1	0
				8.6-10.6	5	44	39	6	4	2	0
				Mean	5	57	31	4	2	1	0
c	5	93	2	10.6-12.6	3	39	55	3	0	0	0
				12.6-14.6	5	34	50	9	2	0	0
				14.6-16.1	8	22	51	14	3	2	0
				16.1-16.4	5	13	62	16	2	2	0
				Mean	5	32	53	8	2	0	0
a+b+c	7	88	5	Mean	7	37	46	5	3	2	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	1.4-4.6	50	8	10	7	0	0	18	7
b	4.6-10.6	9	1	1	trace	1	88	0	0
c	16.1-16.4	49	10	14	1	8	0	0	18

TL 73 SW 16 **7200 3340** **Park Wood** **Block D**

Surface level +95.2 m (+312 ft)
Water Struck at +87.7 m
152 mm, Shell and auger
October 1978.

Waste 18.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, silty, sandy, brown with chalk pebbles, becoming clay, grey with pebbles of chalk flint and shale from 3.2 m	17.7+	18.0

TL 73 SW 17 **7132 3262** **Cotton's Farm** **Block D**

Surface level +95.2 m (+312 ft)
Water not encountered
152 mm, Shell and auger
October 1978.

Waste 18.2+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, brown with pebbles of chalk and shale, becoming grey with additional pebbles of flint from 3.5 m	17.9+	18.2

TL 73 SW 18 **7117 3145** **Wethersfield** **Block D**

Surface level +79.2 m (+260 ft)
Water struck at +66.2 m
152 mm, Shell and auger
November 1978

Overburden 0.6 m
Mineral 18.0 m
Bedrock 0.5+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.3	0.3
Boulder Clay	Clay, sandy, silty, brown with chalk pebbles	0.3	0.6
Kesgrave Sands and Gravels	**a** 'Clayey' sand, with clay seams from 8.0 to 10.0 m Sand: medium and fine with some coarse, quartz, yellow-orange	10.4	11.0
Red Crag	**b** Sand Gravel: fine with coarse, angular flint with rounded phosphatic nodules, quartz, well rounded flint, rounded quartzite and some angular ironstone. Sand: medium and fine with coarse, quartz, brown	7.6	18.6
London Clay	Clay, silty, olive-grey, top weathered to brown	0.5+	19.1

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 mm
a	12	88	0	0.6-2.6	7	19	74	0	0	0	0
				2.6-4.6	6	27	67	0	0	0	0
				4.6-7.0	5	15	79	1	0	0	0
				7.0-9.0	19	79	2	0	0	0	0
				9.0-11.0	24	61	14	1	0	0	0
				Mean	12	39	48	1	0	0	0
b	8	88	4	11.0-13.0	12	34	48	6	0	0	0
				13.0-15.0	9	44	36	8	3	0	0
				15.0-17.0	6	27	41	19	5	2	0
				17.0-18.6	5	28	55	8	4	0	0
				Mean	8	34	44	10	3	1	0
a + b	10	89	1	Mean	10	37	47	5	1	0	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
b	11.0-18.6	42	7	19	5	24	1	0	2

TL 73 SW 19 **7198 3025** **Sand Hill** **Block D**

Surface level +69.8 m (+229 ft)
Water struck at +61.6 m
152 mm, Shell and auger
November 1978

Overburden 0.4 m
Mineral 11.3 m
Bedrock 1.5+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Kesgrave Sands and Gravels	Sand Gravel: coarse and fine, angular flint with rounded phosphatic nodules, well rounded flint, rounded quartz quartzite and angular ironstone. Sand: fine and medium with some coarse, quartz, yellow-orange	11.3	11.7
London Clay	Clay, olive-grey, top weathered to brown-grey	1.5+	13.2

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 mm
5	92	3	0.4-2.4	8	68	23	0	0	1	0
			2.4-4.4	4	49	47	0	0	0	0
			4.4-6.4	7	25	58	8	2	0	0
			6.4-8.4	7	81	12	0	0	0	0
			8.4-10.4	4	87	9	0	0	0	0
			10.4-11.7	3	52	24	4	5	12	0
			Mean	5	61	29	2	1	2	0

COMPOSITION

Depth below surface (m)	percentages by weight in gravel fraction							
	Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
0.4-11.7	41	14	12	6	19	5	0	3

TL 73 SW 20 **7247 3248** **Fairy Farm** **Block D**
Surface level +89.9 m (+295 ft) Overburden 11.6 m
Water struck at +67.5 m Mineral 13.8+ m
152 mm, Shell and auger
October 1978

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, sandy, brown, becoming grey with pebbles of chalk and flint from 4.1 m	11.3	11.6
Kesgrave Sands and Gravels	**a** 'Clayey' sand, with silt seams Sand: medium with fine and some coarse, quartz, yellow-orange	7.9	19.5
Red Crag	**b** Sand, with silt seams Gravel: fine, angular flint with rounded quartz, quartzite and well rounded flint. Sand: medium with fine and coarse, quartz, brown	5.9+	25.4

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 mm
a	10	90	0	11.6-13.5	8	9	82	1	0	0	0
				13.5-15.5	4	6	89	1	0	0	0
				15.5-17.5	6	12	81	1	0	0	0
				17.5-19.5	20	21	57	2	0	0	0
				Mean	10	12	77	1	0	0	0
b	9	90	1	19.5-21.5	10	15	68	6	1	0	0
				21.5-23.5	5	10	71	12	2	0	0
				23.5-25.4	11	10	63	16	0	0	0
				Mean	9	11	67	12	1	0	0
a + b	9	91	0	Mean	9	12	73	6	0	0	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
b	19.5-25.4	42	6	24	10	0	0	0	18

TL 73 SW 21 **7222 3151** **Pouches Hall** **Block D**

Surface level +88.4 m (+290 ft)
Water struck at +68.6 m
152 mm, Shell and auger
October 1978

Overburden 8.5 m
Mineral 17.3+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.5	0.5
Boulder Clay	Clay, sandy, silty with pebbles of chalk and flint, becoming grey from 3.7 m	8.0	8.5
Kesgrave Sands and Gravels	**a** Sand: medium and fine with some coarse, quartz yellow-orange	11.3	19.8
Red Crag	**b** Sand, with clay seams Gravel: fine with a trace of coarse, angular ironstone and flint with rounded quartz, well rounded flint and phosphatic nodules Sand: fine and medium with coarse, quartz, iron-stained	6.0+	25.8

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 mm
a	9	91	0	8.5-9.5	9	16	75	0	0	0	0
				9.5-11.8	17	26	57	0	0	0	0
				11.8-13.8	6	21	73	0	0	0	0
				13.8-15.8	9	72	19	0	0	0	0
				15.8-17.8	11	39	47	3	0	0	0
				17.8-19.8	2	22	74	2	0	0	0
				Mean	9	34	56	1	0	0	0
b	7	89	4	19.8-21.8	9	27	53	6	6	0	0
				21.8-23.8	6	40	31	17	3	3	0
				23.8-25.8	6	50	28	16	0	0	0
				Mean	7	39	37	13	3	1	0
a + b	9	90	1	Mean	9	36	49	5	1	0	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
b	19.8-25.8	30	10	14	0	6	34	0	6

TL 73 SW 22 **7333 3344** **Hawke's Hall** **Block D**

Surface level +96.6 m (+317 ft)
Water not encountered
152 mm, Shell and auger
October 1978

Waste 19.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, silty, brwon with chalk pebbles, becoming grey with additional pebbles of flint from 3.5 m	18.7+	19.0

TL 73 SW 23 **7392 3250** **New Barns** **Block D**

Surface level +88.0 m (+289 ft)
Water struck at +65.7 m
152 mm, Shell and auger
October 1978

Overburden 12.0 m
Mineral 14.6+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, sandy, silty, with chalk pebbles from 2.8 m, becoming grey with additional pebbles of flint below 3.6 m	11.7	12.0
Barham Sands and Gravels	**a** 'Clayey' pebbly sand Gravel: coarse and fine, angular flint with rounded quartz, quartzite, well rounded flint and some phosphatic nodules Sand: medium and fine with coarse, quartz with flint, yellow	1.9	13.9
Kesgrave Sands and Gravels	**b** Sand: medium and fine with some coarse, quartz, yellow	9.0	22.9
Red Crag	**c** Sand: medium and fine with coarse, quartz, orange-brown	3.7+	26.6

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 mm
a	16	66	18	12.0-12-6	34	4	19	7	16	20	0
				12.6-12.9	5	5	85	2	3	0	0
				12.9-13.9	10	27	47	4	7	5	0
				Mean	16	17	44	5	9	9	0
b	9	91	0	13.9-14.9	7	31	61	1	0	0	0
				14.9-15.9	8	11	80	1	0	0	0
				15.9-16.9	17	15	67	1	0	0	0
				16.9-17.9	7	14	78	1	0	0	0
				17.9-18.9	9	21	68	2	0	0	0
				18.9-19.9	8	22	70	0	0	0	0
				19.9-20.9	15	37	48	0	0	0	0
				20.9-21.9	2	25	73	0	0	0	0
				21.9-22.9	5	63	32	0	0	0	0
				Mean	9	26	64	1	0	0	0
c	5	95	0	22.9-23.9	4	46	46	4	0	0	0
				23.9-26.6	6	35	37	22	0	0	0
				Mean	5	38	40	17	0	0	0
a+b+c	9	89	2	Mean	9	28	56	5	1	1	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	12.0-13.9	47	7	23	17	2	0	0	4

TL 73 SW 24 **7350 3185** **Brickkiln Green** **Block D**

Surface level +84.0 m (+276 ft)
Water struck at +67.7 m
152 mm, Shell anbd auger
November 1978

Overburden 4.7 m
MIneral 20.3+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Boulder Clay	Clay, brown, with flint pebbles and additional pebbles of chalk from 2.0 m, becoming grey from 3.3 m	4.5	4.7
Barham Sands and Gravels	**a** Very 'clayey' sand, with clay seams Sand: medium with fine and some coarse,quartz, orange-brown	2.0	6.7
Kesgrave Sands and Gravels	**b** Sand, with clayey seams Sand: fine and medium with some coarse, quartz, yellow-orange	11.0	17.7
Red Crag	**c** Sand Gravel: fine with a trace of coarse, angular flint with rounded quartz, quartzite, phosphatic nodules, well rounded flint and some angular ironstone Sand: fine and medium with coarse, quartz with flint, iron-stained	7.3+	25.0

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 mm
a	20	80	0	4.7-5.7	19	6	74	1	0	0	0
				5.7-6.7	20	18	61	1	0	0	0
				Mean	20	12	67	1	0	0	0
b	6	94	0	6.7-7.7	9	49	41	1	0	0	0
				7.7-9.7	6	16	77	1	0	0	0
				9.7-11.7	6	49	45	0	0	0	0
				11.7-13.7	6	50	43	1	0	0	0
				13.7-15.7	6	71	22	1	0	0	0
				15.7-17.7	7	84	8	1	0	0	0
				Mean	6	54	39	1	0	0	0
c	6	92	2	17.7-18.7	4	24	58	7	6	1	0
				18.7-19.7	3	11	75	8	3	0	0
				19.7-20.7	5	35	53	7	0	0	0
				20.7-21.7	9	72	15	3	1	0	0
				21.7-22.7	3	70	26	1	0	0	0
				22.7-23.7	8	62	28	2	0	0	0
				23.7-25.0	6	45	42	6	1	0	0
				Mean	6	45	42	5	2	0	0
a+b+c	7	92	1	Mean	7	47	43	2	1	0	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
c	17.7-25.0	41	8	25	13	8	2	0	3

TL 73 SW 25 **7395 3118** **Lealands** **Block C**

Surface level +79.5 m (+261 ft)
Water struck at +68.3 m
152 mm, Shell and auger
November 1978

Overburden 0.6 m
Mineral 21.5 m
Bedrock 1.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Boulder Clay	Clay, sandy, mottled brown and red-brown with pebbles of flint and quartz	0.5	0.6
Barham Sands and Gravels	**a** Gravel Gravel: fine and coarse, angular flint with rounded quartz, well rounded flint and rounded quartzite Sand: medium with fine and coarse, quartz mottled grey and red-brown	1.9	2.5
Kesgrave Sands and Gravels	**b** Sandy, gravel Gravel: fine and coarse, rounded quartz with well-rounded flint, rounded quartzite and some angular flint Sand: medium with coarse and fine, quartz, yellow-orange	0.7	3.2
	c Sand, with some clay seams Sand: medium and fine with some coarse, quartz, yellow	12.0	15.2
Red Crag	**d** Pebbly sand Gravel: coarse and fine, angular ironstone with well rounded and angular flint, rounded phosphatic nodules and some rounded quartz Sand: fine and medium with coarse, quartz iron-stained	6.9	22.1
London Clay	Clay, olive-grey	1.0+	23.1

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 mm
a	9	45	46	0.6-1.5	12	6	34	6	21	21	0
				1.5-2.5	8	10	26	8	26	22	0
				Mean	9	8	30	7	24	22	0
b	4	49	47	2.5-3.2	4	9	28	12	33	14	0
c	7	93	0	3.2-5.2	5	18	77	0	0	0	0
				5.2-7.2	5	32	63	0	0	0	0
				7.2-9.2	4	22	73	1	0	0	0
				9.2-11.2	13	15	72	0	0	0	0
				11.2-13.2	8	54	36	2	0	0	0
				13.2-15.2	7	50	41	2	0	0	0
				Mean	7	32	60	1	0	0	0
d	5	88	7	15.2-17.2	7	4	37	12	0	0	0
				17.2-19.2	6	52	27	6	5	4	0
				19.2-22.1	3	60	22	4	2	9	0
				Mean	5	53	28	7	2	5	0
a+b+c +d	6	86	8	Mean	6	36	46	4	4	4	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	0.6-2.5	38	19	24	10	0	0	trace	9
b	2.5-3.2	4	25	37	16	0	0	0	18
d	15.2-22.1	9	18	1	trace	9	62	0	1

TL 73 SW 26 **7320 3038** **Hyde Farm** **Block D**

Surface level +86.9 m (+285 ft)
Water struck at +73.6 m
152 mm, Shell and auger
November 1978

Overburden 6.7 m
Mineral 18.3+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Boulder Clay	Clay, brown with pebbles of chalk and flint from 1.4 m, becoming grey from 3.7 m	6.6	6.7
Barham Sands and Gravels	**a** 'Clayey' sandy gravel, with clayey seams Gravel: coarse and fine with some cobbles, angular flint and rounded quartz with well rounded flint, rounded quartzite and some phosphatic nodules Sand: medium with coarse and fine, quartz with flint, orange-brown	2.5	9.2
Kesgrave Sands and Gravels	**b** Sand, with some quartzite and flint gravel Sand: medium and fine with some coarse, quartz, yellow-orange	10.0	19.2
Red Crag	**c** Sand, with a trace of flint, quartzite and ironstone gravels Sand: medium and fine with some coarse, quartz, iron-stained.	5.8+	25.0

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 mm
a	10	59	31	6.7-7.2	20	6	58	7	7	2	0
				7.2-8.2	8	9	51	8	11	13	0
				8.2-9.2	6	9	27	10	21	25	2
				Mean	10	8	42	9	14	16	1
b	5	94	1	9.2-10.2	7	55	33	2	2	1	0
				10.2-11.2	5	32	62	1	0	0	0
				11.2-12.2	3	39	57	1	0	0	0
				12.2-13.2	6	62	32	0	0	0	0
				13.2-15.2	6	41	50	2	0	1	0
				15.2-17.2	5	19	74	1	0	1	0
				17.2-19.2	4	44	51	1	0	0	0
				Mean	5	40	53	1	0	1	0
c	4	96	0	19.2-21.2	4	56	38	2	0	0	0
				21.2-22.2	3	62	33	1	1	0	0
				22.2-23.2	3	41	56	0	0	0	0
				23.2-25.0	4	31	64	1	0	0	0
				Mean	4	47	48	1	0	0	0
a+b+c	5	90	5	Mean	5	38	50	2	2	3	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	6.7-9.2	43	8	38	7	1	0	0	3

TL 73 SW 27 **7436 3471** **Bloy's Hall** **Block A**

Surface level +74.7 m (+245 ft)
Water struck at +73.7 m
152 mm, Shell and auger
October 1978

Waste 18.8+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Boulder Clay	Clay, pale grey with pebbles of chalk and flint, becoming dark grey with additional pebbles of shale from 5.7 m	18.4+	18.8

TL 73 SW 28 **7465 3329** **Deek's Farm** **Block C**

Surface level +96.0 m (+315 ft)
Water not encountered
152 mm, Shell and auger
October 1978

Waste 18.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, brown with pebbles of chalk, flint and shale, becoming grey from 8.0 m	17.7+	18.0

TL 73 SW 29 **7455 3194** **Tredgell's Wood** **Block C**

Surface level +89.0 m (+292 ft)
Water struck at +68.7
152 mm, Shell and auger
September 1978

Overburden 8.6 m
Mineral 16.4+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, silty, sandy, brown with flint pebbles, becoming silt, very sandy, brown with pebbles from 1.8 m	2.8	3.1
	Clay, silty, brown, with chalk and flint pebbles, becoming blue-grey from 5.3 m	5.5	8.6
Barham Sands and Gravels	**a** 'Clayey' sand Gravel: fine with coarse, angular and well rounded flint with rounded quartzite and some quartz Sand: medium with coarse and fine, quartz with some flint, yellow-brown	4.7	13.3
Kesgrave Sands and Gravels	**b** 'Clayey' sand, with clay seams Gravel: fine, angular flint and rounded quartz with quartzite some phosphatic nodules, well rounded flint and subangular ironstone Sand: medium with fine and some coarse, quartz, yellow	10.0	23.3
Red Crag	**c** Sand Gravel: fine, angular flint and rounded quartz with quartzite, phosphatic nodules and well rounded flint Sand: medium and fine with coarse, quartz, brown	1.7+	25.0

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 mm
a	13	83	4	8.6-9.6	18	8	67	4	2	1	0
				9.6-10.2	18	2	72	7	1	0	0
				10.2-11.2	9	3	67	14	5	2	0
				11.2-11.9	9	4	65	14	5	3	0
				11.9-12.3	9	2	68	12	4	5	0
				12.3-13.3	11	11	75	1	2	0	0
				Mean	13	6	69	8	3	1	0
b	10	89	1	13.3-14.3	9	16	74	1	0	0	0
				14.3-15.3	8	12	79	1	0	0	0
				15.3-16.3	22	10	67	1	0	0	0
				16.3-17.3	4	9	85	2	0	0	0
				17.3-18.3	2	18	78	2	0	0	0
				18.3-19.3	8	25	65	2	0	0	0
				19.3-20.3	11	23	64	2	0	0	0
				20.3-21.3	13	12	74	1	0	0	0
				21.3-22.3	12	18	65	4	1	0	0
				22.3-23.3	9	19	49	19	4	0	0
				Mean	10	16	70	3	1	0	0
c	4	92	4	23.3-24.3	1	30	37	26	6	0	0
				24.3-25.0	8	37	51	3	1	0	0
				Mean	4	33	43	16	4	0	0
a+b+c	10	88	2	Mean	10	15	67	6	1	1	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	8.6-13.3	51	30	2	7	0	0	0	10
b	13.3-23.3	55	3	26	6	3	2	0	5
c	23.3-25.0	33	8	32	11	11	0	0	5

TL 73 SW 30 **7459 3034** **Shinborough** **Block C**

Surface level +75.0 m (+246 ft)
Water struck at +64.1 m
152 mm, Shell and auger
October 1978

Overburden 10.9 m
Mineral 4.8 m
Bedrock 2.3+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Boulder Clay	Clay, mottled brown and grey with flint pebbles, becoming grey with additional pebbles of chalk and shale from 3.9 m	10.8	10.9
Barham Sands and Gravels	Sandy gravel, with seams of clay and sand from 14.6 to 15.1 m Gravel: fine and coarse, angular with well rounded flint, rounded quartz and quartzite Sand: medium with fine and coarse, quartz and flint, grey-green	4.8	15.7
London Clay	Clay, micaceous, grey	2.3+	18.0

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 mm
5	54	41	10.9-11.9	5	8	27	9	28	23	0
			11.9-12.9	4	4	43	12	25	12	0
			12.9-13.9	4	7	31	17	32	9	0
			13.9-14.6	4	4	9	17	38	28	0
			14.6-15.1	Seams of clay and sand						
			15.1-15.7	13	58	28	1	0	0	0
			Mean	5	13	29	12	26	15	0

COMPOSITION

Depth below surface (m)	percentages by weight in gravel fraction							
	Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
10.9-14.6	59	15	7	5	0	0	0	14

TL 73 SE 22 **7557 3408** **Burnthouse Farm** **Block B**

Surface level +86.1 m (+282 ft)
Water not encountered
152 mm, Shell and auger
October 1978

Overburden 18.0 m
Mineral 7.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Boulder Clay	Clay, silty, brown, becoming clay, brown with pebbles of chalk, flint and shale from 1.8 m, passing to grey from 8.1 m	17.6	18.0
Kesgrave Sands and Gravels	**a** 'Clayey' sand, with a trace of gravel Sand: medium with fine and coarse, quartz, yellow	4.0	22.0
Red Crag	**b** 'Clayey' sand Gravel: fine and coarse, well rounded and angular flint with rounded quartz, some quartzite and phospatic nodules Sand: medium with fine and some coarse, quartz	3.0+	25.0

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 mm
a	14	85	1	18.0-22.0	14	10	70	5	1	0	0
b	18	80	2	22.0-23.5	8	7	81	2	2	0	0
				23.5-25.0	27	7	61	2	1	2	0
				Mean	18	7	71	2	1	1	0
a + b	15	83	2	Mean	15	9	70	4	2	0	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
b	22.0-25.0	30	39	20	6	4	0	0	1

TL 73 SE 23 **7584 3312** **Almshouse Green** **Block C**

Surface level +83.5 m (+274 ft)
Water struck at +68.2
152 mm, Shell and auger
September 1978

Overburden 9.3 m
Mineral 13.8 m
Bedrock 0.5+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, brown, becoming mottled brown and grey from 2.6 m, passing to grey with additional pebbles of chalk from 5.0 m	9.0	9.3
Barham Sands and Gravels	**a** 'Very clayey' pebbles sand Gravel: fine with coarse, rounded quartz and well-rounded with angular flint, some rounded quartzite and phosphatic nodules Sand: medium with fine and coarse, quartz, orange-brown	1.0	10.3
Kesgrave Sands and Gravels	**b** Sand, with some gravel in the lower 2 m Gravel: fine and coarse, angular with well rounded flint, rounded quartz and some quartzite Sand: medium with fine and coarse, quartz, orange-yellow	6.0	16.3
Red Crag	**c** Pebbly sand Gravel: fine and coarse, angular flint with rounded, phosphatic nodules, well rounded flint, rounded quartz some quartzite and angular ironstone Sand medium with fine and coarse, quartz with flint, orange-brown	6.8	23.1
London Clay	Clay, micaceous, blue-grey, top weathered to brown	0.5+	23.6

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 mm
a	32	60	8	9.3-10.3	32	12	43	5	6	2	0
b	9	89	2	10.3-11.3	13	34	52	1	0	0	0
				11.3-12.3	3	8	88	1	0	0	0
				12.3-13.3	6	15	78	1	0	0	0
				13.3-14.3	6	21	71	2	0	0	0
				14.3-15.3	11	20	48	16	3	2	0
				15.3-16.3	17	23	45	8	5	2	0
				Mean	9	20	64	5	1	1	0
c	5	89	6	16.3-17.3	7	22	49	11	9	2	0
				17.3-18.3	5	28	54	9	3	1	0
				18.3-19.3	3	17	66	13	1	0	0
				19.3-20.3	3	14	80	3	0	0	0
				20.3-21.3	5	21	44	12	9	9	0
				21.3-22.3	6	22	63	5	3	1	0
				22.3-23.1	3	17	65	7	5	3	0
				Mean	5	20	60	9	4	2	0
a+b+c	9	86	5	Mean	9	20	60	6	3	2	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	9.3-10.3	14	28	50	5	2	0	0	1
b	10.3-16.3	50	24	20	4	0	0	0	2
c	16.3-23.1	51	9	6	4	23	3	0	4

TL 73 SE 24 **7549 3213** **Runalong Wood** **Block C**

Surface level +92.3 m (+303 ft)
Water struck at +86.4 m
152 mm, Shell and auger
October 1978.

Overburden 16.3 m
Mineral 8.7+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Boulder Clay	Clay, mottled brown and grey with flint pebbles, includes chalk pebbles from 2.0 m	5.7	5.9
	Silt, sandy, purple-grey with pebbles of chalk and flint	6.3	12.2
	Clay, blue-black with pebbles of chalk and flint	4.1	16.3
Kesgrave Sands and Gravels	**a** Pebbly sand Gravel: fine with coarse, well rounded and angular flints with rounded quartz and some quartzite Sand: medium and coarse with some fine, quartz	1.0	17.3
	b Sand, with sandy clay from 17.3 to 17.4 m Sand: medium and fine with some coarse, quartz, yellow-brown	7.7+	25.0

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 mm
a	3	76	21	16.3-17.3	3	3	52	21	18	3	0
b	6	94	0	17.3-18.4	11	31	57	1	0	0	0
				18.4-20.4	4	28	68	0	0	0	0
				20.4-21.4	5	16	79	0	0	0	0
				21.4-22.4	8	58	34	0	0	0	0
				22.4-23.4	7	54	38	1	0	0	0
				23.4-24.4	4	32	63	1	0	0	0
				24.4-25.0	6	30	63	1	0	0	0
				Mean	6	35	58	1	0	0	0
a + b	6	92	2	Mean	6	31	58	3	2	0	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	16.3-17.3	27	43	18	2	0	0	0	10

TL 73 SE 25 **7561 3119** **Baker's Farm** **Block C**

Surface level +84.2 m (+276 ft)
Water struck at +70.0 m
152 mm, Shell and auger
October 1978

Overburden 5.4 m
Mineral 14.4 m
Bedrock 0.9+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, sandy, orange-brown with flint pebbles, becoming mottled brown and grey with additional pebbles of chalk from 2.0 m	5.1	5.4
Barham Sands and Gravels	**a** 'Clayey' pebbly sand Gravel: fine and coarse angular flint and rounded quartz with quartzite and some well rounded flint, rounded phosphatic nodules and angular ironstone. Sand: medium and fine with coarse, quartz mottled, orange and pale grey.	3.0	8.4
Kesgrave Sands and Gravels	**b** Sand Gravel: a trace of fine and coarse, rounded quartz with angular and well rounded flint, rounded phosphatic nodules and some quartzite. Sand: medium with fine and some coarse, quartz, yellow.	7.7	16.1
Red Crag	**c** Sand Gravel: fine with coarse, angular flint with rounded quartz, phosphatic nodules, angular ironstone some well rounded flint and rounded quartzite. Sand: medium and fine with coarse, quartz, ironstone.	3.7	19.8
London Clay	Clay, micaceous, olive-grey	0.9+	20.7

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 mm
a	17	66	17	5.4-6.4	24	21	36	4	9	6	0
				6.4-7.4	18	23	29	7	12	11	0
				7.4-8.4	9	14	60	6	10	1	0
				Mean	17	19	41	6	11	6	0
b	6	94	0	8.4-9.4	8	26	62	2	1	1	0
				9.4-10.4	10	29	60	1	0	0	0
				10.4-11.4	4	18	77	1	0	0	0
				11.4-12.4	8	14	78	0	0	0	0
				12.4-14.1	7	14	77	2	0	0	0
				14.1-15.1	5	15	75	5	0	0	0
				15.1-16.1	3	8	77	11	1	0	0
				Mean	6	18	73	3	0	0	0
c	3	93	4	16.1-17.8	4	34	42	16	2	2	0
				17.8-19.8	3	43	48	2	3	1	0
				Mean	3	39	45	9	3	1	0
a+b+c	8	87	5	Mean	8	23	59	5	3	2	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	5.4-8.4	47	1	39	8	1	1	0	3
b	8.4-16.1	24	13	51	4	7	0	0	1
c	16.1-19.8	50	3	20	3	15	7	0	2

TL 73 SE 26 **7530 3032** **Shinborough** **Block C**

Surface level +68.2 m (+224 ft)
Water struck at +66.4 m
152 mm, Shell and auger
October 1978

Overburden 1.8 m
Mineral 1.4 m
Bedrock 2.2+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Clay, silty, sandy, brown	0.2	0.4
	Peat	0.3	0.7
	Clay, very sandy, mottled orange-brown and grey with pebbles of flint and chalk	1.1	1.8
	'Clayey' sand Gravel: fine with a trace of coarse, angular flint with rounded quartz, well rounded flint, rounded quartzite and some angular ironstone Sand: fine and medium with coarse, quartz and flint, orange-brown	1.4	3.2
London Clay	Clay, silty, blue-grey, top weathered to orange-brown	2.2+	5.4

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 mm
18	79	3	1.8-2.8	20	34	30	12	3	1	0
			2.8-3.2	15	47	28	8	2	0	0
			Mean	18	38	30	11	3	0	0

COMPOSITION

Depth below surface (m)	percentages by weight in gravel fraction							
	Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
1.8-3.2	66	9	15	6	0	2	0	2

TL 73 SE 27 **7650 3468** **Highstreet Green** **Block B**

Surface level +79.3 (+260 ft)
Water not encountered
152 mm, Shell and auger
October 1978

Overburden 10.6 m
Mineral 8.1 m
Bedrock 3.7+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made Ground	0.5	0.5
Boulder Clay	Clay, sandy, orange-brown with pebbles of chalk and flint, becoming mottled brown and pale grey from 1.5 m, passing to olive-grey with additional pebbles of shale from 6.0 m	10.1	10.6
Barham Sands and Gravels	**a** 'Clayey' Sand, with clay seams Gravel: fine with coarse, angular flint with rounded quartz, quartzite, well rounded flint, some angular ironstone and rounded phosphatic nodules. Sand: medium with fine and coarse, quartz, orange-yellow.	3.2	13.8
Red Crag	**b** 'Clayey' sand Gravel: fine and coarse, angular flint and rounded quartz, with well rounded flint, some rounded quartzite phosphatic nodules and angular ironstone Sand: medium and fine with coarse, quartz, yellow	4.9	18.7
London Clay	Clay, silty, olive-grey, top weathered to brown	3.7+	22.4

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 mm
a	18	78	4	10.6-11.6	13	22	58	7	0	0	0
				11.6-12.8	25	12	41	12	7	3	0
				12.8-13.8	15	18	58	6	2	1	0
				Mean	18	17	52	9	3	1	0
b	10	88	2	13.8-14.8	16	26	51	7	0	0	0
				14.8-15.8	0	25	58	13	2	2	0
				15.8-16.8	7	30	57	6	0	0	0
				16.8-17.8	12	23	51	9	3	2	0
				17.8-18.7	16	23	45	10	3	3	0
				Mean	10	26	53	9	1	1	0
a + b	13	84	3	Mean	13	23	52	9	2	1	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	10.6-13.8	41	12	19	19	2	3	0	4
b	13.8-18.7	47	19	26	2	2	2	0	2

TL 73 SE 28 **7654 3396** **Cuckoos Farm** **Block B**

Surface level +77.2 m (+253 ft)
Water struck at +64.2 m
152 mm, Shell and auger
September 1978

Overburden 7.0 m
Mineral 8.9 m
Bedrock 4.0+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, sandy, silty, mottled brown and grey with pebbles of chalk and flint, becoming pale brown from 4.8 m	6.7	7.0
Kesgrave Sands and Gravels	**a** Sand, with clay seams Sand: medium with fine and some coarse, quartz, yellow	2.0	9.0
Red Crag	**b** Pebbly sand Gravel: fine and coarse, angular ironstone and flint with rounded phosphatic nodules, well rounded flint, some rounded quartz and quartzite. Sand: medium with fine and coarse, quartz, orange-brown.	6.9	15.9
London Clay	Clay, silty, micaceous, blue-grey	4.0+	19.9

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 mm
a	8	92	0	7.0-8.0	12	23	64	1	0	0	0
				8.0-9.0	6	17	71	6	0	0	0
				Mean	8	20	68	4	0	0	0
b	10	84	6	9.0-10.0	15	26	44	14	1	0	0
				10.0-11.0	10	20	49	21	0	0	0
				11.0-12.0	11	18	38	24	6	3	0
				12.0-13.0	16	26	42	7	8	1	0
				13.0-14.0	4	29	56	6	4	1	0
				14.0-15.0	5	12	80	2	1	0	0
				15.0-15.9	10	11	61	3	6	9	0
				Mean	10	20	53	11	4	2	0
a + b	10	86	4	Mean	10	20	56	10	3	1	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
b	9.0-15.9	29	9	5	3	16	36	0	2

TL 73 SE 29 **7651 3313** **Lowt's Wood** **Block B**

Surface level +87.4 m (+287 ft)
Water struck at +64.9 m
152 mm, Shell and auger
October 1978

Overburden 9.4 m
Mineral 15.6+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, sandy, brown with flint pebbles, becoming mottled brown and orange-brown with additional pebbles of chalk from 2.0 m, passing to grey from 4.0 m	9.1	9.4
Barham Sands and Gravels	**a** Gravel, with clay seams Gravel: fine and coarse, angular flint and rounded quartz with well rounded flint and rounded quartzite Sand: medium with coarse and fine, quartz with flint	3.5	12.9
Kesgrave Sands and Gravels	**b** 'Clayey' sand, with clay seams Sand: medium and fine, quartz, yellow-orange	9.0	21.9
Red Crag	**c** Pebbly sand Gravel: fine and coarse, angular and well rounded flint with rounded quartz, quartzite and some phosphatic nodules Sand: medium and fine with coarse, quartz with flint, orange-brown.	3.1+	25.0

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 mm
a	8	46	46	9.4-10.4	11	9	32	6	29	13	0
				10.4-11.4	3	6	31	9	34	17	0
				11.4-12.9	10	6	28	10	32	14	0
				Mean	8	7	30	9	32	14	0
b	10	90	0	12.9-13.9	27	23	50	0	0	0	0
				13.9-15.9	9	31	60	0	0	0	0
				15.9-17.9	17	45	38	0	0	0	0
				17.9-19.9	4	35	61	0	0	0	0
				19.9-21.9	3	52	45	0	0	0	0
				Mean	10	39	51	0	0	0	0
c	8	84	8	21.9-23.9	9	28	47	7	5	4	0
				23.9-25.0	5	28	46	16	4	1	0
				Mean	8	28	46	10	5	3	0
a+b+c	9	79	12	Mean	9	30	45	4	8	4	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	9.4-12.9	33	21	27	15	0	0	0	4
c	12.9-21.9	42	34	14	6	1	trace	0	3

TL 73 SE 30 **7640 3255** **Pepper's Farm** **Block C**

Surface level +93.3 m (+306 ft)
Water not encountered
152 mm, Shell and auger
October 1978

Overburden 15.7 m
Mineral 9.3+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.3	0.3
Boulder Clay	Clay, silty, brown with pebbles of chalk and flint	0.6	0.9
	Clay, silty, sandy, laminated, mottled orange-brown and grey	1.2	2.1
	Clay, silty, brown with pebbles of chalk and flint, becoming grey from 3.2 m	13.6	15.7
Barham Sands and Gravels	**a** 'Very clayey' pebbly sand, with clay seams Gravel: fine and coarse, angular with well rounded flint, rounded quartzite, some quartz and phosphatic nodules Sand: medium and fine with some coarse, quartz with some flint, mottled brown and yellow-brown	1.6	17.3
Kesgrave Sands and Gravels	**b** Sand, with clay seams in the upper 1 m Sand: medium with fine and some coarse, quartz with some flint, yellow-brown	7.7+	25.0

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 mm
a	28	66	6	15.7-16.7	23	14	50	4	6	3	0
				16.7-17.3	35	19	43	2	1	0	0
				Mean	28	16	47	3	4	2	0
b	6	94	0	17.3-18.3	7	27	65	1	0	0	0
				18.3-19.3	6	25	69	0	0	0	0
				19.3-20.3	7	16	77	0	0	0	0
				20.3-21.3	6	17	77	0	0	0	0
				21.3-22.3	8	6	85	1	0	0	0
				22.3-23.3	7	27	65	1	0	0	0
				23.3-24.3	3	17	80	0	0	0	0
				24.3-25.0	3	11	86	0	0	0	0
				Mean	6	18	75	1	0	0	0
a + b	10	89	1	Mean	10	18	70	1	1	0	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	15.7-17.3	55	17	5	12	3	0	0	8

TL 73 SE 31 **7649 3159** **Listonhall Farm** **Block C**

Surface level +86.3 m (+283 ft)
Water struck at +66.3 m
152 mm, Shell and auger
October 1978

Overburden 8.4 m
Mineral 12.5 m
Bedrock 0.6+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Boulder Clay	Clay, silty, brown with flint pebbles, becoming mottled orange-brown and grey with additional pebbles of chalk from 0.9 m, passing to grey with additonal pebbles of shale below 4.0 m	8.3	8.4
Barham Sands and Gravels	**a** 'Clayey' sandy gravel Gravel: coarse and fine, angular flint and rounded quartz with some quartzite, well rounded flint and rounded chalk Sand: medium and coarse with fine, flint with quartz, mottled orange-brown and yellow-brown	1.6	10.0
Kesgrave Sands and Gravels	**b** Sandy gravel Gravel: fine and coarse, angular flint with rounded quartz, well rounded flint, rounded quartzite and some phosphatic nodules Sand: medium with coarse and fine, quartz with flint, yellow-brown	2.6	12.6
	c Sand: medium and fine with some coarse, quartz, yellow-orange	4.9	17.5
Red Crag	**d** Sand Gravel: fine with a trace of coarse, angular with well-rounded flint, rounded phosphatic nodules, angular iron-stone, rounded quartzite and some quartz Sand: medium with fine and coarse, quartz with some flint orange-brown	3.4	20.9
London Clay	Clay, silty, blue-grey, top weathered to brown	0.6+	21.5

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 mm
a	12	58	30	8.4-9.4	13	5	26	19	27	10	0
				9.4-10.0	9	7	53	13	10	8	0
				Mean	12	5	36	17	21	9	0
b	5	67	28	10.0-10.4	2	6	39	11	23	19	0
				10.4-11.4	5	5	46	13	20	11	0
				11.4-12.4	6	5	68	3	10	8	0
				12.4-12.6	5	8	59	3	12	13	0
				Mean	5	5	54	8	16	12	0
c	5	95	0	12.6-13.6	4	8	87	1	0	0	0
				13.6-14.6	7	35	57	1	-	-	-
				14.6-15.6	9	15	76	0	0	0	0
				15.6-16.6	5	37	58	0	0	0	0
				16.6-17.5	1	30	68	1	0	0	0
				Mean	5	25	69	1	0	0	0
d	5	92	3	17.5-18.5	3	14	75	8	0	0	0
				18.5-19.5	8	10	65	13	4	0	0
				19.5-20.5	2	14	68	13	3	0	0
				20.5-20.9	7	38	38	11	5	1	0
				Mean	5	15	66	11	3	0	0
a+b+ c+d	6	84	10	Mean	6	16	61	7	7	3	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	8.4-10.0	51	4	33	5	0	0	1	6
b	10.0-12.6	43	19	24	11	1	0	0	2
d	17.5-20.9	32	21	3	6	20	17	0	1

TL 73 SE 32 **7635 3047** **Edmondsey Wood** **Block C**

Surface level +72.6 m (+238 ft)
Water struck at +70.0 m
152 mm, Shell and auger
October 1978

Overburden 1.6 m
Mineral 2.3 m
Bedrock 1.4+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.4	0.4
Boulder Clay	Clay, very sandy, mottled orange and pale grey with pebbles of flint and quartz	1.2	1.6
Barham Sands and Gravels	Sandy Gravel Gravel: fine and coarse, angular with well rounded flint, rounded quartz some quartzite, phosphatic nodules and angular ironstone Sand: medium and coarse with fine, quartz, orange-brown	2.3	3.9
London Clay	Clay, silty, olive-grey top weathered to brown	1.4+	5.3

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 mm
10	50	40	1.6-2.6	18	5	28	13	18	18	0
			2.6-3.9	4	2	32	17	28	17	0
			Mean	10	4	30	16	23	17	0

COMPOSITION

Depth below surface (m)	percentages by weight in gravel fraction							
	Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
1.6-3.9	72	9	9	3	3	3	0	1

TL 73 SE 33 7747 3442 **Sible Hedingham** **Block B**

Surface level +64.8 m (+213 ft)
Water struck at +55.1 m
152 mm, Shell and auger
October 1978

Overburden 0.7 m
Mineral 12.9 m
Bedrock 0.7+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, silty, sandy, pale brown with pebbles of chalk and flint	0.4	0.7
Barham Sands and Gravels	**a** 'Clayey' sand, with clayey seams Gravel: fine with a trace of coarse, angular flint and rounded quartz with quartzite and some phosphatic nodules Sand: medium with fine and some coarse, quartz, mottled orange and pale grey	2.0	2.7
Kesgrave Sands and Gravels	**b** 'Clayey' sand, with clay seams Sand: medium with fine and some coarse, quartz, yellow-grey	5.0	7.7
Red Crag	**c** 'Clayey' sand Gravel: fine and coarse, angular flint with rounded quartz, phosphatic nodules, well rounded flint and rounded quartzite Sand: medium and fine with coarse, quartz, iron-stained	5.9	13.6
London Clay	Clay, silty, olive-grey, top weathered to orange-brown	0.7+	14.3

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 mm
a	12	87	1	0.7-1.7	14	6	75	3	2	0	0
				1.7-2.7	10	3	83	2	1	1	0
				Mean	12	5	79	3	1	0	0
b	10	90	0	2.7-3.7	12	19	69	0	0	0	0
				3.7-4.7	7	22	71	0	0	0	0
				4.7-5.7	17	18	65	0	0	0	0
				5.7-6.7	9	19	71	1	0	0	0
				6.7-7.7	8	23	67	2	0	0	0
				Mean	10	20	69	1	0	0	0
c	12	85	3	7.7-8.7	19	26	48	7	0	0	0
				8.7-9.7	10	30	46	14	0	0	0
				9.7-10.7	21	29	35	10	4	1	0
				10.7-11.7	5	17	55	13	8	2	0
				11.7-12.7	7	24	49	18	2	0	0
				12.7-13.6	7	19	53	21	0	0	0
				Mean	12	24	47	14	2	1	0
a+b+c	11	88	1	Mean	11	20	61	7	1	0	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	0.7-2.7	44	0	39	11	1	0	0	5
c	7.7-13.6	44	8	20	7	18	0	0	3

TL 73 SE 34 **7756 3373** **Sible Hedingham** **Block B**

Surface level +66.0 m (+216 ft)
Water struck at +62.3 m
152 mm, Shell and auger
October 1978

Overburden 0.3 m
Mineral 12.1 m
Bedrock 1.2+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Kesgrave Sands and Gravels	**a** 'Clayey' sand, with very clayey seams Sand: medium and fine, quartz, orange-yellow	2.9	3.2
Red Crag	**b** Pebbly sand Gravel: fine and coarse, angular with well rounded flint, rounded phosphatic nodules, quartzite, quartz and angular ironstone Sand: fine and medium with coarse, quartz with flint, brown	9.2	12.4
London Clay	Clay, silty, blue-grey, top weathered to brown	1.2+	13.6

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 mm
a	10	90	0	0.3-1.4	15	20	65	0	0	0	0
				1.4-3.2	6	36	58	0	0	0	0
				Mean	10	29	61	0	0	0	0
b	7	86	7	3.2-4.9	4	25	51	20	0	0	0
				4.9-6.0	2	27	57	13	1	0	0
				6.0-7.1	6	53	31	7	2	1	0
				7.1-8.2	7	30	43	12	5	3	0
				8.2-9.2	5	30	51	12	2	0	0
				9.2-10.6	7	47	32	11	3	0	0
				10.6-11.6	28	28	11	3	19	11	0
				11.6-12.4	3	62	8	21	4	2	0
				Mean	7	37	37	12	5	2	0
a + b	8	88	4	Mean	8	35	44	9	3	1	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
b	3.2-12.4	40	18	7	8	16	8	0	3

TL 73 SE 35 **7768 3317** **Cobbs Fenn** **Block B**

Surface level +67.9 m (+223 ft)
Water struck at +58.4 m
152 mm, Shell and auger
September 1978

Overburden 3.2 m
Mineral 14.4 m
Bedrock 0.4+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Bouder Clay	Clay, sandy, brown with flint pebbles	2.8	3.2
Barham Sands and Gravels	**a** 'Clayey' pebbly sand, becoming sand from 3.7 m Gravel: fine and coarse, angular with well rounded flint, rounded quartz and quartzite Sand: medium with fine and coarse, quartz, orange-brown	1.3	4.5
Kesgrave Sands and Gravels	**b** Sand, with clay seams Gravel: a trace of fine and coarse, angular flint and rounded quartz with well rounded flint and some rounded quartzite Sand: medium with fine and some coarse, quartz, yellow	7.5	12.0
Red Crag	**c** Sand Gravel: fine and coarse, well rounded flint with rounded quartz, angular flint, ironstone, rounded quartzite and phosphatic nodules Sand: medium with fine and coarse, quartz, iron-stained	5.6	17.6
London Clay	Clay, silty, olive-grey, top weathered to brown	0.4+	18.0

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 mm
a	13	70	17	3.2-4.5	13	12	53	5	11	6	0
b	7	93	0	4.5-5.5	7	10	81	1	1	0	0
				5.5-6.8	5	8	85	2	0	0	0
				6.8-7.8	8	4	88	0	0	0	0
				7.8-8.8	8	18	74	0	0	0	0
				8.8-9.8	12	22	63	3	0	0	0
				9.8-11.0	5	20	72	3	0	0	0
				11.0-12.0	2	15	72	9	1	1	0
				Mean	7	14	76	3	0	0	0
c	6	91	3	12.0-13.0	3	14	62	17	4	0	0
				13.0-14.0	10	11	55	17	5	2	0
				14.0-15.0	5	19	63	13	0	0	0
				15.0-16.0	5	23	58	12	2	0	0
				16.0-17.6	6	19	64	8	3	0	0
				Mean	6	18	60	13	3	0	0
a+b+c	7	90	3	Mean	7	15	68	7	2	1	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	3.2-4.5	45	24	12	15	0	0	0	4
b	4.5-12.0	47	14	34	3	0	0	0	2
c	12.0-17.6	17	25	22	11	8	12	0	5

TL 73 SE 36 **7743 3251** **Southey Green Farm** **Block B**

Surface level +82.2 m (+270 ft)
Water struck at +66.5 m
152 mm, Shell and auger
October 1978

Overburden 3.7 m
Mineral 13.4 m
Bedrock 0.5+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, mottled brown and grey with flint pebbles	3.4	3.7
Barham Sands and Gravels	**a** 'Clayey' pebbly sand Gravel: fine and coarse, angular flint and rounded quartz with quartzite, well rounded flint and some rounded phosphatic nodules Sand: medium with coarse and fine, quartz, orange-brown	3.0	6.7
Kesgrave Sands and Gravels	**b** Sand: medium with fine and some coarse, quartz, orange-yellow	5.0	11.7
Red Crag	**c** Sand Gravel: fine with a trace of coarse, angular flint and rounded quartz with phosphatic nodules, well rounded flint, rounded quartzite and some angular ironstone Sand: medium with coarse and fine, quartz, orange-brown	5.4	17.1
London Clay	Clay, micaceous, blue-grey, top weathered to brown	0.5+	17.6

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 mm
a	15	75	10	3.7-4.7	18	3	50	7	10	12	0
				4.7-5.7	22	4	50	15	8	1	0
				5.7-6.7	5	11	83	1	0	0	0
				Mean	15	6	61	8	6	4	0
b	5	95	0	6.7-7.7	4	12	84	0	0	0	0
				7.7-8.7	6	21	73	0	0	0	0
				8.7-9.7	6	16	78	0	0	0	0
				9.7-10.7	7	17	76	0	0	0	0
				10.7-11.7	4	8	86	2	0	0	0
				Mean	5	15	79	1	0	0	0
c	4	94	2	11.7-12.7	3	7	89	1	0	0	0
				12.7-13.7	4	6	87	3	0	0	0
				13.7-14.7	6	16	64	12	2	0	0
				14.7-15.7	4	12	63	17	4	0	0
				15.7-16.7	3	12	61	17	6	1	0
				16.7-17.1	6	12	62	17	2	1	0
				Mean	4	11	72	11	2	0	0
a+b+c	7	90	3	Mean	7	11	73	6	2	1	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	3.7-6.7	39	9	31	13	1	0	0	7
c	11.7-17.1	41	8	29	6	12	1	0	3

TL 73 SE 37 **7743 3145** **Clayhill Farm** **Block C**

Surface level +90.6 m (+297 ft)
Water struck at +71.6 m
152 mm, Shell and auger
October 1978

Overburden 11.7 m
Mineral 13.3+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.3	0.3
Boulder Clay	Clay, mottled brown and grey with pebbles of chalk and flint, becoming darker from 4.8 m	11.4	11.7
Barham Sands and Gravels	**a** 'Clayey' pebbly sand Gravel: fine and coarse, angular flint with rounded quartz, well rounded flint, rounded quartzite and some phosphatic nodules Sand: medium with fine and coarse, quartz with flint, orange-brown	3.3	15.0
Kesgrave Sands and Gravels	**b** Sandy gravel Gravel: fine and coarse, angular flint and rounded quartz with well rounded flint, rounded quartzite and some phosphatic nodules Sand: medium with coarse and fine, quartz, orange-brown	3.0	18.0
	c Sand, with a trace of fine gravel Sand: medium and fine with some coarse, quartz, orange-brown	5.0	23.0
Red Crag	**d** Sand Gravel: fine, angular flint with rounded phosphatic nodules, quartz, quartzite and well rounded flint Sand: medium with fine and coarse, quartz, iron-stained	2.0+	25.0

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 mm
a	17	72	11	11.7-12.7	22	24	41	4	6	3	0
				12.7-13.7	21	10	49	5	10	5	0
				13.7-15.0	10	8	65	6	8	3	0
				Mean	17	14	53	5	8	3	0
b	6	59	35	15.0-16.0	9	10	34	11	26	10	0
				16.0-17.0	7	5	31	10	26	21	0
				17.0-18.0	3	5	66	4	12	10	0
				Mean	6	7	44	8	21	14	0
c	4	96	0	18.0-19.0	5	44	51	0	0	0	0
				19.0-20.0	2	34	64	0	0	0	0
				20.0-21.0	2	28	70	0	0	0	0
				21.0-22.0	2	55	40	2	1	0	0
				22.0-23.0	7	63	29	1	0	0	0
				Mean	4	44	51	1	0	0	0
d	3	96	1	23.0-24.0	2	19	72	6	1	0	0
				24.0-25.0	4	11	77	7	1	0	0
				Mean	3	15	75	6	1	0	0
a+b+c +d	8	81	11	Mean	8	24	53	4	7	4	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	11.7-15.0	46	15	18	13	3	0	0	5
b	15.0-18.0	46	14	28	10	1	0	0	1
d	23.0-25.0	40	9	17	8	24	0	0	2

TL 73 SE 38 **7756 3054** **Orange Hall** **Block C**

Surface level +81.2 m (+266 ft)
Water struck at +68.2 m
152 mm, Shell and auger
September 1978

Overburden 3.9 m
Mineral 1.0 m
Waste 0.6 m
Mineral 11.6 m
Bedrock 0.9+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.4	1.4
Boulder Clay	Clay, sandy, silty, brown with flint pebbles, becoming mottled with chalk; pebbles of flint and quartz	1.4	2.8
	Clay, very sandy, silty with pebbles of flint and quartz	1.1	3.9
Barham Sands and Gravels	**a** Sandy gravel, with clay seams Gravel: fine and coarse, angular flint and rounded quartz with quartzite, some phosphatic nodules and well rounded flint Sand: medium and coarse with fine	1.0	4.9
	Silt and clay, yellow-orange with flint pebbles	0.6	5.5
Kesgrave Sands and Gravels	**b** Sand, with clayey seams Sand: medium with fine and a trace of coarse, orange-yellow	9.0	14.5
Red Crag	**c** Sand Gravel: fine and coarse, angular with well rounded flint, rounded quartz, phosphatic nodules, some quartzite and angular ironstone Sand: medium with fine and coarse, quartz, brown	2.6	17.1
London Clay	Clay, micaceous, blue-grey, top weathered to brown	0.9+	18.0

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 mm
a	9	49	42	3.9-4.9	9	4	30	15	25	17	0
b	6	94	0	5.5-6.5	13	28	58	1	0	0	0
				6.5-7.5	4	11	84	1	0	0	0
				7.5-8.5	8	14	77	1	0	0	0
				8.5-9.5	6	10	83	1	0	0	0
				9.5-10.5	4	9	87	0	0	0	0
				10.5-11.5	2	10	88	0	0	0	0
				11.5-12.5	7	6	87	0	0	0	0
				12.5-13.5	6	16	78	0	0	0	0
				13.5-14.5	2	22	76	0	0	0	0
				Mean	6	14	80	0	0	0	0
c	3	95	2	14.5-15.5	3	7	89	1	0	0	0
				15.5-16.5	3	7	80	7	2	1	0
				16.5-17.1	3	4	83	6	2	2	0
				Mean	3	6	84	5	1	1	0
a+b+c	6	90	4	Mean	6	11	77	2	2	2	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	3.9-4.9	46	4	33	9	4	0	0	4
c	14.5-17.1	36	23	17	5	16	2	0	1

TL 73 SE 39 **7848 3416** **Sible Hedingham** **Block B**

Surface level +42.7 m (+140 ft)
Water struck at +41.6 m
152 mm, Shell and auger
October 1978

Overburden 1.4 m
Mineral 7.5 m
Waste 2.6 m
Bedrock 0.5+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
First Terrace	Clay, sandy, silty, brown with flint pebbles	1.1	1.4
	Sandy gravel Gravel: fine and coarse, angular with well rounded flint, rounded chalk, some rounded quartz and quartzite Sand: medium with coarse and fine, quartz with flint and some chalk, grey-brown.	7.5	8.9
Glacial Silt	Silt, clayey, grey. Seam of chalk and flint pebbles at 9.7 m. Becomes peaty towards the base	2.6	11.5
Thanet Beds	Clay, very sandy, silty, mottled grey-brown, pink and green	0.5+	12.0

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 mm
5	54	41	1.4-2.4	3	12	37	12	22	14	0
			2.4-3.4	4	10	31	11	30	14	0
			3.4-4.4	4	4	27	14	31	20	0
			4.4-5.4	5	6	34	14	23	16	2
			5.4-6.4	4	5	39	8	26	18	0
			6.4-7.4	5	5	36	12	29	13	0
			7.4-8.4	5	4	42	13	28	8	0
			8.4-8.9	6	8	33	13	32	8	0
			Mean	5	7	35	12	27	14	0

COMPOSITION

Depth below surface (m)	percentages by weight in gravel fraction							
	Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
1.4-8.9	70	9	4	2	0	0	7	8

TL 73 SE 40 **7867 3348** **Hill House** **Block B**

Surface level +44.0 m (+144 ft)
Water struck at +36.9 m
152 mm, Shell and auger
September 1978

Overburden 0.6 m
Mineral 1.2 m
Waste 6.3 m
Mineral 12.0 m
Waste 0.3 m
Bedrock 0.5+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Second Terrace	Clay, silty, sandy, brown	0.3	0.6
	a 'Very clayey' sandy gravel Gravel: fine and coarse, angular flint with rounded quartz, well rounded flint and some rounded quartzite Sand: medium with coarse and fine quartz, orange-brown	1.2	1.8
Glacial Silt	Silt, sandy, laminated, orange-brown, becoming olive-grey from 2.7 m, with peat and flint pebbles below 7.1 m	6.3	8.1
Glacial Sand and Gravel,upper	**b** Sandy gravel, with clay seams Gravel: fine and coarse, angular flint with rounded chalk some quartzite, quartz, phosphatic nodules, well-rounded flint and angular ironstone Sand: medium and coarse with fine, quartz with flint and chalk, olive-grey	12.0	20.1
Boulder Clay	Clay, silty, sandy, grey with pebbles of chalk and shale	0.3	20.4
Upper Chalk	Chalk, soft with flints	0.5+	20.9

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 mm
a	27	42	31	0.6-1.8	27	7	27	8	23	8	0
b	4	68	28	8.1-9.1	2	6	44	10	18	20	0
				9.1-10.1	4	5	51	14	18	8	0
				10.1-11.1	3	9	56	11	11	8	2
				11.1-12.1	3	7	51	14	17	8	0
				12.1-13.1	2	4	41	18	20	15	0
				13.1-14.1	2	3	33	19	21	22	0
				14.1-15.1	3	3	37	28	20	9	0
				15.1-16,1	2	3	37	26	18	12	2
				16.1-17.1	17	5	52	9	12	5	0
				17.1-18.1	3	3	37	26	20	11	0
				18.1-19.1	4	6	66	14	6	4	0
				19.1-20.1	2	3	30	29	26	10	0
				Mean	4	5	45	18	17	11	0
a + b	6	65	29	Mean	6	5	43	17	18	11	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	0.6-1.8	46	19	24	1	0	0	trace	10
b	8.1-20.1	60	1	3	6	3	1	12	14

Tl 73 SE 41 **7820 3213** **Hole Farm** **Block C**

Surface level +67.6 m (+222 ft)
Water struck at +62.5 m
152 mm, Shell and auger
October 1978

Overburden 3.2 m
Mineral 3.3 m
Bedrock 0.7+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Silt, clayey, brown	2.9	3.2
Barham Sand and Gravels	Pebbly sand Gravel: fine and coarse, angular flint with rounded quartzite, some phosphatic nodules and angular ironstone Sand: coarse with medium and some fine, quartz, orange-brown	3.3	6.3
London Clay	Clay, micaceous, blue-grey, top weathered to brown	0.9+	7.2

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 mm
4	86	10	3.2-3.5	13	12	33	6	23	13	0
			3.5-4.5	4	6	85	1	3	1	0
			4.5-5.9	3	28	64	2	2	1	0
			5.9-6.5	3	25	47	3	11	11	0
			Mean	4	19	65	2	6	4	0

COMPOSITION

Depth below surface (m)	percentages by weight in gravel fraction							
	Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
3.2-6.5	59	9	18	6	3	2	0	3

TL 73 SE 42 **7855 3160** **Cutmaple** **Block B**
Surface level +85.6 m (+281 ft) Overburden 9.0 m
Water struck at +64.2 m Mineral 16.7+ m
152 mm,Shell and auger
September 1978

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Boulder Clay	Clay, orange-brown with chalk pebbles, becoming grey from 6.2 m	8.8	9.0
Barham Sands and Gravel	**a** 'Very clayey' pebbly sand, with a sandy clay seam from 11.8 to 12.2 m Gravel: fine with coarse, angular flint and rounded quartz with quartzite, some well rounded flint, rounded phosphatic nodules and angular ironstone Sand: medium with coarse and fine, brown	4.2	13.2
Kesgrave Sands and Gravels	**b** Sand, with clayey seams Sand: medium with fine and some coarse, quartz, yellow	9.0	22.2
Red Crag	**c** Pebbly sand Gravel: fine with coarse, angular flint with rounded phosphatic nodules, quartz, well rounded flint, some rounded quartzite and angular ironstone Sand: medium with fine and coarse, orange-yellow	3.5+	25.7

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 mm
a	23	63	14	9.0-10.8	35	9	39	5	9	3	0
				10.8-11.8	15	4	43	11	20	7	0
				11.8-12.2	Sandy clay						
				12.2-13.2	11	3	75	6	5	0	0
				Mean	23	6	50	7	11	3	0
b	6	94	0	13.2-14.2	9	17	73	1	0	0	0
				14.2-15.2	10	43	47	0	0	0	0
				15.2-16.2	7	8	85	0	0	0	0
				16.2-17.2	3	5	92	0	0	0	0
				17.2-18.2	4	5	90	1	0	0	0
				18.2-19.2	10	27	62	1	0	0	0
				19.2-20.2	11	23	66	0	0	0	0
				20.2-21.2	1	3	95	1	0	0	0
				21.2-22.2	4	12	82	2	0	0	0
				Mean	6	16	77	1	0	0	0
c	2	91	7	22.2-23.2	2	15	70	10	3	0	0
				23.2-24.2	4	12	70	9	5	0	0
				24.2-25.7	1	19	46	24	9	1	0
				Mean	2	16	60	15	6	1	0
a+b+c	9	86	5	Mean	9	14	67	5	4	1	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	9.0-13.2	48	3	36	7	1	1	trace	4
c	22.2-25.7	53	10	12	4	16	0	4	

TL 73 SE 43 **7844 3042** **Shardlowe's Farm** **Block C**

Surface level +78.0 m (+256 ft)
Water struck at +67.1 m
152 mm, Shell and auger
October 1978

Overburden 3.9 m
Mineral 13.5 m
Bedrock 0.8+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Boulder Clay	Clay, brown with pebbles of chalk and flint	3.8	3.9
Barham Sands and Gravels	**a** 'Clayey' pebbly sand, with clay seams Gravel: fine and coarse, angular flint and rounded quartz with quartzite, some well rounded flint and rounded phosphate nodules Sand: medium and fine with coarse, yellow-brown	5.8	9.7
Kesgrave Sands and Gravels	**b** Sand, with clayey seams Sand: medium and fine, quartz, orange	5.3	15.0
Red Crag	**c** Pebbly sand Gravel: fine and coarse, well rounded and angular flint with rounded quartz, some quartzite and angular ironstone Sand: medium and coarse with fine, quartz and flint, iron-stained	2.4	17.4
London Clay	Clay, micaceous, blue-grey	0.8+	18.2

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 mm
a	14	72	14	3.9-4.7	24	40	32	1	1	2	0
				4.7-5.7	21	32	23	8	12	4	0
				5.7-6.7	15	8	34	9	19	15	0
				6.7-7.7	9	11	60	6	10	4	0
				7.7-8.7	6	9	69	6	7	3	0
				8.7-9.7	9	16	67	2	4	2	0
				Mean	14	19	48	5	9	5	0
b	8	92	0	9.7-10.7	10	12	78	0	0	0	0
				10.7-11.8	Sandy clay						
				11.8-12.8	10	38	52	0	0	0	0
				12.8-15.0	7	39	54	0	0	0	0
				Mean	8	32	60	0	0	0	0
c	3	77	20	15.0-16.0	4	10	41	17	18	10	0
				16.0-17.2	2	13	55	18	10	2	0
				17.2-17.4	No grading data						
				Mean	3	11	49	17	14	6	0
a+b+c	10	80	10	Mean	10	22	52	6	7	3	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	3.9-9.7	46	4	38	7	2	0	0	3
c	15.0-17.4	36	51	10	2	trace	1	0	0

TI 73 SE 44 **7957 3460** **Hopewell's Farm** **Block B**

Surface level +73.9 m (+242 ft)
Water struck at +63.6 m
152 mm, Shell and auger
October 1978

Overburden 2.3 m
Mineral 10.8 m
Bedrock 2.4+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Barham Sands and Gravels	Clay, sandy, orange-brown with flint pebbles	2.1	2.3
	a 'Clayey' pebbly sand Gravel: fine and coarse, angular flint, with rounded quartz, well rounded flint and rounded quartzite Sand: medium and fine with coarse, quartz and flint, orange	1.0	3.3
Kesgrave Sands and Gravels	**b** 'Clayey' sand, with clayey seams Sand: medium and fine with some coarse, quartz, yellow	6.0	9.3
Red Crag	**c** 'Clayey' sand Sand: medium and fine with coarse, quartz, brown	3.8	13.1
London Clay	Clay, silty, olive-grey, top weathered to brown	2.4+	15.5

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 mm
a	12	77	11	2.3-3.3	12	20	52	5	7	4	0
b	10	90	0	3.3-4.3	22	12	60	0	0	0	0
				4.3-5.3	9	36	55	0	0	0	0
				5.3-6.3	6	26	68	0	0	0	0
				6.3-7.3	8	24	68	0	0	0	0
				7.3-8.3	5	38	57	0	0	0	0
				8.3-9.3	12	36	47	5	0	0	0
				Mean	10	29	60	1	0	0	0
c	15	85	0	9.3-10.3	18	23	50	9	0	0	0
				10.3-11.3	17	43	35	5	0	0	0
				11.3-12.3	13	38	46	3	0	0	0
				12.3-13.1	11	25	62	2	0	0	0
				Mean	15	32	48	5	0	0	0
a+b+c	12	87	1	Mean	12	29	55	3	1	0	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	2.3-3.3	60	10	20	5	0	0	trace	5

TL 73 SE 45 **7963 3387** **Purlshill** **Block B**

Surface level +80.8 m (+265 ft)
Water struck at +60.3 m
152 mm, Shell and auger
October 1978

Overburden 2.7 m
Mineral 21.7 m
Bedrock 0.7+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, mottled grey and brown with pebbles of chalk and flint	2.4	2.7
Barham Sands and Gravels	**a** 'Clayey' pebbly sand Gravel: fine and coarse, angular flint with rounded quartz, well rounded flint, rounded quartzite and some angular ironstone Sand: medium with fine and coarse, quartz, orange	5.0	7.7
Kesgrave Sands and Gravels	**b** 'Clayey' sand, with a trace of fine and coarse gravel Sand: fine and medium with some coarse, quartz, orange-yellow	12.6	20.3
Red Crag	**c** Sand Gravel: fine with coarse, angular flint with rounded quartzite, quartz, well rounded flint and some angular ironstone Sand: fine and medium with coarse, iron-stained	4.1	24.4
London Clay	Clay, micaceous, blue-grey, top weathered to brown	0.7+	25.1

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 mm
a	17	64	19	2.7-3.7	24	30	36	2	3	5	0
				3.7-4.7	19	18	32	6	12	13	0
				4.7-5.7	14	7	28	13	25	13	0
				5.7-6.7	17	15	46	6	7	9	0
				6.7-7.7	9	8	72	2	3	6	0
				Mean	17	15	43	6	10	9	0
b	12	88	0	7.7-8.3	11	69	18	1	1	0	0
				8.3-10.3	26	51	23	0	0	0	0
				12.3-12.3	11	29	59	1	0	0	0
				12.3-14.3	14	34	51	1	0	0	0
				14.3-16.3	7	85	8	0	0	0	0
				16.3-18.3	8	37	52	2	0	1	0
				18.3-20.3	9	30	58	3	0	0	0
				Mean	12	46	41	1	0	0	0
c	6	90	4	20.3-22.3	7	46	32	10	4	1	0
				22.3-24.4	6	48	35	8	2	1	0
				Mean	6	47	34	9	3	1	0
a+b+c	12	83	5	Mean	12	39	40	4	3	2	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	2.7-7.7	42	21	25	7	0	1	0	4
c	20.3-24.4	59	9	11	14	0	2	0	5

TL 73 SE 46 **7968 3253** **Foxborough Hill Farm** **Block** B

Surface level +37.9 m (+124 ft)
Water struck at +3.5.5 m
152 mm, Shell and auger
October 1978

Overburden 2.4 m
Mineral 3.4 m
Waste 10.1+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Alluvium	Clay, silty, brown, becoming peaty from 1.2 m	1.9	2.4
	a Sandy gravel, with a sandy silt seam from 3.8 to 4.5 m Gravel: fine and coarse, angular with well rounded flint, rounded quartz, quartzite and some angular ironstone Sand: medium with coarse and fine, quartz, brown	3.4	5.8
Glacial Silt	Silt, laminated, olive-grey with chalk sand from 12.0 m	8.0	13.8
Boulder Clay	Clay, grey with chalk pebbles	2.0	15.8
Glacial Sand and Gravel, upper	**b** 'Clayey' pebbly sand Gravel: fine with coarse, angular flint and rounded chalk with quartz and quartzite Sand: medium with coarse and fine, chalk with flint and quartz, grey	0.1+	15.9
	Borehole terminated due to technical difficulties		

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines	Sand			Gravel		
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	$+1-4$	$+4-16$	$+16-64$	$+64$ mm
a	9	58	33	2.4-3.8	6	10	29	10	28	17	0
				3.8-4.5	Sandy silt						
				4.5-5.8	12	14	41	14	17	2	0
				Mean	9	12	34	12	23	10	0
b	12	69	19	15.8-15.9	12	14	41	14	17	2	0
a + b	7	49	44	Mean	7	11	27	11	27	17	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others.
a	2.4-5.8	67	10	8	4	0	1	0	10
b	15.8-15.9	40	0	7	7	0	0	26	20

TL 73 SE 47 **7949 3142** **Broak's Wood** **Block B**

Surface level +67.6 m (+222 ft)
Water Struck at +64.4 m
152 mm, Shell and auger
September 1978

Overburden 3.2 m
Mineral 1.9 m
Bedrock 1.1+ m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Barham Sands and Gravels	Silt, very sandy with sandy and clay seams	3.0	3.2
	Sandy gravel, with clay seams Gravel: fine and coarse, angular flint and rounded quartz with well rounded flint, rounded quartzite, some phosphatic nodules and chalk Sand: medium with coarse and fine, quartz orange-brown	1.9	5.1
London Clay	Clay, blue-grey, top weathered to brown	1.1+	6.2

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 mm
4	55	41	3.2-4.2	4	10	27	19	25	15	0
			4.2-5.1	5	17	28	7	26	17	0
			Mean	4	14	27	14	25	16	0

COMPOSITION

Depth below surface (m)	percentages by weight in gravel fraction							
	Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
3.2-5.1	43	9	31	7	2	0	1	7

TL 73 SE 48 **7944 3038** **Great Spansey Wood** **Block B**

Surface level +79.9 m (+262 ft)
Water struck at +65.7 m
152 mm, Shell and auger
September 1978

Overburden 9.8 m
Mineral 10.7 m
Waste 0.6 m
Bedrock 1.4+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Boulder Clay	Clay, mottled orange-brown and grey with pebbles of chalk and flint, becoming olive-grey from 4.3 m	9.6	9.8
Barham Sands and Gravels	**a** 'Clayey' pebbly sand Gravel: fine and coarse, angular flint with rounded quartzite, quartz and well rounded flint Sand: medium with fine and coarse, quartz, orange-yellow	3.0	12.8
Kesgrave Sands and Gravels	**b** Sand, with clay seams Gravel: fine, angular flint with rounded quartz, quartzite, well rounded flint and some angular iron-stone Sand: medium with fine and coarse, quartz, yellow	4.0	16.8
Red Crag	**c** Pebbly sand, with pebbly clay from 19.0 to 19.4 m Gravel: fine and coarse, angular and well rounded flint with rounded phosphatic nodules, quartz and quartzite Sand: medium with fine and coarse, quartz, red-brown	3.7	20.5
	Clay with sandy seams and pebbles	0.6	21.1
London Clay	Clay, micaceous, blue-grey, top weathered to brown	1.4+	22.5

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 mm
a	10	77	13	9.8-10.8	12	7	74	2	4	1	0
				10.8-11.8	10	1	58	10	14	7	0
				11.8-12.8	9	9	65	4	8	5	0
				Mean	10	6	66	5	9	4	0
b	7	92	1	12.8-13.8	8	15	76	1	0	0	0
				13.8-14.8	8	20	72	0	0	0	0
				14.8-15.8	6	15	56	22	1	0	0
				15.8-16.8	6	19	69	5	1	0	0
				Mean	7	17	68	7	1	0	0
c	6	85	9	16.8-17.8	3	17	52	15	9	4	0
				17.8-19.0	4	15	64	13	3	1	0
				19.0-19.4	Pebbly clay						
				19.4-20.5	10	13	56	9	8	4	0
				Mean	6	15	58	12	6	3	0
a+b+c	8	85	7	Mean	8	13	64	8	5	2	0

COMPOSITION

	Depth below surface (m)	percentages by weight in gravel fraction							
		Angular flint	Well rounded flint	Quartz	Quartzite	Phosphatic nodules	Ironstone	Chalk	Others
a	9.8-12.8	51	1	15	20	0	0	0	4
b	12.8-16.8	56	5	12	7	0	3	0	17
c	16.8-20.5	49	21	7	4	17	0	0	2

TL 73 SE E1 **7922 3184** **Foxborough Hill Farm** **Block B**

Surface level (+c 76.2 m) +c 250 ft
Water not encountered
Exposure
March 1979

Overburden 5.5 m
Mineral 9.0+

LOG

Geological classification	Lithology	Thickness m	Depth m
Boulder Clay	Clay, brown with pebbles of chalk and flint	2.5	2.5
Barham Sands and Gravels	Clay, sandy, red-brown and light grey with pebbles	3.0	5.5
Kesgrave Sands and Gravels	Pebbly sand Gravel: fine and coarse, predominantly angular flint Sand: medium with fine and coarse, quartz, yellow-orange	9.0+	14.5

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	$+1-4$	$+4-16$	$+16-64$	$+64$ mm
6	87	7	5.5-8.5	9	4	79	6	2	0	0
			8.5-10.5	6	2	50	14	16	12	0
			10.5-14.5	4	27	68	1	0	0	0
			Mean	6	14	68	5	4	3	0

List of other registered boreholes

Borehole	Grid reference
TL 73 NW	
1	7387 3742
3	7263 3652
9	7310 3842
10	7356 3911
24	7359 3992
TL 73 NE	
1	7540 3595
2	7596 3527
3	7688 3643
10	7521 3891
12	7592 3785
14	7639 3852
15	7707 3776
16	7880 3901
17	7777 3947
19	7963 3888
TL 73 SW	
1	7237 3498
2	7289 3383
3	7016 3314
8	729 310
10	7377 3034
TL 73 SE	
3	7805 3476
12	789 327
18	7506 3324
19	7935 3322

APPENDIX F

LIST OF WORKINGS

In 1980 only one sand and gravel pit was known to be operational. All the worked-out areas are shown on the resource map accompanying the report. A list of active and disused workings is given below.

Location	Grid reference	Deposit worked
Active		
Foxborough Hill	793 320	Kesgrave Sands and Gravels
Disused		
Great Yeldham	755 390	Glacial Sands and Gravels, upper
Kilowen Cottages	800 334	Kesgrave Sands and Gravels

REFERENCES

ALLEN, V. T. 1936. Terminology of medium-grained sediments. **Rep. Natl. Res. Counc., Washington, 1935-1936, App. 1, Rep. Comm. Sediment.**, 18-47.

ARCHER, A. A. 1969. Background and problems of an assessment of sand and gravel resources in the United Kingdom. **Proc. 9th Commonw. Min. & Metall. Congr., 1969,** Vol. 2: Mining and petroleum geology, 495-508.

— 1970a. Standardisation of the size classification of naturally occurring particles. **Géotechnique,** Vol. 20, 103-107.

— 1970b. Making the most of metrication. **Quarry Managers' J.**, Vol. 54, No. 6, 223-227.

ATTERBERG, A. 1905. Die rationelle Klassifikation der Sande und Kiese. **Chem. Z.**, Vol. 29, 195-198.

BOSWELL, P. G. H. 1929. The geology of the country around Sudbury, Suffolk. **Mem. Geol. Surv. G. B.**

BRISTOW, C. R., and COX, F. C. 1973. The Gipping Till: a reappraisal of East Anglian glacial stratigraphy. **J. Geol. Soc. London,** Vol. 129, 1-37.

BRITISH STANDARDS INSTITUTION. 1967. **B.S.1377: Methods of testing soils for civil engineering purposes.** (London: British Standards Institution.)

BUREAU OF MINES AND GEOLOGICAL SURVEY. 1948. **Pp. 14-17** in **Mineral resources of the United States.** (Washington, DC: Public Affairs Press.)

HARRIS, P. M., THURRELL, R. G., HEALING, R. A., and ARCHER, A. A. 1974. Aggregates in Britain. **Proc. R. Soc.**, Ser. A, Vol. 339, 329-353.

HESTER, S. W. 1965. Stratigraphy and palaeogeography of the Woolwich and Reading Beds. **Bull. Geol. Surv. G. B.**, No. 23, 117-137.

HEY, R. W. 1980. Equivalents of the Westland Green Gravels in Essex and East Anglia. **Proc. Geol. Assoc.,** Vol 91, 279-289

HULL, J. H. 1981. Methods of calculating the volume of resources of sand and gravel. **Appendix** (pp. 192-193) to **THURRELL, R. G.** 1981. Quarry resources and reserves: the identification of bulk mineral resources: the contribution of the Institute of Geological Sciences. **Quarry Management,** for March 1981, 181-193.

LANE, E. W., and others. 1947. Report of the sub-committee on sediment terminology. **Trans. Am. Geophys. Union,** Vol. 28, 936-938.

PETTIJOHN, F. J. 1957. **Sedimentary rocks.** 2nd edition. (London: Harper and Row.)

ROSE, J., and ALLEN, P. 1977. Middle Pleistocene stratigraphy in south-east Suffolk. **J. Geol. Soc. London,** Vol. 133, 83-103.

THURRELL, R. G. 1971. The assessment of mineral resources with particular reference to sand and gravel. **Quarry Managers' J.**, Vol. 55, 19-25.

— 1981. Quarry resources and reserves: the identification of bulk mineral resources: the contribution of the Institute of Geological Sciences. **Quarry Management,** for March 1981, 181-193.

TWENHOFEL, W. H. 1937. Terminology of the fine-grained mechanical sediments. **Rep. Natl. Res. Counc., Washington, 1936-37,** App. 1, Rep. Comm. Sediment., 81-104.

UDDEN, J. A. 1914. Mechanical composition of clastic sediments. **Bull. Geol. Soc. Am.,** Vol. 25, 655-744.

WENTWORTH, C. K. 1922. A scale of grade and class terms for clastic sediments. **J. Geol.**, Vol. 30, 377-392.

— 1935. The terminology of coarse sediments. **Bull. Natl. Res. Counc. Washington,** No. 98, 225-246.

WHITAKER, W., PENNING., W. H., DALTON, W. H., and BENNETT, F. J. 1878. The geology of the north-west part of Essex and the north-east part of Hertfordshire and parts of Cambridgeshire and Suffolk. **Mem. Geol. Surv. G. B.**

WILLMAN, H. B. 1942. Geology and mineral resources of the Marseilles, Ottawa and Streator quadrangles. **Bull. Illinois State Geol. Surv.**, No. 66, 343-344.

The following reports of the Institute relate particularly to bulk mineral resources

Reports of the Institute of Geological Sciences

Assessment of British Sand and Gravel Resources

1 The sand and gravel resources of the country south-east of Norwich, Norfolk: Resource sheet TG 20.
E. F. P. Nickless.
Report 71/20 ISBN 0 11 880216 X £1.15

2 The sand and gravel resources of the country around Witham, Essex: Resource sheet TL 81. H. J. E. Haggard.
Report 72/6 ISBN 0 11 880588 6 £1.20

3 The sand and gravel resources of the area south and west of Woodbridge, Suffolk: Resource sheet TM 24.
R. Allender and S. E. Hollyer.
Report 72/9 ISBN 0 11 880596 7 £1.70

4 The sand and gravel resources of the country around Maldon, Essex: Resource sheet TL 80. J. D. Ambrose.
Report 73/1 ISBN 0 11 880600 9 £1.20

5 The sand and gravel resources of the country around Hethersett, Norfolk: Resource sheet TG 10.
E. F. P. Nickless.
Report 73/4 ISBN 0 11 880606 8 £1.60

6 The sand and gravel resources of the country around Terling, Essex: Resource sheet TL 71. C. H. Eaton.
Report 73/5 ISBN 0 11 880608 4 £1.20

7 The sand and gravel resources of the country around Layer Breton and Tolleshunt D'Arcy, Essex: Resource sheet TL 91 and part of TL 90. J. D. Ambrose.
Report 73/8 ISBN 0 11 880614 9 £1.30

8 The sand and gravel resources of the country around Shotley and Felixstowe, Suffolk: Resource sheet TM 23.
R. Allender and S. E. Hollyer.
Report 73/13 ISBN 0 11 880625 4 £1.60

9 The sand and gravel resources of the country around Attlebridge, Norfolk: Resource sheet TG 11.
E. F. P. Nickless.
Report 73/15 ISBN 0 11 880658 0 £1.85

10 The sand and gravel resources of the country west of Colchester, Essex: Resource sheet TL 92. J. D. Ambrose.
Report 74/6 ISBN 0 11 880671 8 £1.45

11 The sand and gravel resources of the country around Tattingstone, Suffolk: Resource sheet TM 13. S. E. Hollyer.
Report 74/9 ISBN 0 11 880675 0 £1.95

12 The sand and gravel resources of the country around Gerrards Cross, Buckinghamshire: Resource sheet SU 99, TQ 08 and TQ 09. H. C. Squirrell.
Report 74/14 ISBN 0 11 880710 2 £2.20

Mineral Assessment Reports

13 The sand and gravel resources of the country east of Chelmsford, Essex: Resource sheet TL 70. M. R. Clarke.
ISBN 0 11 880744 7 £3.50

14 The sand and gravel resources of the country east of Colchester, Essex: Resource sheet TM 02. J. D. Ambrose.
ISBN 0 11 880745 5 £3.25

15 The sand and gravel resources of the country around Newton on Trent, Lincolnshire: Resource sheet SK 87.
D. Price.
ISBN 0 11 880746 3 £3.00

16 The sand and gravel resources of the country around Braintree, Essex: Resource sheet TL 72. M. R. Clarke.
ISBN 0 11 880747 1 £3.50

17 The sand and gravel resources of the country around Besthorpe, Nottinghamshire: Resource sheet SK 86 and part of SK 76. J. R. Gozzard.
ISBN 0 11 880748 X £3.00

18 The sand and gravel resources of the Thames Valley, the country around Cricklade, Wiltshire: Resource sheet SU 09/19 and parts of SP 00/10. P. R. Robson.
ISBN 0 11 880749 8 £3.00

19 The sand and gravel resources of the country south of Gainsborough, Lincolnshire: Resource sheet SK 88 and part of SK 78. J. H. Lovell.
ISBN 0 11 880750 1 £2.50

20 The sand and gravel resources of the country east of Newark upon Trent, Nottinghamshire: Resource sheet SK 85.
J. R. Gozzard.
ISBN 0 11 880751 X £2.75

21 The sand and gravel resources of the Thames and Kennet Valleys, the country around Pangbourne, Berkshire: Resource sheet SU 67. H. C. Squirrell.
ISBN 0 11 880752 8 £3.25

22 The sand and gravel resources of the country north-west of Scunthorpe, Humberside: Resource sheet SE 81.
J. W. C. James.
ISBN 0 11 880753 6 £3.00

23 The sand and gravel resources of the Thames Valley, the country between Lechlade and Standlake: Resource sheet SP 30 and parts of SP 20, SU 29 and SU 39. P. Robson.
ISBN 0 11 881252 1 £7.25

24 The sand and gravel resources of the country around Aldermaston, Berkshire: Resource sheet SU 56 and SU 66. H. C. Squirrell.
ISBN 0 11 881253 X £5.00

25 The celestite resources of the area north-east of Bristol: Resource sheet ST 68 and parts of ST 59, 69, 79, 58, 78, 68 and 77. E. F. P. Nickless, S. J. Booth and P. N. Mosley.
ISBN 0 11 881262 9 £5.00

26 The limestone and dolomite resources of the country around Monyash, Derbyshire: Resource sheet SK 16.
F. C. Cox and D. McC. Bridge.
ISBN 0 11 881263 7 £7.00

27 The sand and gravel resources of the country west and south of Lincoln, Lincolnshire: Resource sheets SK 95, SK 96 and SK 97. I. Jackson.
ISBN 0 11 884003 7 £6.00

28 The sand and gravel resources of the country around Eynsham, Oxfordshire: Resource sheet SP 40 and part of SP 41. W. J. R. Harries.
ISBN 0 11 884012 6 £3.00

29 The sand and gravel resources of the country south-west of Scunthorpe, Humberside: Resource sheet SE 80.
J. H. Lovell.
ISBN 0 11 884013 4 £3.50

30 Procedure for the assessment of limestone resources.
F. C. Cox, D. McC. Bridge and J. H. Hull.
ISBN 0 11 884030 4 £1.25

31 The sand and gravel resources of the country west of Newark upon Trent, Nottinghamshire: Resource sheet SK 75.
D. Price and P. J. Rogers.
ISBN 0 11 884031 2 £3.50

32 The sand and gravel resources of the country around Sonning and Henley: Resource sheet SU 77 and SU 78.
H. C. Squirrell.
ISBN 0 11 884032 0 £5.25

33 The sand and gravel resources of the country north of Gainsborough: Resource sheet SK 89. J. R. Gozzard and D. Price
ISBN 0 11 884033 9 £4.50

34 The sand and gravel resources of the Dengie Peninsula, Essex: Resource sheet TL 90, etc. M. B. Simmons.
ISBN 0 11 884081 9 £5.00

35 The sand and gravel resources of the country around Darvel: Resource sheet NS 53, 63, etc. E. F. P. Nickless, A. M. Aitken and A. A. McMillan.
ISBN 0 11 884082 7 £7.00

36 The sand and gravel resources of the country around Southend-on-Sea, Essex: Resource sheets TQ 78, 79 etc. S. E. Hollyer and M. B. Simmons.
ISBN 0 11 884083 5 £7.50

37 The sand and gravel resources of the country around Bawtry, South Yorkshire: Resource sheet SK 69. A. R. Clayton
ISBN 0 11 884053 3 £5.75

38 The sand and gravel resources of the country around Abingdon, Oxfordshire: Resource sheet SU 49, 59, SP 40, 50. C. E. Corser.
ISBN 0 11 884084 5 £5.50

39 The sand and gravel resources of the Blackwater Valley (Aldershot) area: Resource sheet SU 85, 86, parts SU 84, 94, 95, 96. M. R. Clarke, A. J. Dixon and M. Kubala.
ISBN 0 11 884085 1 £7.00

40 The sand and gravel resources of the country west of Darlington, County Durham: Resource sheet NZ 11, 21. A. Smith.
ISBN 0 11 884086 X £5.00

41 The sand and gravel resources of the country around Garmouth, Grampian Region: Resource sheet NJ 36. A. M. Aitken, J. W. Merritt and A. J. Shaw.
ISBN 0 11 884090 8 £8.75

42 The sand and gravel resources of the country around Maidenhead and Marlow: Resource sheet SU 88, parts SU 87, 97, 98. P. N. Dunkley.
ISBN 0 11 884091 6 £5.00

43 The sand and gravel resources of the country around Misterton, Nottinghamshire: Resource sheet SK 79. D. Thomas and D. Price.
ISBN 0 11 884092 4 £5.25

44 The sand and gravel resources of the country around Sedgefield, Durham: Resource sheet NZ 32. M. D. A. Samuel.
ISBN 0 11 884093 2 £5.75

45 The sand and gravel resources of the country around Brampton, Cumbria: Resource sheet NY 55, part 56. I. Jackson.
ISBN 0 11 884094 0 £6.75

46 The sand and gravel resources of the country around Harlow, Essex: Resource sheet TL 41. P. M. Hopson.
ISBN 0 11 884107 6 £9.50

47 The limestone and dolomite resources of the country around Wirksworth, Derbyshire: Resource sheet SK 25, part 35. F. C. Cox and D. J. Harrison.
ISBN 0 11 884108 4 £15.00

48 The sand and gravel resources of the Loddon Valley area: Resource sheet SU 75, 76, parts 64, 65, 66 and 74. M. R. Clarke, E. J. Raynor and R. A. Sobey.
ISBN 0 11 884109 2 £8.75

49 The sand and gravel resources of the country around Lanark, Strathclyde Region: Resource sheet NS 94, part 84. J. L. Laxton and E. F. P. Nickless.
ISBN 0 11 884112 2 £11.00

50 The sand and gravel resources of the country around Fordingbridge, Hampshire: Resource sheet SU 11 and parts of SU 00, 01, 10, 20 and 21. M. Kubala.
ISBN 0 11 884111 4 £7.75

51 The sand and gravel resources of the country north of Bournemouth, Dorset: Resource sheet SU 00, 10, 20, SZ 09, 19 and 29. M. R. Clarke.
ISBN 0 11 884110 6 £9.75

52 The sand and gravel resources of the country between Hatfield Heath and Great Waltham, Essex: Resource sheet TL 51 and 61. R. J. Marks.
ISBN 0 11 884113 0 £8.00

53 The sand and gravel resources of the country around Cottenham, Cambridgeshire: Resource sheet TL 46 and 47. A. J. Dixon.
ISBN 0 11 884114 9 £9.25

54 The sand and gravel resources of the country around Huntingdon and St Ives. Cambridgeshire: Resource sheets TL 16, 17, 26, 27, 36 and 37. R. W. Gatliff.
ISBN 0 11 884115 7 £8.75

55 The sand and gravel resources of the country around Ipswich, Suffolk: Resource sheet TM 14. R. Allender and S. E. Hollyer.
ISBN 0 11 884116 5 £10.00

56 Procedure for the assessment of the conglomerate resources of the Sherwood Sandstone Group. D. P. Piper and P. J. Rodgers.
ISBN 0 11 884143 2 £1.25

57 The conglomerate resources of the Sherwood Sandstone Group of the country around Cheadle, Staffordshire: Resource sheet SK 04. P. J. Rogers, D. P. Piper and T. J. Charsley.
ISBN 0 11 884144 0 *not yet priced*

58 The sand and gravel resources of the country west of Peterhead, Grampian Region: Resource sheet NK 04 and parts of NJ 94 and 95, NK 05, 14 and 15. A. A. McMillan and A. M. Aitken.
ISBN 0 11 884145 9 £12.00

59 The sand and gravel resources of the country around Newbury, Berkshire: Resource sheet SU 46 and 57, parts of SU 36, 37 and 47. J. R. Gozzard.
ISBN 0 11 884146 7 *not yet priced*

60 The sand and gravel resources of the country south-west of Peterborough, in Cambridgeshire and east Northamptonshire: Resource sheet TL 09 and 19 and SP 98 and TL 08. A. M. Harrisson.
ISBN 0 11 884147 5 £15.50

61 The sand and gravel resources of the country north of Wrexham, Clwyd: Resource sheet SJ 35 and part of SJ 25. P. N. Dunkley.
ISBN 0 11 884148 3 £11.75

62 The sand and gravel resources of the country around Dolphinton, Strathclyde Region, and West Linton, Borders Region: Resource sheet NT 04 and 14, parts of NT 05 and 15. A. A. McMillan, J. L. Laxton and A. J. Shaw.
ISBN 0 11 884149 1 £8.00

63 The sand and gravel resources of the valley of the Douglas Water, Strathclyde: Resource sheet NS 83 and parts of NS 82, 92 and 93. A. J. Shaw and E. F. P. Nickless.
ISBN 0 11 884150 5 £11.50

64 The sand and gravel resources of the country between Wallingford and Goring, Oxfordshire: Resource sheet SU 68 and part of SU 58. C. E. Corser.
ISBN 0 11 884151 3 *not yet priced*

65 The sand and gravel resources of the country around Hexham, Northumberland: Resource sheet NY 86 and 96. J. H. Lovell.
ISBN 0 11 884152 1 £7.50

66 The sand and gravel resources of the country west of Chelmsford, Essex: Resource sheet TL 60. P. M. Hopson.
ISBN 0 11 884153 X £8.50

67 The sand and gravel resources of the country around Hatfield and Cheshunt, Hertfordshire: Resource sheet TL 20 and 30, and parts of TQ 29 and 39. J. R. Gozzard.
ISBN 0 11 884167 X £10.00

68 The sand and gravel resources of the country north-east of Halstead, Essex: Resource sheet TL 83. R. J. Marks and J. W. Merritt.
ISBN 0 11 884168 8 £13.25

69 The sand and gravel resources of the country around Welwyn Garden City. Hertfordshire: Resource sheet TL 11 and 21. J. R. Gozzard.
ISBN 0 11 884169 6 £10.50

70 The sand and gravel resources of the country east of Harrogate, North Yorkshire: Resource sheet SE 35. D. L. Dundas.
ISBN 0 11 884170 7 £9.50

71 The sand and gravel resources of the country around Hemel Hempstead, St Albans and Watford: Resource sheet TL 00 and 10, and parts of TQ 09 and 19.
W. J. R. Harries, S. E. Hollyer and P. M. Hopson.
ISBN 0 11 884171 8 *not yet priced*

72 The sand and gravel resources of the country around Bury St Edmunds Suffolk: Resource sheet TL 86.
M. P. Hawkins.
ISBN 0 11 884172 6 £10.50

73 The sand and gravel resources of the country between Ely and Cambridge, Cambridgeshire: Resource sheet TL 56, 57.
A. R. Clayton.
ISBN 0 11 884173 4 £9.50

74 The sand and gravel resources of the country around Blaydon, Tyne and Wear: Resource sheet NZ 06, 16.
J. R. A. Giles.
ISBN 0 11 884174 2 *not yet priced*

75 The sand and gravel resources of the country around Stokesley, North Yorkshire: Resource sheet NZ 40, 50 and parts 41, 51. R. G. Crofts.
ISBN 0 11 884175 0 *not yet priced*

76 The sand and gravel resources of the country around Ellon, Grampian Region: Resource sheets NJ 93 with parts of NJ 82, 83 and 92 and NK 03 with parts of NK 02 and 13.
J. W. Merritt.
ISBN 0 11 884176 9 £15.00

77 The limestone and dolomite resources of the country around Buxton, Derbyshire: Resource sheet SK 07 and parts of SK 06 and 08. D. J. Harrison.
ISBN 0 11 884177 7 *not yet priced*

78 The sand and gravel resources of the country west of Boroughbridge, North Yorkshire: Resource sheet SE 30.
D. A. Abraham.
ISBN 0 11 884178 5 *not yet priced*

79 The limestone and dolomite resources of the country around Bakewell, Derbyshire: Resource sheet SK 26 and part of SK 27. D. McC. Bridge and J. R. Gozzard.
ISBN 0 11 884179 3 *not yet priced*

80 The sand and gravel resources of the country between Stamford and Peterborough: Resource sheet TF 00 and 10.
S. J. Booth.
ISBN 0 11 884180 7 *not yet priced*

81 The sand and gravel resources of the Thames and Thame valleys, the country around Dorchester and Watlington, Oxfordshire: Resource sheet SU 69 and part 59.
C. E. Corser.
ISBN 0 11 884204 8 *not yet priced*

82 The sand and gravel resources of the country around Sible Hedingham, Essex: Resource sheet TL 73. R. J. Marks and D. W. Murray.
ISBN 0 11 884205 6 £10.75

Reports of the Institute of Geological Sciences

Other Reports

69/9 Sand and gravel resources of the Inner Moray Firth.
A. L. Harris and J. D. Peacock.
ISBN 0 11 880106 6 35p

70/4 Sands and gravels of the southern counties of Scotland.
G. A. Goodlet.
ISBN 0 11 880105 8 90p

72/8 The use and resources of moulding sand in Northern Ireland. R. A. Old.
ISBN 0 11 881594 0 30p

73/9 The superficial deposits of the Firth of Clyde and its sea lochs. C. E. Deegan, R. Kirby, I. Rae and R. Floyd.
ISBN 0 11 880617 3 95p

77/1 Sources of aggregate in Northern Ireland (2nd edition).
I. B. Cameron.
ISBN 0 11 881279 3 70p

77/2 Sand and gravel resources of the Grampian Region.
J. D. Peacock and others.
ISBN 0 11 881282 3 80p

77/5 Sand and gravel resources of the Fife Region.
M. A. E. Browne.
ISBN 0 11 884004 5 60p

77/6 Sand and gravel resources of the Tayside Region.
I. B. Paterson.
ISBN 0 11 884008 8 £1.40

77/8 Sand and gravel resources of the Strathclyde Region.
I. B. Cameron and others.
ISBN 0 11 884028 2 £2.50

77/9 Sand and gravel resources of the Central Region, Scotland. M. A. E. Browne.
ISBN 0 11 884016 9 £1.35

77/19 Sand and gravel resources of the Borders Region, Scotland. A. D. McAdam.
ISBN 0 11 884025 8 £1.00

77/22 Sand and gravel resources of the Dumfries and Galloway Region of Scotland. I. B. Cameron.
ISBN 0 11 884021 5 £1.20

78/1 Sand and gravels of the Lothian Region of Scotland.
A. D. McAdam.
ISBN 0 11 884042 8 £1.00

78/8 Sand and gravel resources of the Highland Region.
W. Mykura, D. L. Ross and F. May.
ISBN 0 11 884050 9 £3.00

Dd 696465 K8

Typeset for the Institute of Geological Sciences by Willsons Printers (Leicester) Limited

Printed in England for Her Majesty's Stationery Office by Commercial Colour Press, London E7

INSTITUTE OF GEOLOGICAL SCIENCES

INDUSTRIAL MINERALS ASSESSMENT UNIT

THE SAND AND GRAVEL RESOURCES OF THE COUNTRY AROUND SIBLE HEDINGHAM, ESSEX

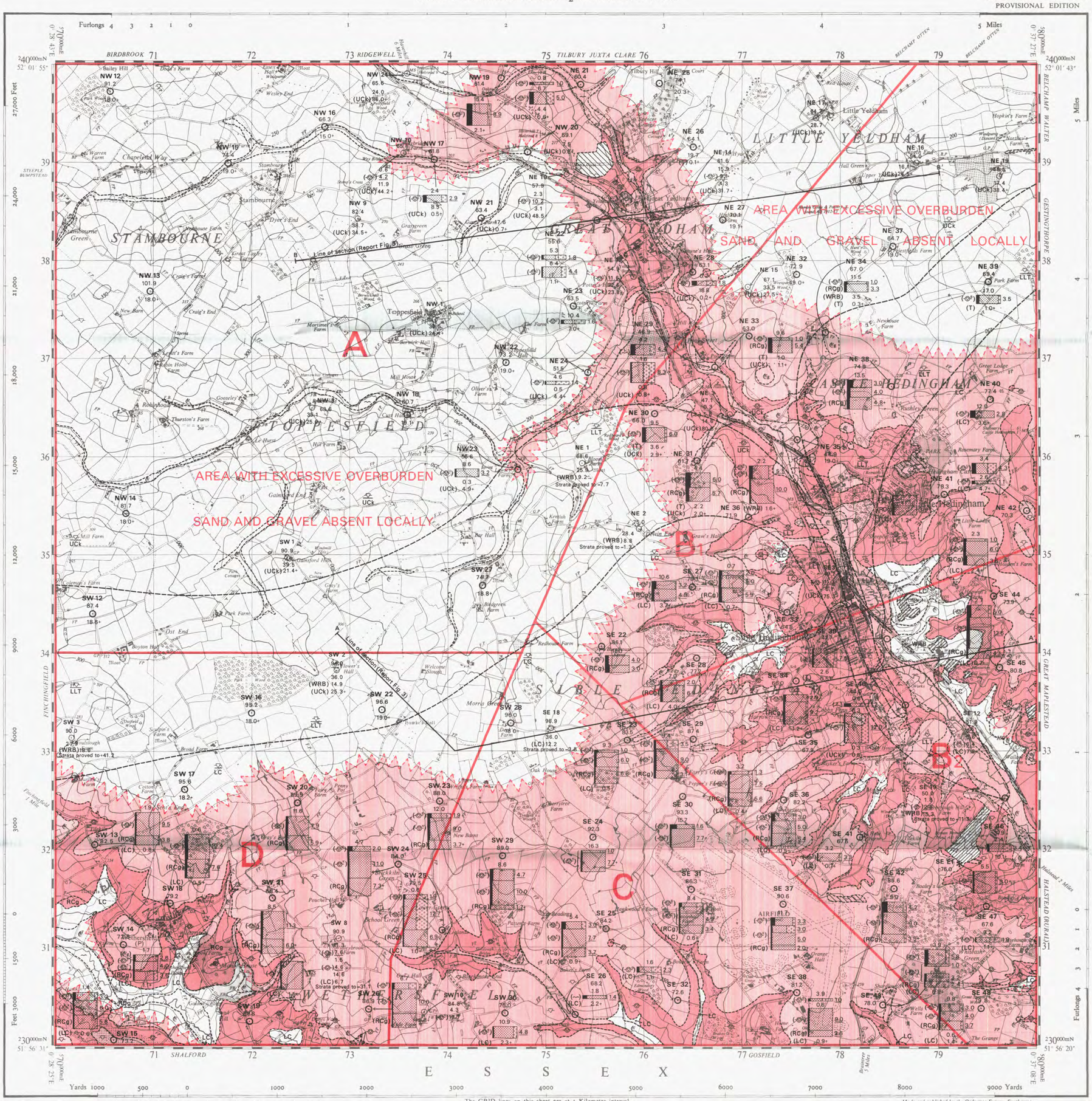
THE SAND & GRAVEL RESOURCES OF SHEET TL 73
(SIBLE HEDINGHAM, ESSEX)

82

Scale 1:25 000 or about 2½ Inches to 1 Mile

ORDNANCE SURVEY
SHEET TL 73
PROVISIONAL EDITION

This map should be read in conjunction with the accompanying report which contains details of the assessment of the resources.



EXPLANATION OF SYMBOLS AND ABBREVIATIONS

Landslip L-1

DRIFT

Alluvium - silts, clays and peats with basal sand and gravel A-20

River Terrace Deposits - clayey sandy gravel with pebbles of flint and quartz
- **1st Terrace** 1T-31
- **2nd Terrace** 2T-23

Head - poorly sorted pebbly sandy clay H-33

Head Gravel - poorly sorted clayey sandy gravel and pebbly sandy clay H-34

Boulder Clay - brown and grey clay with pebbles of chalk and flint. BC-30

Glacial Silt - clayey sandy silt, often laminated, with flecks of chalk GSI-5

Glacial Sand and Gravel, upper - poorly sorted clayey sandy gravel to clayey sand with pebbles of chalk and flint GS-57

Barham Sands and Gravels - clayey pebbly sand with flint pebbles BSG-2

Kesgrave Sands and Gravels - medium and fine micaceous sand K-3

Upper Glacial Sand and Gravel, Barham Sands and Gravels, Kesgrave Sands and Gravels and Red Crag undivided - while individual deposits are identified in I.M.A.U. borehole records, they are generally mapped as an individual unit apart from where a positive identification could be made

SOLID

Red Crag - red-brown sand with some pebbles NC-3

London Clay - olive grey silty clay

Lower London Tertiaries - sands, silts and clays
- **Woolwich and Reading Beds**
- **Thanet Beds** (proved only in boreholes)

Upper Chalk - soft white limestone (proved only in boreholes)

RECENT AND PLEISTOCENE

EOCENE PALAEOCENE CRETACEOUS

UCk The superposition of symbols indicates the deposit at the surface (▽) and the solid formation (UCk) beneath the drift; other drift deposits may intervene.

Made Ground

Worked-out Area

BOUNDARY LINES

Geological boundary, Drift

Geological boundary, Solid

Inferred boundary between recognised categories of deposits

Resource Block boundary

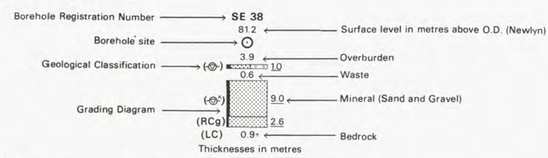
BOREHOLE DATA

SITE LOCATIONS

Industrial Minerals Assessment Unit (I.M.A.U.) Boreholes

Other Boreholes

I.M.A.U. BOREHOLES



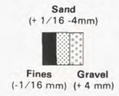
Note:
(i) Figures underlined denote thicknesses used in the assessment of resources
(ii) The + sign indicates that the base of the deposit was not reached
(iii) The Geological Classification is given only for mineral and bedrock

Borehole Registration Number

Each I.M.A.U. borehole is identified by a Registration Number, e.g. SE 38. The letters refer to the quarter sheet and the figures to the I.G.S. serial number for that quarter. The unique designation for the borehole SE 38 is TL 73 SE 38.

Grading Diagrams

Each grading diagram shows the mean particle size distribution of a distinct deposit of 'sand and gravel'



The height of the diagram is proportional to the mineral thickness

The widths of the divisions shows the proportions of **Fines, Sand** and **Gravel**

OTHER BOREHOLES

The layout of information is the same as for I.M.A.U. boreholes although data available may not be as comprehensive. They are registered in the same series. The final depth of deep boreholes is given in metres above (+) or below (-) O.D. (Newlyn).

EXPOSURE RECORDS

Information from the inspection of exposures is shown in the same way as for boreholes but they are located by an asterisk, thus *. Reference number and details of thickness are shown

CATEGORIES OF DEPOSITS

Exposed mineral (average thickness of overburden less than 1.0m) CAT-E1

Continuous or almost continuous spreads of mineral beneath overburden (average thickness of overburden greater than 1.0m) CAT-C3

Sand and Gravel either not potentially workable (see Report) or absent CAT-A2

RESOURCE BLOCKS

For the purpose of assessment the mineral-bearing land is divided into Resource Blocks (see Report). Each is designated by a letter.

Schematic sections showing the general relationships of deposits along lines AA' and BB' constitute Fig. 3 of report.

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

The representation on this map of a Road, Track, or Footpath, is no evidence of the existence of a right of way.

The GRID lines on this sheet are at 1 Kilometre interval.
Heights are in feet above Mean Sea Level at Newlyn.
Contours values are in feet.
1 square inch on this map represents 99.659 acres on the ground.

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

Compiled from 6" sheets last fully revised 1919-24.
Other partial systematic revision 1938-54 has been incorporated.

Made and published by the Ordnance Survey, Southampton.

TL 64 205	TL 74 206	TL 84
TL 63	TL 73	TL 83
TL 62 222	TL 72 223	TL 82

Diagram showing the relation of the National Grid 1:25000 sheets with the One-Inch Geological Sheets 223, 222, 205 and 206.

Geological lines from six-inch survey by M.J. Heath and S.R. Mills in 1974-75. W.A. Read, District Geologist
Included in One-Inch Geological Sheets 206 and 223

Sand and Gravel Survey by R.J. Marks, P.M. Hopson, D.W. Murray and J.H. Lovell in 1978.
R.G. Thurrell, Head, Industrial Minerals Assessment Unit.

1:25000 Sand and Gravel Resource Sheet published 1981.
G.M. Brown, D. Sc., F.R.S., Director, Institute of Geological Sciences.

Drawn and printed for the Institute of Geological Sciences, by Cook Hammond & Kell Ltd., Mitcham and Westminster