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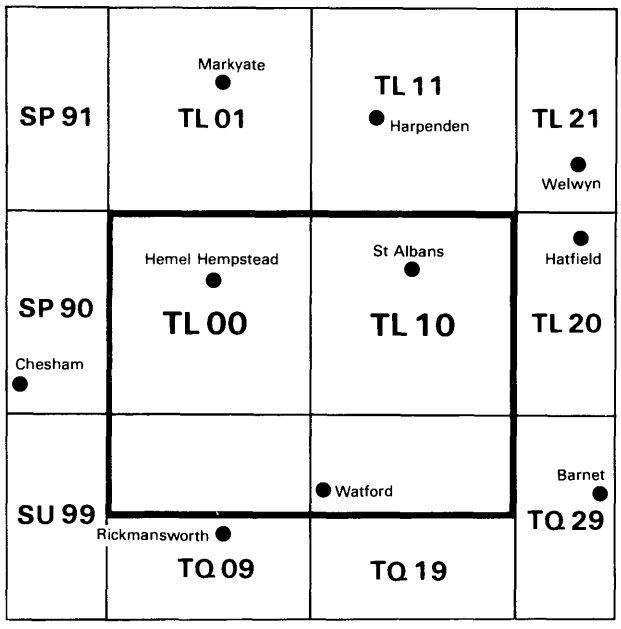

The sand and gravel resources of the country around Hemel Hempstead, St Albans and Watford, Hertfordshire

Description of 1:25 000 sheets TL 00, TL 10 and parts of TQ 09 and TQ 19

W. J. R. Harries, S. E. Hollyer and P. M. Hopson

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

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

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The asterisk on the cover indicates that parts of sheets adjacent to those cited are described in this report.

PREFACE

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

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

This report describes the sand and gravel resources of 300 km^2 of country shown on the accompanying 1:25 000 resource map. The survey was conducted in 1972–73 by Mr C. H. Eaton, assisted by Mr D. R. Parker as field officer who supervised the drilling and sampling programme. The report was compiled by Dr W. J. R. Harries, Mr S. E. Hollyer and Mr P. M. Hopson.

The work is based on a geological survey at 1:10 560 scale carried out between 1898 and 1922 and published between 1922 and 1925 as new-series one-inch sheets 238 (Aylesbury), 239 (Hertford), 255 (Beaconsfield) and 256 (North London).

Mr J. W. Gardner, CBE (Land Agent), has been responsible for negotiating access to land for drilling. The ready cooperation of landowners and tenants in this work is gratefully acknowledged.

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Description of 1:25 000 sheets TL 00, TL 10 and parts of TQ 09 and TQ 19

W. J. R. HARRIES, S. E. HOLLYER and P. M. HOPSON

SUMMARY

The geological maps of the Institute of Geological Sciences, pre-existing borehole information and 91 boreholes drilled for the Industrial Minerals Assessment Unit form the basis of the assessment of sand and gravel resources in the neighbourhood of Hemel Hempstead, St Albans and Watford in Hertfordshire.

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

The 1:25 000 maps are divided into 6 resource blocks, containing between 1.7 and 16.4 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 positions of the boreholes and the outlines of the resource blocks are shown on the accompanying map.

Bibliographic reference
HARRIES, W. J. R., HOLLYER, S. E., and HOPSON, P. M. 1982. The sand and gravel resources of the country around Hemel Hempstead, St Albans and Watford, Hertfordshire. Description of 1:25 000 sheets TL 00, TL 10 and parts of TQ 09 and TQ 19. *Miner. Assess. Rep. Inst. Geol. Sci.*, No. 71.

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INTRODUCTION

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

The survey provides information at the 'indicated' level "for which tonnage and grade are computed partly from specific measurements, samples or production data and partly from projection for a reasonable distance on geologic evidence. The sites available for inspection, measurement, and sampling are too widely or 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 one metre 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 BS sieve, about 1/16 mm) should not exceed 40 per cent.
d The deposit must lie within 25 m of the surface, this being taken as the likely maximum working depth under most circumstances. It follows from the second criterion that boreholes are drilled no deeper than 18 m if no sand and gravel has been proved.

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

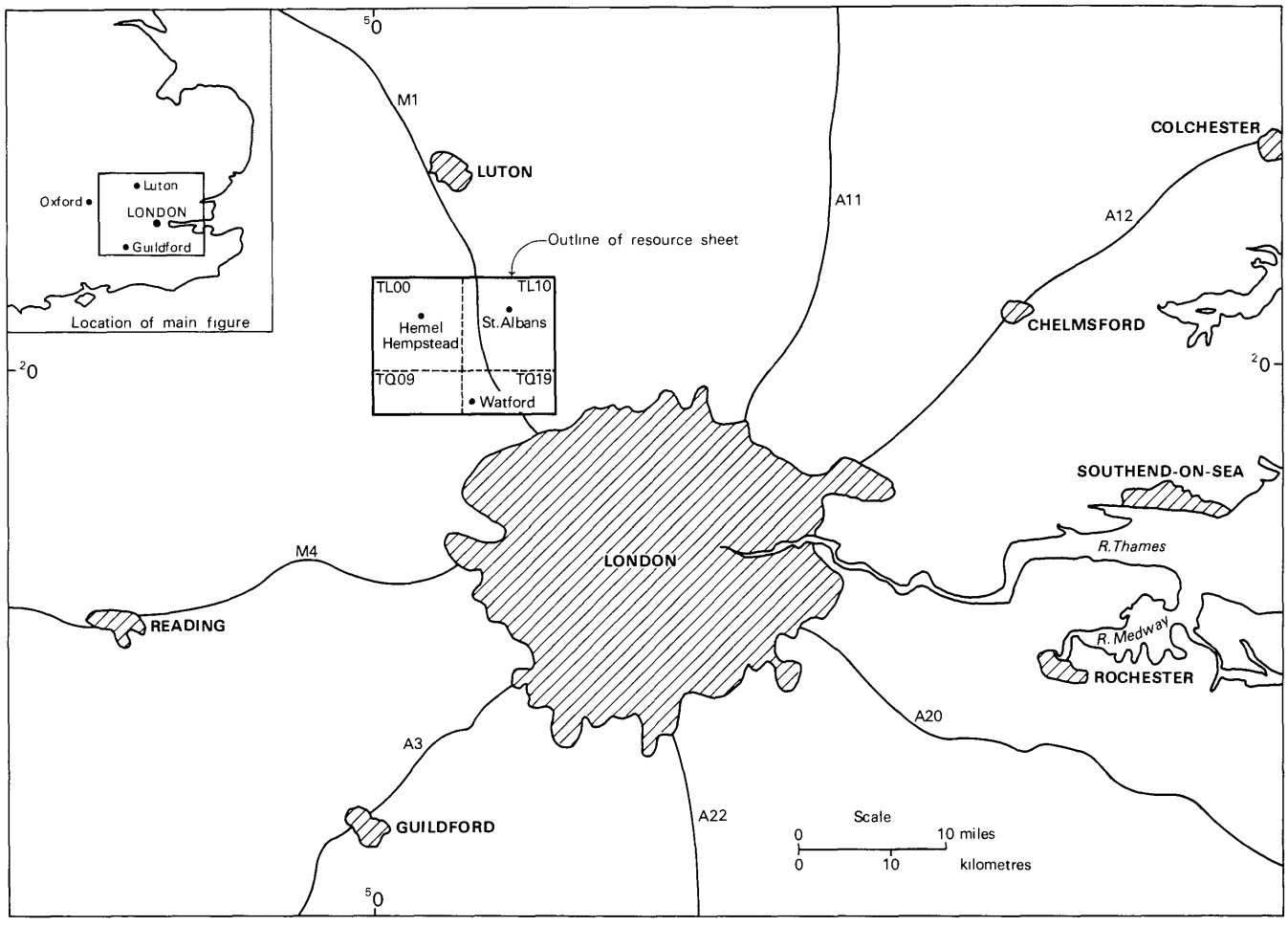


Figure 1 Location of the resource sheet.

For the particular needs of assessing sand and gravel resources, a grain-size classification based on the geometric scale 1/16 mm, 1/4 mm, 1 mm, 4 mm, 16 mm has been adopted. The boundaries between fines (that is, the clay and silt fractions) and sand, and between sand and gravel grade material, are placed at 1/16 mm and 4 mm respectively (see Appendix C).

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 and high agricultural or landscape value, which might stand in the way of sand and gravel being exploited, although towns are excluded. The estimated total volume therefore bears no simple relationship to the amount that could be extracted in practice.

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

DESCRIPTION OF THE RESOURCE SHEET

GENERAL

This area, which lies immediately north-west of London (see Figure 1), has become a dormitory for a large commuting population, but light engineering (principally around Watford) and mixed farming are the main local industries.

The resource sheet covers 300 km^2 of Hertfordshire around Hemel Hempstead, St Albans and Watford. These large urban areas, together with the small towns of Borehamwood, Chorleywood, Kings Langley, London Colney and Radlett cover 92.8 km^2. Of the remaining 207.2 km^2 of the resource sheet, 139.8 km^2, principally in the north-west around Hemel Hempstead and in the south-east around Aldenham, is barren ground and 67.4 km^2 contains potentially workable sand and gravel.

TOPOGRAPHY

The Vale of St Albans, into which all the main rivers flow, separates the Chalk upland to the north-west from the Tertiary escarpment to the south-east. The Chalk upland in the vicinity of Hemel Hempstead and Bovingdon forms part of the dip slope of the Chiltern Hills and reaches a maximum height of 170.1 m above Ordnance Datum in the north-west near Berkhampstead, from whence it slopes gently to the south-east. The rivers Chess, Bulbourne, Gade and Ver flow down this slope in incised V-shaped valleys to join the River Colne, which flows south-westwards along the foot of the Tertiary escarpment through the Vale of St Albans.

To the south-east of the Vale, the crest of the Tertiary escarpment, which lies generally at about 91 m above Ordnance Datum, carries patches of Pebble Gravel, which form low rounded hills rising well above the escarpment to about 145 m, for example, Elstree Hill [TQ 183 950] and Shenley Hill [TL 190 001].

The River Bulbourne and the lower reaches of the River Gade, from Berkhampstead through Hemel Hempstead to Watford, have been extensively canalised to form the Grand Union Canal.

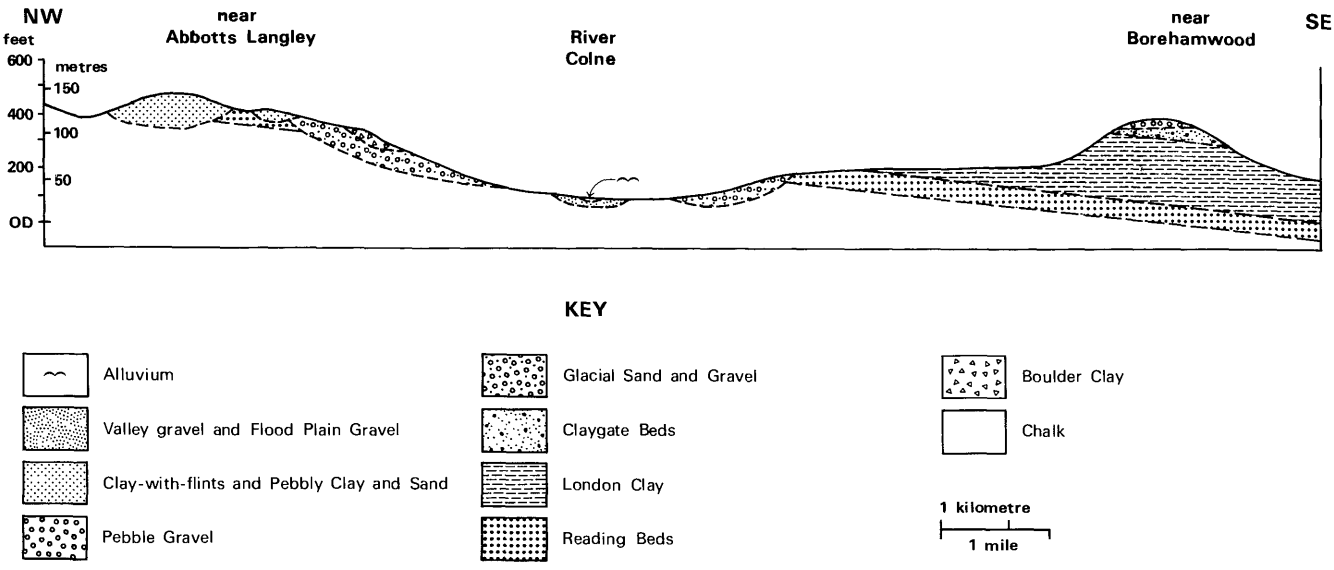


Figure 2 Diagrammatic section showing the general relationships of the strata.

GEOLOGY

The solid rocks, which dip gently south-eastwards, range in age from the Upper Cretaceous Middle Chalk to the Eocene Claygate Beds; they are concealed in places by a veneer of glacial and fluvial deposits of Pleistocene and Recent age (Sherlock and Pocock, 1924; Sherlock, 1960; Gibbard, 1977). The deposits are listed in Table 1 in order of increasing age and their general relationship to each other and to the topography is shown in the horizontal section, Figure 2.

Table 1 Classification of the solid and drift formations

DRIFT
Pleistocene and Recent
Alluvium
Flood Plain Gravel
Brickearth
Valley Gravel
Boulder Clay
Glacial Sand and Gravel
Clay-with-flints
Pebbly Clay and Sand
Pebble Gravel
SOLID
Lower Tertiary (Palaeocene to Eocene)
Claygate Beds
London Clay
Reading Beds
Upper Cretaceous (Turonian to Campanian)
Upper Chalk
Chalk Rock
Middle Chalk

To the north-west of the River Colne, the Middle and Upper Chalk generally form the bedrock to the younger, relatively unconsolidated Drift deposits, though outliers of Reading Beds intervene in some places, for example in the vicinity of Bedmond [TL 091 036]. To the south-east of the Colne the Chalk is overlain by the Reading Beds, the London Clay and the Claygate Beds, which form a dissected escarpment trending south-west to north-east between Watford and Shenley [TL 175 011].

SOLID

Chalk The Middle Chalk is massive, well-jointed white limestone with seams of scattered nodular flints, which become more prominent towards the top. It is separated from the overlying Upper Chalk by the Chalk Rock, which consists of one or more thin beds of hard creamy limestone, usually with disseminated dark green glauconite grains; it forms a prominent feature in the valleys of the Gade, Bulbourne and Chess.

The Upper Chalk is commonly massive, soft, white or occasionally iron-stained limestone with seams of nodular and tabular flint throughout. The surface of the Chalk, on which the Lower Tertiary strata rest unconformably dips very gently (at about 1°) towards the south-east. In some localities, for example near Abbots Langley and Chorleywood, the Chalk surface has been modified by solution effects, and depressions may be filled with Tertiary and Pleistocene debris (see, for example, the log of borehole 10 NW 37 [TL 1210 0700]).

Reading Beds The Reading Beds, which dip south-eastwards beneath the younger Eocene formations, crop out in a narrow strip extending from Oxhey [TQ 124 952] north-eastwards to Shenley [TL 175 011] and remain as outliers beneath drift deposits near Abbots Langley [TL 090 020], Hemel Hempstead and Chorleywood. These beds generally comprise stiff, waxy, multi-coloured, silty sandy clay overlying brown or greenish brown very clayey sand. Their base is marked by a bed of nodular flint cobbles, the 'Bottom Bed', which exceptionally contains small oyster shells (borehole 10 SW 16 [TL 1068 0433]). The maximum thickness proved in an IMAU borehole is 10.6 m in borehole 10 SE 14 [TL 1968 0433], but the Reading Beds are known to thicken towards the south-east (in the vicinity of Borehamwood).

London Clay The London Clay, which forms the upper slopes of the Tertiary escarpment and passes under Borehamwood, typically comprises dark bluish grey and grey silty clay, with subordinate sandy silty clay seams, containing scattered mica flakes, pyrite nodules and beds of septaria. Near the surface the formation weathers readily: oxidised pyrite nodules in the presence

of carbonate have given rise locally to secondary crystalline selenite and the clays take on a generally pale yellowish brown to deep ochreous brown colour, commonly to a depth exceeding 5 m. For example, 6.4 m of brown silty clay was proved in IMAU borehole 19 NE 22 [TQ 1969 9891].

Claygate Beds The London Clay passes up gradually into the Claygate Beds, which consist of pale brown, often finely laminated, evenly bedded and micaceous silty fine sand and sandy silty clay. Only the lowest members of the Claygate Beds are represented: they occupy ground to the south of Borehamwood in the extreme south-east of the resource sheet.

DRIFT

Pebble Gravel The Pebble Gravel consists generally of a thin pale brown and grey mottled clay with varying amounts of sand and well-rounded flint pebbles, resting on sporadically sandy 'clayey' gravel. The gravel contains predominantly well-rounded flint (derived from Eocene pebble beds), some subangular flint and a trace of quartz pebbles with varying amounts of medium subangular quartz sand.

Small patches of Pebble Gravel, of early Pleistocene age, resting on the Tertiary beds, have been mapped on a level plane (the Pebble Gravel Platform of Wooldridge) at approximately 122 m above Ordnance Datum in the vicinity of Borehamwood. Boreholes 10 SE 13 [TL 1929 0078] and 19 NE 21 [TQ 1927 9968] near Shenley proved 3.3 m and 4.0 m of Pebble Gravel respectively.

Clay-with-flints and associated *Pebbly Clay and Sand* These deposits cap the high ground on the Chalk dip slope to the north-west of the Vale of St Albans. The Clay-with-flints consists of a basal reddish brown, often manganese-stained, clay containing nodular flints. This is overlain by sandy clay containing unweathered flint cobbles (locally derived directly from the Chalk) and a small proportion of well-rounded flint pebbles (derived from Eocene pebble beds).

The Clay-with-flints passes laterally, commonly downslope, into the Pebbly Clay and Sand; this deposit differs from Clay-with-flints in containing up to 50 per cent of rounded Tertiary flint (Sherlock, 1924) and varying amounts of angular flint sand and in being black- and brown-mottled. Both deposits lack exotic constituents and appear to be local in origin.

Boulder Clay and associated *Glacial Sand and Gravel* These deposits occupy a tract of low ground approximately 9 km wide, extending across the area from north-east to south-west. They are found on the lowest part of the Chalk dip slope and are bounded to the south-east by the lower slopes of the Tertiary escarpment.

The Boulder Clay ranges in proved thickness from 0.3 m in borehole 10 NE 15 [TL 1946 0865] to a maximum thickness of 9.2 m in borehole 10 SE 12 [TL 1967 0306]. It consists of chalk pellets, pebbles of flint, quartz and quartzite and, rarely, exotic rock types such as schist, set in a matrix of dark grey silty clay. Occasionally the Boulder Clay is sandy and weathers at the surface to firm, commonly decalcified, pebbly brown clay.

The Glacial Sand and Gravel ranges in thickness from 1.2 m, found in borehole 09 NE 8 [TQ 0865 9758], to 13.7 m in Hydrogeology Unit record 239/339 [TL 1940 0796]. It is the most extensive potentially workable mineral formation in the area and consists of angular to subangular flint, quartz and quartzite with subordinate chert, jasper and chalk.

The relationship between Boulder Clay and Glacial Sand and Gravel is complex and reflects a varying glacial environment. Boulder Clay usually overlies the Glacial Sand and Gravel but may also occur as lenses within it, as was shown, for example, by borehole 10 NE 14 [TL 1946 0966]. In boreholes 10 SE 10 [TL 1968 0433] and 10 SE 11 [TL 1877 0238] Boulder Clay underlies the Glacial Sand and Gravel to rest directly on the Chalk.

Valley Gravel Valley Gravel, a term which includes all the undivided terrace deposits, occurs along all the main river valleys as discontinuous spreads adjacent to the Alluvium of the present-day flood plains. It consists of fine and coarse, subangular to rounded flint with subrounded quartz and quartzite pebbles. The Valley Gravel ranges in thickness from 1.2 m in borehole 00 SE 21 [TL 0705 0366] to 6.7 m in borehole 10 NW 32 [TL 1265 0825].

In the valleys of the rivers Colne and Ver, south of St Albans, the Valley Gravel appears to include resorted Glacial Sand and Gravel and unworn nodular flint cobbles derived from the Chalk.

Brickearth The only recorded occurrence of Brickearth is in the area of Radlett Aerodrome [TL 155 037] where a veneer of brown and grey sandy silty clay overlies Valley Gravel.

Flood Plain Gravel The Flood Plain Gravel extends in a narrrow tract from Little Organ Hall [TQ 178 985] southwards to Tykes Water Lake [TQ 174 964]. Boreholes 19 NE 19 [TQ 1779 9852] and 19 NE 20 [TQ 1767 9763] prove thicknesses of 0.8 m and 1.2 m, respectively, of grey and brown mottled, sandy pebbly clay with rounded pebbles of quartz, quartzite and flint.

Alluvium Alluvium occurs in all the main river valleys and consists of pale brown clayey silt generally up to 2.0 m thick with occasional flint pebbles overlying up to 5.0 m of gravel, as, for example, in borehole 00 NW 17 [TL 0198 0638].

COMPOSITION OF THE SAND AND GRAVEL

Pebble Gravel, Glacial Sand and Gravel, Valley Gravel and, to a lesser extent, the gravel underlying the Alluvium are the four formations that contain potentially workable sand and gravel.

Pebble Gravel The mean grading of the Pebble Gravel is fines 11 per cent, sand 48 per cent and gravel 41 per cent, giving an overall mineral classification of 'clayey' sandy gravel (Figure 7). The gravel consists of equal proportions of fine and coarse, subangular to well rounded flint with some quartz. The sand is predominantly of medium grade with some fine and a trace of coarse grades, and consists of white and yellow angular to subangular quartz.

Glacial Sand and Gravel The grading of samples of the Glacial Sand and Gravel (Figure 3) shows a wide variation with no well-defined regional pattern, though it should be noted that the mean gradings of resource blocks B, C, D and E are similar (Table 2 and Figure 4).

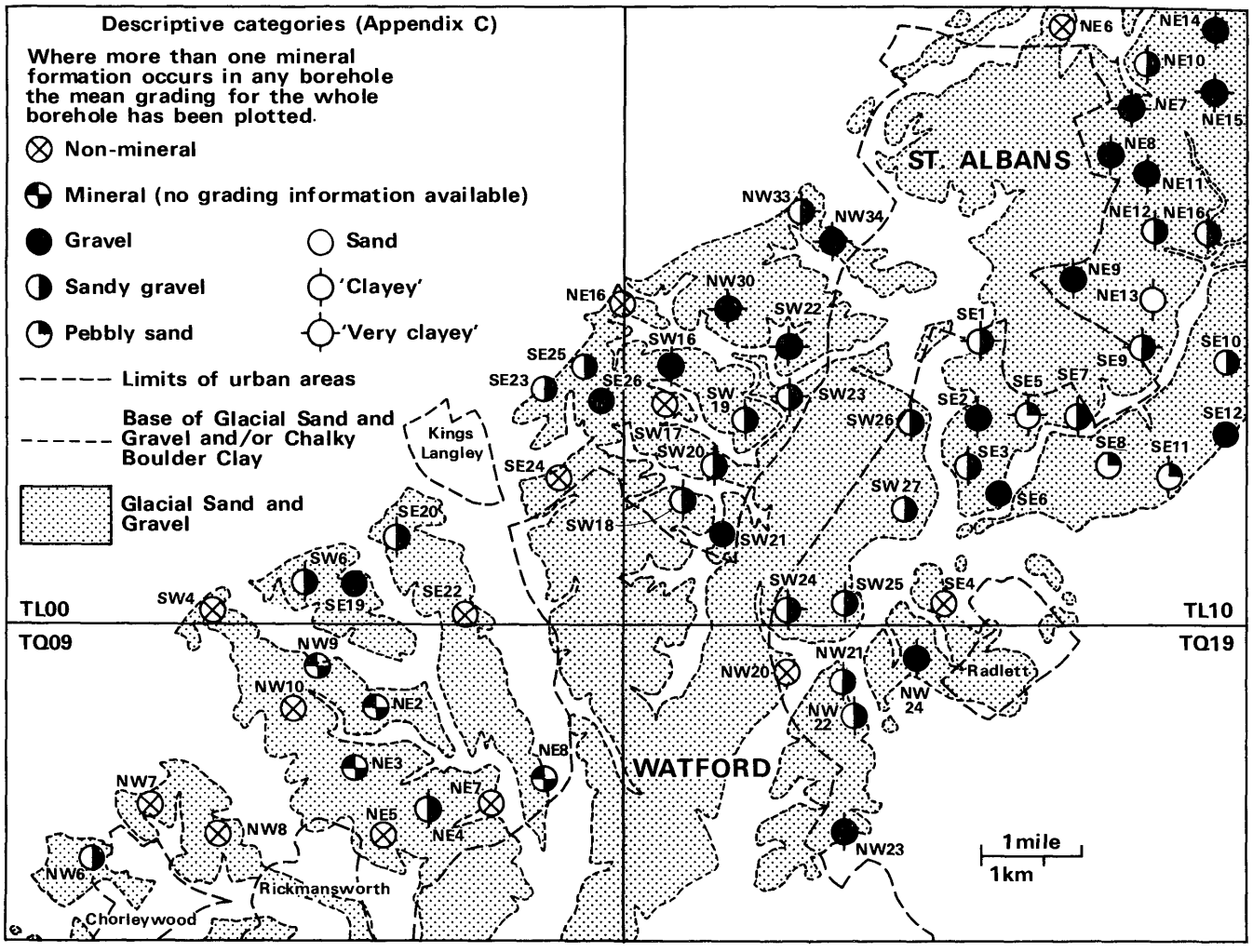


Figure 3 Grading characteristics of the Glacial Sand and Gravel.

The mean grading of the Glacial Sand and Gravel as a whole is fines 16 per cent, sand 44 per cent and gravel 40 per cent giving an overall mineral classification of 'clayey' sandy gravel. The gravel fraction consists of 80 to 90 per cent generally angular flint, with about 10 per cent rounded 'Bunter' quartzite and up to 5 per cent quartz, chert and jasper, combined with a trace of chalk. The proportions of fine, medium and coarse grade sand are generally 1:2:1 and the sand consists of about 60 per cent angular quartz, 30 per cent angular flint and some 10 per cent quartzite, chert and chalk combined. There is a direct relationship between grain size and composition, such that the quantity of angular flint increases and that of quartz decreases with increasing grain size.

Valley Gravel The mean grading of the Valley Gravel is fines 9 per cent, sand 28 per cent and gravel 63 per cent, which classifies the deposit as gravel. The gravel fraction consists of equal proportions of fine and coarse, subangular to rounded flint with subrounded quartz and quartzite. The sand is brown or reddish brown, angular to subangular quartz with equal proportions of medium and coarse grades and some fine grade.

Alluvium The mean grading of the gravel underlying the Alluvium is fines 2 per cent, sand 25 per cent and gravel 73 per cent, which classifies it as gravel. The gravel fraction consists of fine and coarse subangular to subrounded flint, becoming more angular with depth, with some fine chalk pebbles near the base. The sand is coarse and medium with a trace of fine grade and is predominantly subangular quartz with some angular flint and rounded chalk.

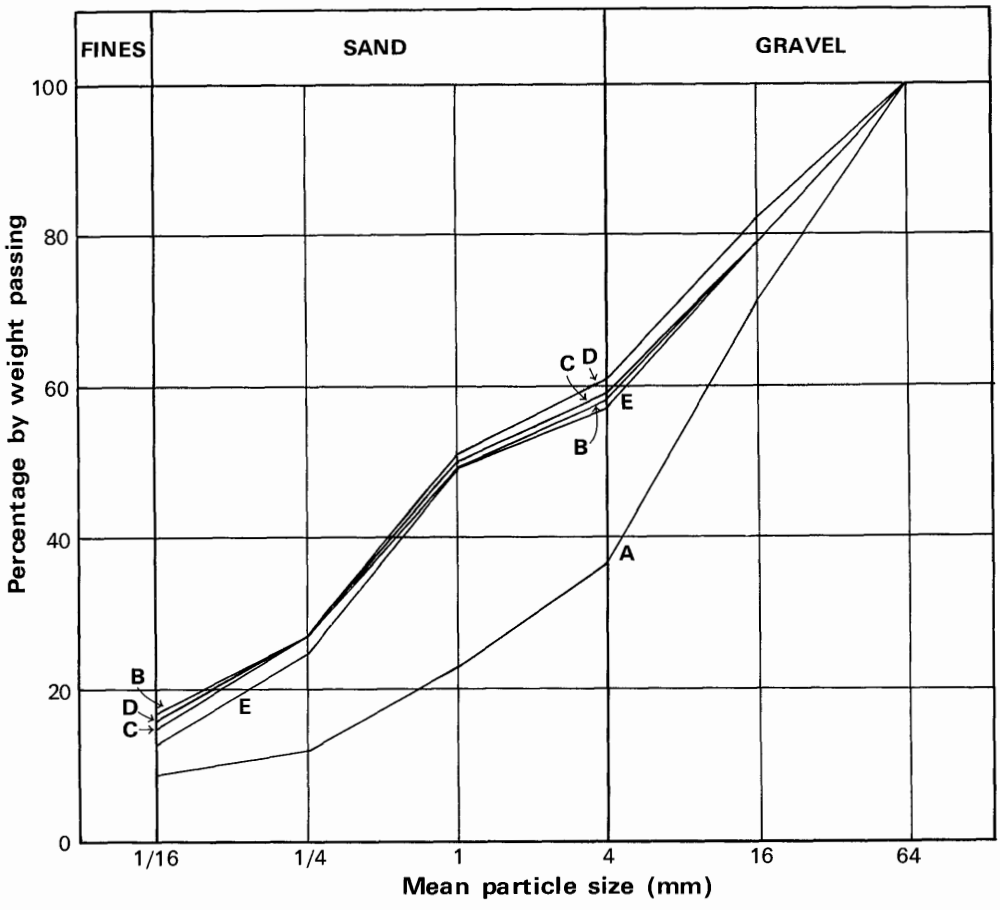
THE MAP

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, on which the topography is shown in grey, 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 maps of this area, which was surveyed in 1898–1922 at the scale of 1:10 560. Borehole data, which include the stratigraphic relations and mean particle-size distribution of the sand and gravel samples collected during the assessment survey, are also shown.

The geological boundaries show the best available interpretation of the information available at the time of survey. However, it is inevitable, particularly with glacial deposits (such as those included in the area of this report), which change rapidly vertically and laterally, that local irregularities or discrepancies will be revealed by some boreholes (for example, at borehole TL 10 SE 14). These are taken into account in the assessment of resources (see below and Appendix B).



BLOCK	Percentages by weight					
	-1/16mm	+1/16-1/4mm	+1/4-1mm	+1-4mm	+4-16mm	+16-64mm
A	9	3	11	14	34	29
B	17	10	22	9	21	21
C	15	12	23	9	20	21
D	16	11	24	10	21	18
E	13	12	24	8	22	21

Figure 4 Particle-size distribution for the assessed thickness of mineral in resource blocks A to E.

Mineral resource information

The mineral-bearing ground is subdivided into resource blocks (see Appendix A). Within a resource block the mineral is subdivided into areas where it is 'exposed' and areas where it is present 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 the block. The mineral is described as 'almost

Table 2 The sand and gravel resources of the country around Hemel Hempstead, St Albans and Watford: 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% confidence level		Fines −1/16 mm	Sand +1/16 −4 mm	Gravel +4 mm
	km^2	km^2	m	m	$m^3 \times 10^6$	±%	$\pm m^3 \times 10^6$			
A	11.4	10.2	2.0	2.9	30	37	11	9	28	63
B	19.0	12.3	2.5	2.9	36	37	13	17	41	42
C	14.1	11.5	4.4	7.9	91	22	20	15	44	41
D	23.0	15.3	3.9	5.5	84	29	24	16	45	39
E	36.5	16.4	2.0	3.9	64	39	25	13	44	43
B to E	92.6	55.5	3.1	5.0	275	17	46	16	44	40
F	9.2	1.7	0.9*	1.9*	3*					
Barren areas outside resource blocks	94.0									
Urban areas	92.8									

* Denotes inferred figure.

continuous' if it is present in 75 per cent or more of the boreholes in a resource block.

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 areas it has been assumed that mineral is absent except in infrequent and relatively minor patches, which can neither be outlined nor assessed quantitatively in the context of this survey. Areas of unassessed sand and gravel, for example, built-up areas, are indicated by a red stipple.

The area of the exposed sand and gravel is measured from the mapped geological boundary lines. The whole of this area is considered as mineral, although it may include small areas where sand and gravel is not present or is not potentially workable. Inferred boundaries have been inserted where sand and gravel beneath cover is interpreted to be not potentially workable or absent. Such boundaries (for which a distinctive symbol is used) are drawn primarily for the purpose of volume estimation. The symbol is intended to convey an approximate location within a likely zone of occurrence rather than to represent the breadth of the zone, its size being limited only by cartographic considerations. For the purpose of measuring areas the centre-line of the symbol is used.

RESULTS

The statistical results are summarised in Table 2. Grading particulars are also shown in Figure 4.

Accuracy of results

For five resource blocks the accuracy of the results at the symmetrical 95 per cent probability level varies between 22 per cent and 39 per cent (that is, it is probable that 19 times out of 20 the true volumes present lie within these limits). However, the true values are more likely to be nearer the figures estimated than the limits. Moreover, it is probable that in each block roughly the same percentage limits would apply for the estimate of volume of a very much smaller parcel of ground (say, 100 hectares) containing similar sand and gravel deposits if the results from the same number of sample points (as provided by, say, ten boreholes) were used in the calculation. Thus, if closer limits are needed for the quotation of reserves of part of a block, it can be expected that data from more than 10 sample points will be required, even if the area is quite small. This point can be illustrated by considering the whole of the potentially workable sand and gravel on this sheet. The volume (275 million m^3) can be estimated to limits of ± 17 per cent at the 95 per cent probability level, by a calculation based on the data from 114 sample points spread across five resource blocks.

However, it must be emphasised that the quoted volume of sand and gravel has no simple relationship with the amount that could be extracted in practice, as no allowance has been made in the calculations for any restraints (such as existing buildings and roads) on the use of the land for mineral working.

NOTES ON THE RESOURCE BLOCKS

Block A

This block extends over an area of 11.4 km^2 and, except for patchy outcrops in the north-east, includes most of the major river valley deposits (i.e. Valley Gravel, Flood Plain Gravel and Alluvium).

Table 3 Block A: data from IMAU boreholes

Borehole	Recorded thickness		Mean grading percentage					
	Mineral	Overburden	Fines	Fine sand	Medium sand	Coarse sand	Fine gravel	Coarse gravel
	m	m	−1/16 mm	+1/16–1/4 mm	+1/4–1 mm	+1–4 mm	+4–16 mm	+16 mm
TL 00 NW 17	5.0	1.6	3	2	11	13	38	33
TL 00 NE 6	3.0	2.0	1	0	8	15	35	41
TL 10 NW 32	6.7	0.6	13	4	10	16	32	25
TL 10 SW 28	3.4	0.4	18	7	17	11	29	18
Block mean grading			9	3	11	14	34	29

The assessment of mineral resources is based on 7 Industrial Minerals Assessment Unit boreholes, 11 Hydrogeology Unit records and 9 commercial borehole records. The mean thickness of mineral is 2.9 m and it ranges from 1.2 m in borehole 00 SE 21 [TL 0706 0366] to 6.7 m in borehole 10 NW 32 [TL 1265 0825]; the overburden ranges in thickness from 0.2 m in borehole 00 SE 21 to 5.5 m in Hydrogeology Unit record 239/243 [TL 1516 0385]; it has a mean thickness of 2.0 m.

The mean grading for the resource block (Table 3) is fines 9 per cent, sand 28 per cent and gravel 63 per cent, which gives a classification for the mineral of gravel. Three small areas of Glacial Sand and Gravel, at [TQ 089 997], [TQ 090 993] and [TQ 091 985], which extend into the block from the main outcrop at Abbots Langley, have not been assessed because of their small extent (see Appendix B, para. 14).

The estimated volume of mineral present in the block is 30 ± 11 million m^3 at the 95 per cent confidence level.

Block B

This block, which extends to 19.0 km^2, includes all the Glacial Sand and Gravel lying north-west of the urban development around Bricket Wood, between St Albans and Watford. It is bounded to the west and south-west by Kings Langley and Abbots Langley respectively, and to the north by the boundary between Pebbly Clay and Sand and Glacial Sand and Gravel.

The mineral-bearing ground occupies 12.3 km^2 and is dissected by minor mainly dry valleys exposing the bedrock, which is predominantly of Upper Chalk; small patches of Reading Beds occur north of Abbots Langley.

The Glacial Sand and Gravel is overlain by overburden comprising pebbly sandy clay, which ranges in thickness from 0.2 m in borehole 10 SW 18 [TL 1093 0196] to 5.4 m in borehole 10 SW 21 [TL 1151 0146]: its mean thickness, based on measurements from 28 boreholes, is 2.5 m.

Three boreholes, 00 NE 16 [TL 0990 0522], 00 SE 24 [TL 0889 0235] and 10 SW 17 [TL 1056 0355] did not encounter Glacial Sand and Gravel and proved sandy pebbly clay resting on bedrock.

The mean grading for the block (Table 4) is fines 17 per cent, sand 41 per cent and gravel 42 per cent giving an overall mineral classification of 'clayey' gravel.

The assessment of mineral resources is based on 15 IMAU boreholes and 13 other records. The estimated volume of mineral is 36 ±13 million m^3.

Block C

Covering 14.1 km^2 of country to the east and north-east of St Albans, this block includes 11.5 km^2 of potentially workable sand and gravel. The mineral is composed mainly of Glacial Sand and Gravel together with a sinuous ribbon of Valley Gravel west of Nashe's Farm [TL 180 096] amounting to 0.1 km^2.

The Glacial Sand and Gravel may be split, by an impersistent bed of boulder clay, into an upper, more clayey, member and a lower, sandy, member. The intercalated clay reaches a thickness of 5.7 m in borehole 10 NE 14 [TL 1946 0966].

The assessment of mineral resources is based on 12 IMAU boreholes and 8 Hydrogeology Unit records. The mean thickness of mineral is 7.9 m and the range of thickness is from 2.7 m in borehole 10 NE 13 [TL 1847 0533] to a total of 13.7 m in Hydrogeology Unit borehole 239/339 [TL 1940 0796].

The overburden ranges in thickness from 0.5 m in borehole 10 NE 7 [TL 1809 0844] to 7.0 m in borehole 10 NE 13 [TL 1847 0533] and it has a mean thickness of 4.4 m.

The mean grading for the resource block (Table 5) is fines 15 per cent, sand 44 per cent and gravel 41 per cent, giving an overall mineral classification of 'clayey' sandy gravel.

The estimated volume of mineral in the block is 91 ± 20 million m^3.

Block D

This block extends over an area of 23.0 km^2 to the south of St Albans and east of Watford; it is subdivided into 5 parts by the deposits of the River Colne, which are included in Block A. Mineral, all of which is Glacial Sand and Gravel, covers 15.3 km^2; of this area 2.4 km^2 is overlain by Boulder Clay. Two beds of mineral formation, separated by a pebbly clay regarded as Boulder Clay, are present in the area of London Colney.

The assessment of mineral resources is based on 19 IMAU boreholes and 4 Hydrogeology Unit records. The overburden ranges in thickness from 0.6 m in borehole 19 NW 22 [TQ 1369 9864] to 5.4 m in borehole 10 SW 24 [TL 1264 0026] and has a mean thickness of 3.9 m. As in Block B, the uppermost part of the Glacial Sand and Gravel is regarded as overburden because of its high fines content, and the mineral-bearing part of the formation is regarded as being continuous under overburden.

The mineral ranges in thickness from 2.3 m in borehole 10 SW 26 [TL 1462 0334] to a total of 12.0 m in

Table 4 Block B: data from IMAU boreholes

Borehole	Recorded thickness		Mean grading percentage					
	Mineral	Overburden	Fines	Fine sand	Medium sand	Coarse sand	Fine gravel	Coarse gravel
	m	m	−1/16 mm	+1/16–1/4 mm	+1/4–1 mm	+1–4 mm	+4–16 mm	+16 mm
TL 00 SE 23	2.9	4.0	10	14	33	11	16	16
TL 00 SE 25	2.3	3.2	10	12	31	7	23	17
TL 00 SE 26	7.0	0.5	6	7	16	9	31	31
TL 10 NW 30	5.5	1.8	30	11	14	4	18	23
TL 10 NW 33	4.0	2.8	22	13	25	5	17	18
TL 10 SW 16	1.9	0.5	15	9	19	11	22	24
TL 10 SW 18	2.6	0.2	15	12	27	12	18	16
TL 10 SW 19	6.0	2.5	15	7	31	11	21	15
TL 10 SW 20	1.3	3.3	17	23	19	7	16	18
TL 10 SW 21	3.8	5.4	6	7	28	10	25	24
TL 10 SW 22	3.0	3.1	28	16	10	6	15	25
TL 10 SW 23	5.7	0.3	28	9	20	11	21	11
Block mean grading			17	10	22	9	21	21

Table 5 Block C: data from IMAU boreholes

Borehole	Recorded thickness			Mean grading percentage					
	Mineral	Over-burden	Waste partings	Fines	Fine sand	Medium sand	Coarse sand	Fine gravel	Coarse gravel
	m	m	m	−1/16 mm	+1/16–1/4 mm	+1/4–1 mm	+1–4 mm	+4–16 mm	+16 mm
TL 10 NE 7	5.0	0.5	3.3	22	15	12	6	22	23
TL 10 NE 8	8.0	4.9	1.4	21	9	15	9	21	25
TL 10 NE 9	6.1	2.1		13	6	15	9	24	33
TL 10 NE 10	13.0	2.5		20	18	16	6	13	27
TL 10 NE 11	4.0	1.3	4.1	19	8	18	11	21	23
TL 10 NE 12	7.8	4.7		14	11	32	9	19	15
TL 10 NE 13	2.7	7.0		14	29	53	2	2	0
TL 10 NE 14	9.0	0.8	5.7	13	9	27	10	25	16
TL 10 NE 15	7.1	0.6		16	8	20	12	22	22
TL 10 NE 16	5.6	2.4	4.4	11	5	25	8	28	23
TL 10 SE 9	5.8	2.5		11	22	39	5	12	11
TL 10 SE 10	11.6	1.1		6	12	33	9	24	16
Block mean grading				15	12	23	9	20	21

borehole 10 SE 3 [TL 1548 0255]; it has a mean thickness of 5.5 m.

Grading results indicate that the mineral ranges from 'very clayey' pebbly sand in borehole 10 SE 5 [TL 1647 0337] to gravel in borehole 10 SE 6 [TL 1603 0212]. The mean grading for the block (Table 6) is fines 16 per cent, sand 45 per cent and gravel 39 per cent, which categorises the mineral as a whole as 'clayey' sandy gravel.

The estimated volume of mineral in the block is 84 ± 24 million m^3.

Block E

Block E includes all of the gravelly deposits west of the River Gade and in the vicinity of the urban area of Chorleywood. The block covers an area of 36.5 km^2 of which 16.4 km^2 contains potentially workable sand and gravel. Two categories of mineral, namely 'continuous' and 'discontinuous' spreads of mineral beneath overburden, have been recognised covering 7.7 km^2 and 8.7 km^2 respectively. The recognition of these categories of deposit is based upon the ratio of boreholes, within each spread of mineral, that proved the presence of mineral against those that did not (see section on 'Mineral resource information').

In the area designated as containing continuous (or almost continuous) mineral beneath overburden the mean thicknesses of overburden and mineral are 1.5 m and 5.9 m respectively; where the mineral is discontinuous, the overburden and mineral have mean thicknesses of 2.4 m and 2.2 m respectively.

The assessment of mineral resources is based on 13 IMAU boreholes, 5 Hydrogeology Unit records and 28 other records.

The mean grading for the block (Table 7) is fines 13 per cent, sand 44 per cent and gravel 43 per cent, giving an overall classification of 'clayey' sandy gravel.

Table 6 Block D: data from IMAU boreholes

Borehole	Recorded thickness			Mean grading percentage					
	Mineral m	Over-burden m	Waste partings m	Fines −1/16 mm	Fine sand +1/16–1/4 mm	Medium sand +1/4–1 mm	Coarse sand +1–4 mm	Fine gravel +4–16 mm	Coarse gravel +16 mm
TL 10 SW 24	6.7	5.3		26	12	16	12	21	13
TL 10 SW 25	4.0	1.1	2.4	18	8	23	13	22	16
TL 10 SW 26	2.3	1.4		18	7	16	20	24	15
TL 10 SW 27	5.0	3.3		9	12	39	10	17	13
TL 10 SE 1	3.4	2.2		23	6	29	9	16	17
TL 10 SE 2	7.0	1.4	5.6	12	3	15	13	27	30
TL 10 SE 3	12.0	0.6	3.3	18	9	23	11	22	17
TL 10 SE 5	3.7	3.1	3.1	22	24	40	6	6	2
TL 10 SE 6	5.5	2.9		7	7	26	11	18	31
TL 10 SE 7	5.1	3.4		12	14	22	10	21	21
TL 10 SE 8	3.5	1.5		10	42	21	6	14	7
TL 10 SE 11	6.8	3.9		20	17	39	7	10	7
TQ 19 NW 21	8.1	4.6		11	12	28	10	26	13
TQ 19 NW 22	10.0	0.6		19	11	22	10	21	17
TQ 19 NW 23	1.8	2.5		13	7	5	2	29	44
TQ 19 NW 24	9.3	0.9		16	6	22	9	23	24
Block mean grading				16	11	24	10	21	18

Table 7 Block E: data from IMAU boreholes

Borehole	Recorded thickness		Mean grading percentage					
	Mineral m	Overburden m	Fines −1/16 mm	Fine sand +1/16–1/4 mm	Medium sand +1/4–1 mm	Coarse sand +1–4 mm	Fine gravel +4–16 mm	Coarse gravel +16 mm
TL 00 SW 6	9.7	1.7	12	13	28	8	22	17
TL 00 SE 19	5.9	0.4	10	5	14	13	26	32
TL 00 SE 20	5.7	3.2	18	15	25	5	20	17
TQ 09 NW 6	2.7	1.7	9	12	29	6	19	25
TQ 09 NE 4	2.4	2.0	14	16	26	7	17	20
Block mean grading			13	12	24	8	22	21

The estimated volume of mineral in the block is 64 ± 25 million m^3.

Block F

This block occupies 9.2 km^2 along the eastern margin of the district, north of Borehamwood, and embraces 1.7 km^2 of Pebble Gravel.

The mean grading for the block (Table 8), based on samples from 2 boreholes, is fines 11 per cent, sand 48 per cent and gravel 41 per cent, indicating that the material may be described as 'clayey' sandy gravel.

An inferred assessment (Appendix B, para. 12) based on data from 3 IMAU boreholes indicates that about 3 million m^3 of mineral is present in the block.

NOTES ON THE REMAINING AREAS

Areas are left uncoloured on the resource map where boreholes show that the sand and gravel has an overburden ratio greater than 3:1, or is likely to be absent, apart from scattered minor occurrences. This ground is divided for descriptive purposes into two areas.

East and South-west of Hemel Hempstead This area encompasses the higher ground of the Chiltern Hills. The geology is one of Clay-with-flints and Pebbly Clay and Sand resting on Upper Chalk bedrock, although Reading Beds do occur east of Hemel Hempstead. Six boreholes were drilled in deposits of Clay-with-flints, five in deposits of Pebbly Clay and Sand and one in Glacial Sand and Gravel. With the exception of borehole 10 NW 37 (TL 1210 0700) all proved waste resting on Upper Chalk bedrock at moderately shallow depths. Borehole 10 NW 37 was exceptional in proving 18.8+ m of Pebbly Clay and Sand and Boulder Clay, the Upper Chalk bedrock not being reached.

Typically the Clay-with-flints comprises a brown clay with angular flint pebbles and the Pebbly Clay and Sand a pale brown sandy pebbly clay with angular and subangular flint and subangular quartzite pebbles.

South of Radlett This is a small area of ground almost devoid of drift deposits. However, Pebble Gravel occurs

Table 8 Block F: data from IMAU boreholes

Borehole	Recorded thickness		Mean grading percentage					
	Mineral	Overburden	Fines −1/16 mm	Fine sand +1/16–1/4 mm	Medium sand +1/4–1 mm	Coarse sand +1–4 mm	Fine gravel +4–16 mm	Coarse gravel +16 mm
TL 10 SE 13	2.8	1.2	10	11	38	14	15	12
TQ 19 NE 21	3.0	1.1	11	6	17	12	26	28
Block mean grading			11	8	27	13	21	20

between Elstree and Borehamwood and Floodplain Gravel and Alluvium along the valley of the Tykes Water. The Pebble Gravel has not been assessed and the distinctive symbol has been used on the map. The Floodplain Gravel has been assessed by two boreholes, which proved 1.5 m or less of brown pebbly clay resting on London Clay bedrock.

APPENDIX A

FIELD AND LABORATORY PROCEDURES

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

The mineral shown on each 1:25 000 sheet is divided into resource blocks. The arbitrary size selected, 10 km^2, 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. Exceptionally, other schemes for subdividing the resource sheet area (for example, the use of 'resource sub-blocks') may be used where these are considered to be more appropriate.

A reconnaissance of the ground is carried out to record and sample any exposures, and inquiries are made to ascertain what borehole information is available. In addition, shallow trenches may be cut to investigate the grading of deposits, particularly in very coarse material, and to test the geology prior to commencing the drilling programme. 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 (sometimes referred to as 'percussion' 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 deposit, or, ideally, at every 1 m (3.3 ft) depth. The samples, each weighing between 25 and 45 kg (55 and 100 lb), are despatched in heavy duty polythene bags to a laboratory for grading. The grading procedure is based on British Standard 1377 (1975). Random checks on the accuracy of the grading are made in the Institute's laboratories.

Other methods of drilling and sampling are occasionally employed, for example the Minuteman power auger rig, and downhole tests such as U4 and SPT may be carried out. The Minuteman, which is small and portable, is normally used when access to land with shell rigs would be difficult to arrange and when information is requested quickly.

The auger tool comprises a continuous-'flight' 76-mm (3-inch) spiral auger; the use of this equipment, as with all 'open-hole' drilling methods, inevitably leads to the mixing and contamination of the sampled material. Thus, data relating to depth and composition cannot always be accurately determined.

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

Detailed records may be consulted at the appropriate office of the Institute: the address is shown on page ii of this report, next to the preface.

APPENDIX B

STATISTICAL PROCEDURE

Statistical assessment

1 A statistical assessment is made of an area of mineral greater than 2 km^2, if there is a minimum of five evenly spaced boreholes in the resource block (for smaller areas see paragraph 12 below).

2 The simple methods used in the calculations are consistent with the amount of data provided by the survey (Hull, pp. 192–193 *in* Thurrell, 1981). Conventional symmetrical confidence limits are calculated for the 95 per cent probability level, that is, there is a 5 per cent or one in twenty chance of a result falling outside the stated limits.

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

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

4 The above relationship may be transposed such that

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

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

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

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

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

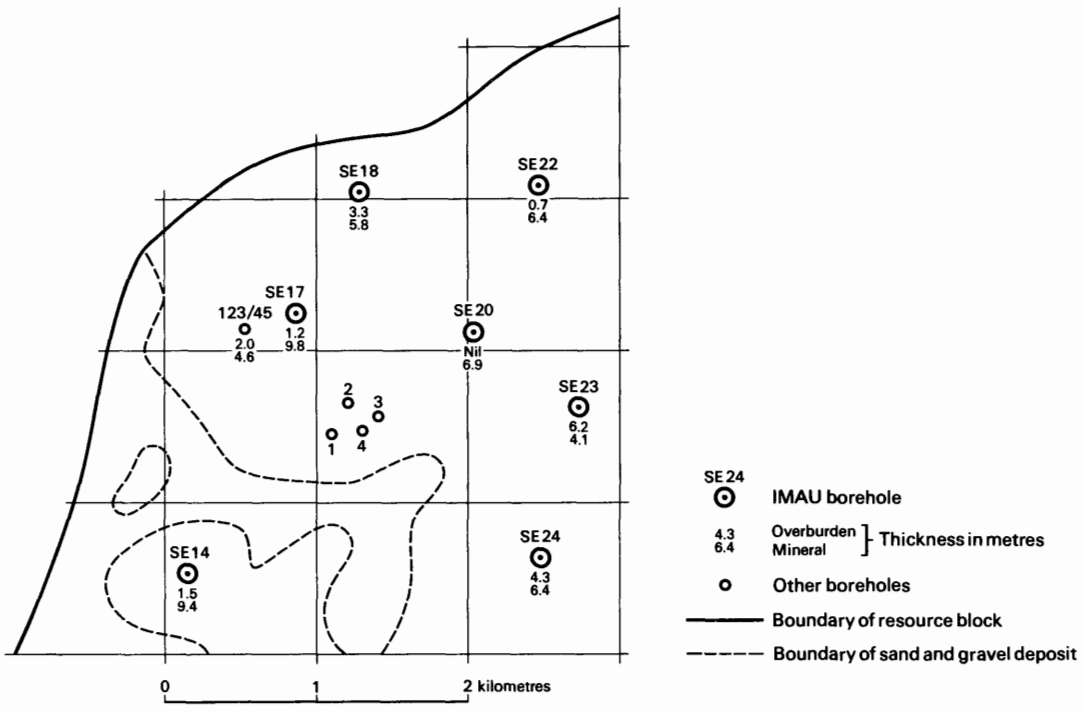
For groups of closely spaced boreholes a discretionary weighting factor may be applied to avoid bias (see note on weighting below). The standard deviation for mean thickness S_{l_m}, expressed as a proportion of the mean thickness, is given by

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

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

6 The sampled area in each resource block is coloured pink on the map. Wherever possible, calculations relate to the mineral within mapped geological boundaries (which may not necessarily correspond to the limits of deposit). Where the area

Figure 5 Example of resource block assessment: map of fictitious block.



Block calculation 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	Hydrogeology Unit record
123/45	½	2.0		4.6		
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_t is calculated as

$$1.05\,(t/\overline{wl_m})\sqrt{\,[\Sigma(wl_m - \overline{wl_m})^2/n(n-1)]} \times 100$$
$$= 1.05 \times (2.365/6.5)\sqrt{\,[15.82/(8 \times 7)]} \times 100$$
$$= 20.3$$
$$\simeq 20 \text{ per cent.}$$

Figure 6 Example of resource block assessment: calculation and results.

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 usually small relative to those in thickness. The relationship $S_A/S_{\bar{l}_m} \leqslant \frac{1}{3}$ is assumed in all cases. It follows from equation [2] that

$$S_{\bar{l}_m} \leqslant S_{l'} \leqslant 1.05\, S_{\bar{l}_m}. \qquad [3]$$

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, 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_l, the following inequality corresponding to equation [3] is applied: $L_{\bar{l}_m} \leqslant L_{l'} \leqslant 1.05\, L_{\bar{l}_m}$.

10 In summary, for values of n between 5 and 20, L_l 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 (weighting factors may be included: see paragraph 15).

11 The application of this procedure to a fictitious area is illustrated in the diagram which accompanies this Appendix.

Inferred assessment

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

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

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

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

APPENDIX C

CLASSIFICATION AND DESCRIPTION OF SAND AND GRAVEL

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

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

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

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

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

Thus it is possible to classify the mineral into one of twelve descriptive categories (illustrated at the end of this appendix). The procedure is as follows:

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

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

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

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

The boundary at 64 mm distinguishes pebbles from cobbles. The term 'gravel' is used loosely to denote both pebble-sized and cobble-sized material.

The size distribution of borehole samples is determined by sieve analysis, which is presented by the laboratory as logarithmic cumulative curves (see, for example, British Standard 1377: 1975). In this report the grading is tabulated on the borehole record sheets (Appendix F), the intercepts corresponding with the simple geometric scale $\frac{1}{16}$ mm, $\frac{1}{4}$ mm, 1 mm, 4 mm, 16 mm and so on as required. Original sample grading curves are available for reference at the appropriate office of the Institute.

Each bulk sample is described subjectively by a geologist at the borehole site. Subsequently, the descriptive categories of the mineral for each borehole are modified according to the results obtained from the mean particle size analysis of the samples.

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

The terms used in the field to describe the degree of rounding of particles, which is concerned with the sharpness of the edges and corners of a clastic fragment and not the shape (after Pettijohn, 1975), are as follows.

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

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

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

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

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

Table 9 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

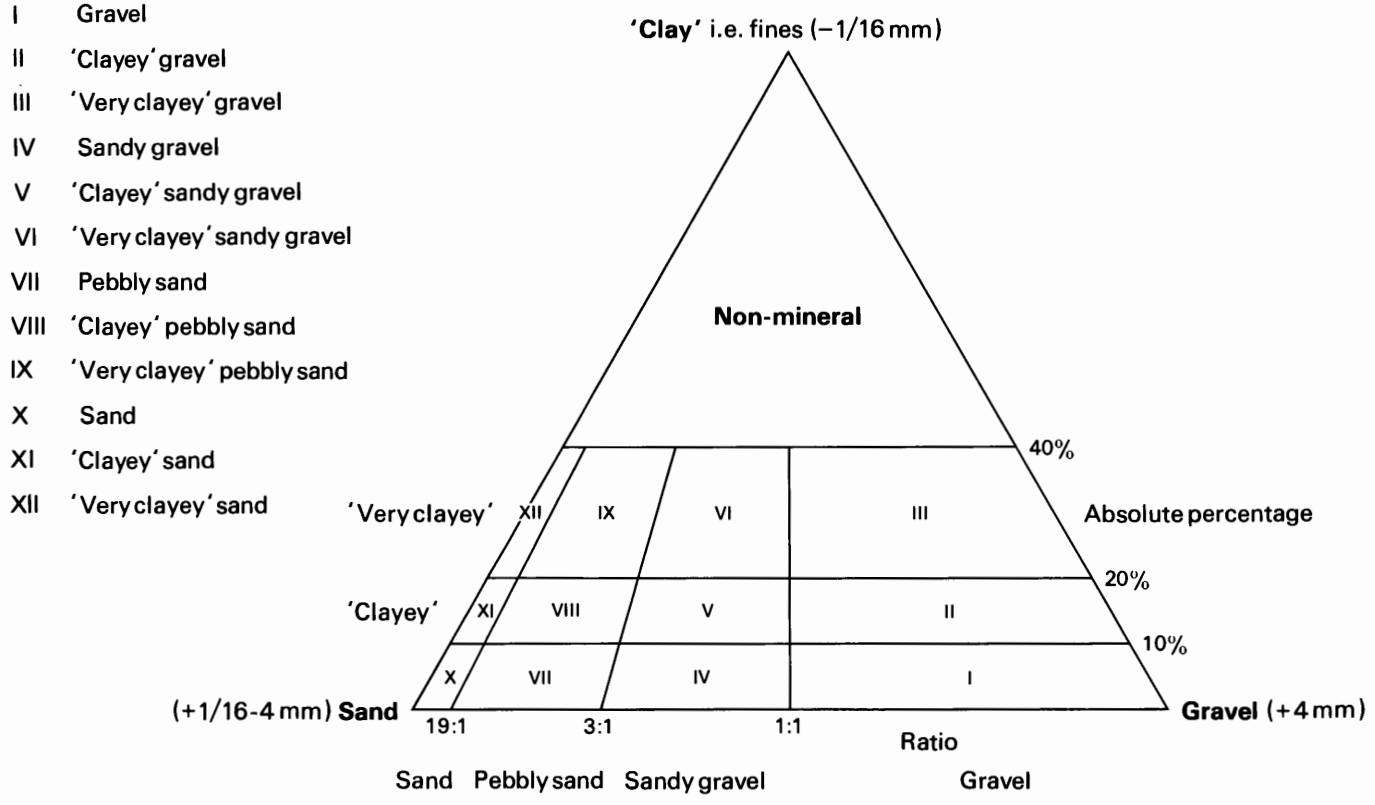


Figure 7 Diagram showing the descriptive categories used in the classification of sand and gravel.

APPENDIX D

EXPLANATION OF THE BOREHOLE RECORDS

Annotated example

TL 10 SW 25[1] **1350 0043**[2] **Munden House, St Stephen** **Block D**[3]

Surface level (+67.4 m) +221 ft[4]
Water not struck[5]
Shell and auger, 6 in (152 mm) diameter[6]
February 1972

Overburden 1.1 m[7]
Mineral 2.0 m
Waste 2.4 m
Mineral 2.0 m
Waste 0.4 m
Bedrock 0.3 m+[9]

LOG

Geological classification	Lithology	Thickness m	Depth[8] m
	Soil	0.5	0.5
Glacial Sand and Gravel[10]	Soft, brown pebbly clay with subangular to subrounded flint pebbles	0.6	1.1
	a 'Clayey' sandy gravel[11] Gravel: fine to coarse, subangular to well-rounded flint Sand: mainly medium with some fine and coarse; brown	2.0	3.1
Chalky Boulder Clay	Brown clay with a few subangular flint pebbles	2.4	5.5
Glacial Sand and Gravel	**b** 'Clayey' sandy gravel Gravel: fine to coarse, subrounded flint Sand: mainly medium with some fine and coarse; brown	2.0	7.5
	Brown sandy pebbly clay with angular to well-rounded flint pebbles	0.4	7.9
Upper Chalk	Soft white chalk	0.3+	8.2

GRADING

	Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+64
a	12	46	42[14]	[12]1.1–2.1	5	4	32	13	22	24[13]
				2.1–3.1	19	7	22	14	28	10
				Mean	12	6	27	13	25	17
b	24	41	35	5.5–6.5	13	10	20	13	26	18
				6.5–7.5	35	11	18	11	13	12
				Mean	24	10	19	12	20	15
a + b	18	44	38	Mean	18	8	23	13	22	16

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

1 Borehole Registration Number
Each Industrial Minerals Assessment Unit (IMAU) borehole is identified by a Registration Number. This consists of two statements.

1 The number of the 1:25 000 sheet on which the borehole lies, for example TL 10.

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

Thus the full Registration Number is TL 10 SW 25.

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

3 Location and Resource Block
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.

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

5 Groundwater Conditions
If groundwater was present the level at which it was encountered is normally given (in metres and feet above Ordnance Datum).

6 Type of Drill and Date of Drilling
Modified shell and auger rigs were used in this survey. The type of machine, the external diameter of the casing used, and the month and year of completion of the borehole are stated.

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

8 Thickness and Depth
All measurements were made in metres.

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

10 Geological Classification
The geological classification is given whenever possible.

11 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.

12 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 within the sand and gravel or at every 1 m of depth. Samples obtained by the bailing technique (that is, from deposits below the water table) are indicated by an asterisk.

13 Grading Results
The limits are as follows: gravel, + 4 mm; sand, −4+1/16 mm; fines, −1/16 mm.

14 Mean Grading
The grading of the full thickness of the mineral horizon identified in the log is the mean of the individual sample gradings weighted by the thicknesses represented, if these vary. The classification used is shown in Table 9.

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.

APPENDIX E

LIST OF BOREHOLES USED IN THE ASSESSMENT OF RESOURCES

Borehole number*	Grid reference†	Resource block
1 MINERAL ASSESSMENT BOREHOLES		
Pp. 19–28		
TL 00		
NW 15	0061 0879	Barren area
16	0076 0726	A
17	0198 0638	A
18	0380 0855	Barren area
TL 00		
NE 14	0888 0897	Barren area
15	0884 0526	Barren area
16	0990 0522	B
TL 00		
SW 2	0102 0358	Barren area
3	0332 0460	Barren area
4	0334 0032	Barren area
5	0463 0184	Barren area
6	0480 0072	E
TL 00		
SE 18	0550 0468	Barren area
19	0559 0069	E
20	0631 0143	E
21	0705 0366	A
22	0744 0022	E
23	0867 0382	B
24	0889 0235	B
25	0925 0418	B
26	0957 0356	B
Pp.29–68		
TL 10		
NW 30	1163 0507	B
31	1199 0986	A
32	1265 0825	A
33	1277 0670	B
34	1334 0622	Urban area
35	1062 0951	Barren area
36	1104 0759	Barren area
37	1210 0700	Barren area
38	1365 0976	Barren area
TL 10		
NE 6	1699 0966	C
7	1809 0844	C
8	1784 0756	C
9	1723 0561	C
10	1844 0909	C
11	1835 0726	C
12	1845 0638	C
13	1847 0533	C
14	1946 0966	C
15	1946 0865	C
16	1936 0639	C
TL 10		
SW 16	1069 0423	B
17	1056 0355	B
18	1093 0196	B
19	1185 0330	B
20	1142 0263	B
21	1151 0146	B
22	1257 0449	B
23	1260 0371	B
24	1264 0026	D
25	1350 0043	D
26	1462 0334	D
27	1451 0190	D
28	1398 0083	A
TL 10		
SE 1	1567 0458	D
2	1569 0334	D
3	1548 0255	D
4	1512 0041	D
5	1647 0337	D
6	1603 0212	D
7	1728 0340	D
8	1780 0262	D
9	1833 0450	C
10	1968 0433	C
11	1877 0238	D
12	1967 0306	D
13	1929 0078	F
14	1753 0111	E
Pp. 69–75		
TQ 09		
NW 4	0061 9673	E
5	0119 9790	E
6	0135 9627	E
7	0232 9720	E
8	0335 9669	E
9	0496 9943	E
10	0457 9873	E
TQ 09		
NE 2	0589 9865	E
3	0557 9778	E
4	0681 9708	E
5	0615 9667	E
6	0636 9535	A
7	0782 9720	E
8	0865 9758	E
Pp.75–81		
TQ 19		
NW 20	1263 9933	D
21	1350 9909	D
22	1369 9864	D
23	1359 9679	D
24	1472 9949	D
TQ 19		
NE 19	1779 9852	Barren area
20	1767 9763	Barren area
21	1927 9968	F
22	1969 9891	F
2 HYDROGEOLOGY UNIT BOREHOLES		
238/114	0768 0023	E
239/ 23	1353 0209	D
90A	1982 0578	C
90B	1984 0574	C
160	1834 0691	C
209A	1421 0178	D
243	1514 0385	A
294	1392 0214	D
330A	1531 0163	A
337B	1948 0737	C
338	1934 0727	C
339	1939 0797	C
456	1942 0788	C
460	1894 0598	C
534	1229 0904	A
538B	1846 0336	D
255/101	0669 9847	E
148A	0869 9906	A
148B	0870 9906	A
148C	0871 9907	A
180	0802 9827	E
241	0678 9853	E
305	0672 9850	E
256/297A	1293 9917	A
297B, C	1294 9917	A

* By sheet and quadrant for Industrial Minerals Assessment Unit boreholes.

† The first two characters of the borehole number indicate the 100-km square for IMAU boreholes. Hydrogeology Unit boreholes with prefixes 238 and 239 fall in 100-km square TL; those with prefixes 255 and 256 fall in 100-km square TQ.

Records of 50 site-investigation boreholes, held in confidence by the Institute, were also used in the assessment.

APPENDIX F

INDUSTRIAL MINERALS ASSESSMENT UNIT
BOREHOLE RECORDS

TL 00 NW 15 0061 0879 Shenstone Court, Nettleden with Potten End

Surface level (+170.1 m)+558 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
November 1972

Waste 6.7 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Pebbly Clay and Sand	Silty pebbly clay	0.3	0.4
	Stiff, orange-brown and grey mottled pebbly clay with subrounded to rounded flint and a few quartzite pebbles	5.8	6.2
	Stiff dark brown clay with black iron-staining and a few subangular flint cobbles	0.5	6.7
Upper Chalk	Soft white chalk	0.3+	7.0

TL 00 NW 16 0076 0726 Bankmill Bridge, Northchurch **Block A**

Surface level (+99.7 m) +327 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Waste 5.6 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Valley Gravel	Soft brown silty clay with a few subangular and subrounded flint pebbles	5.4	5.6
Middle Chalk	Soft white chalk	0.1+	5.7

TL 00 NW 17 0198 0638 Bourne End, Hemel Hempstead **Block A**

Surface level (+91.4 m) +300 ft
Water struck at (+89.3 m)
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Overburden 1.6 m
Mineral 5.0 m
Waste 1.0 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Alluvium	'Very clayey' brown sand with a few angular to subrounded pebbles	1.0	1.6
	Gravel Gravel: fine to coarse, subangular to subrounded flint and an increasing amount of angular flint with depth. Chalk pebbles near base Sand: medium to coarse with some fine; brown	5.0	6.6
	'Very clayey' sand with chalk pebbles and admixed powdery chalk	1.0	7.6
Middle Chalk	Hard white powdery chalk	0.2+	7.8

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
3	26	71	1.6–2.6	4	3	14	14	37	28
			2.6–3.6*	2	1	5	15	42	35
			3.6–4.6*	2	3	15	9	35	36
			4.6–5.6*	2	2	12	15	39	30
			5.6–6.6*	6	2	8	9	37	38
			Mean	3	2	11	13	38	33

TL 00 NW 18 0380 0855 Warnersend Farm, Hemel Hempstead

Surface level (+151.2 m) +496 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Waste 4.7 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Clay-with-flints	Grey and brown mottled clay with a few angular and subangular flint cobbles	0.3	0.9
	Grey and brown mottled pebbly clay with closely packed angular flint cobbles	0.2	1.1
	Stiff brown clay with black iron-staining and a few angular and subangular flint cobbles	3.6	4.7
Upper Chalk	Soft white chalk	0.2+	4.9

TL 00 NE 14 0888 0897 Eaton Lodge, Redbourn

Surface level (+131.7 m) +432 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Waste 5.1 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Clay-with-flints	Soft brown clay with a few angular and subangular flint cobbles	5.0	5.1
Upper Chalk	Soft white chalk	0.2+	5.3

TL 00 NE 15 0884 0526 Highwoodhall Farm, Abbots Langley

Surface level (+133.5 m) +438 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Waste 5.2 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.1	0.1
Pebbly Clay and Sand	Brown and black mottled sandy pebbly clay with subrounded to rounded flint pebbles	0.5	0.6
	Brown and black mottled clay with a few angular flint cobbles	4.6	5.2
Upper Chalk	Soft white chalk	0.2+	5.4

TL 00 NE 16 0990 0522 Pimlico, St Michael **Block B**

Surface level (+120.4 m) +395 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Waste 4.3 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.7	0.7
Glacial Sand and Gravel	Brown sandy pebbly clay with subrounded to rounded flint and a few angular flint pebbles. Becoming clayey with depth	1.9	2.6
	Stiff brown clay with black iron-staining and a few angular flint cobbles	1.5	4.1
	Pale brown sandy clay	0.2	4.3
Upper Chalk	Soft white chalk	0.2+	4.5

TL 00 SW 2 0102 0358 Bovingdon

Surface level (+153.0 m) +502 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Waste 9.9 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.0	1.0
Clay-with-flints	Brown sandy clay	0.8	1.8
	Stiff brown clay with a few subangular flint cobbles	8.1	9.9
Upper Chalk	Soft white chalk	0.2+	10.1

TL 00 SW 3 0332 0460 Longcroft Farm, Bovingdon

Surface level (+157.9 m) +518 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Waste 8.2 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.6	0.6
Clay-with-flints	Brown and grey mottled clay	1.9	2.5
	Brown pebbly clay with some rounded flint and traces of jasper and quartz pebbles	2.0	4.5
	Brown and grey mottled clay becoming brown at depth with black iron-staining and a few angular flint cobbles	3.7	8.2
Upper Chalk	Soft white chalk	0.1+	8.3

TL 00 SW 4 0334 0032 Rosehall Wood, Sarratt

Surface level (+122.5 m) +402 ft
Water not struck
Shell and auger (modified), 6 in (152 m) diameter
September 1972

Waste 5.1 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Glacial Sand and Gravel	Stiff brown pebbly clay with rounded flint pebbles	0.9	1.5
	Grey and brown mottled clay with a few rounded flint pebbles	1.6	3.1
	Brown pebbly clay, sandy in parts, with rounded flint and a few quartz pebbles. Angular to subangular flint cobbles near base	2.0	5.1
Upper Chalk	Soft white chalk	0.2+	5.3

TL 00 SW 5 0463 0184 Chapel Croft, Chipperfield

Surface level (+135.6 m) +445 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Waste 10.8 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Pebbly Clay and Sand	Soft brown sandy clay	6.7	7.3
	Brown sandy pebbly clay with subrounded to rounded flint pebbles	1.7	9.0
	Stiff brown clay with a few angular flint cobbles	1.8	10.8
Upper Chalk	Soft white chalk	0.2+	11.0

TL 00 SW 6 0480 0072 West Callipers, Sarratt **Block E**

Surface level (+125.3 m) +411 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Overburden 1.7 m
Mineral 9.7 m
Waste 3.0 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Glacial Sand and Gravel	Brown sandy pebbly clay with subrounded to rounded flint and a few subrounded quartz pebbles	1.2	1.7
	'Clayey' sandy gravel Gravel: fine to coarse, coarse usually predominant, subrounded and subangular with some angular, flint. No gravel from 2.7 m to 3.7 m; iron nodules and angular flint cobbles near base. Sand: medium with some fine and coarse; brown	9.7	11.4
	Brown sandy clay with brown iron nodules and a few coarse angular flints	3.0	14.4
Upper Chalk	Soft white chalk	0.1+	14.5

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
12	49	39	1.7–2.7	11	3	23	9	24	30
			2.7–3·7	22	53	23	2	0	0
			3.7–4.7	10	5	17	13	38	17
			4.7–5.7	14	4	14	11	35	22
			5.7–6.7	15	8	27	8	23	19
			6.7–7.7	11	16	45	8	10	10
			7.7–8.7	13	7	22	8	29	21
			8.7–9.7	6	4	17	12	28	33
			9.7–10.7	11	17	46	5	11	10
			10.7–11.4	11	11	45	9	18	6
			Mean	12	13	28	8	22	17

TL 00 SE 18 0550 0468 Shendish, Kings Langley

Surface level (+129.8 m) +426 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Waste 10.7 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Clay-with-flints	Soft brown clay with grey streaks and a few angular and subangular flint cobbles	10.2	10.7
Upper Chalk	Soft white chalk	0.1+	10.8

TL 00 SE 19 0559 0069 Jeffrey's Farm, Abbots Langley **Block E**

Surface level (119.2 m) +391 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Overburden 0.4 m
Mineral 5.9 m
Waste 0.1 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Glacial Sand and Gravel	Gravel Gravel: fine to coarse, subrounded to rounded flint and traces of subrounded to rounded quartz Sand: mainly medium and coarse with some fine; brown	5.9	6.3
	Brown sandy pebbly clay	0.1	6.4
Upper Chalk	Soft white chalk	0.1+	6.5

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
10	32	58	0.4–1.4	9	5	17	13	29	27
			1.4–2.4	10	4	28	13	31	14
			2.4–3.4	10	6	14	10	10	50
			3.4–4.4	9	5	18	13	32	23
			4.4–5.4	10	4	6	15	29	36
			5.4–6.3	12	4	5	12	27	40
			Mean	10	5	14	13	26	32

TL 00 SE 20 0631 0143 Kings Langley Lodge, Kings Langley **Block E**

Surface level (+116.4 m) +382 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Overburden 3.2 m
Mineral 5.7 m
Waste 3.2 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.3	0.3
Glacial Sand and Gravel	Brown sandy pebbly clay becoming grey and brown mottled at 1.6 m with rounded flint pebbles	2.9	3.2
	'Clayey' sandy gravel Gravel: fine and coarse, mainly subrounded to rounded flint with some angular to subangular flint and subrounded to rounded quartz Sand: mainly medium with some fine and coarse; brown	5.7	8.9
	Stiff brown clay with a few angular and subangular flint cobbles	3.2	12.1
Upper Chalk	Soft white chalk	0.1+	12.2

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
18	45	37	3.2–4.2	21	14	24	6	19	16
			4.2–5.2	21	34	11	3	12	19
			5.2–6.2	12	6	32	6	27	17
			6.2–7.2	12	12	36	5	17	18
			7.2–8.2	19	8	14	9	28	22
			8.2–8.9	22	18	35	5	11	9
			Mean	18	15	25	5	20	17

TL 00 SE 21 0705 0366 Barnes Lodge, Kings Langley **Block A**

Surface level (+83.2 m) +273 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
November 1972

Overburden 0.2 m
Mineral 1.2 m
Waste 3.6 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Valley Gravel	'Clayey' sandy gravel Gravel: fine to coarse, subangular to rounded flint and quartzite Sand: mainly medium to coarse with some fine; brown. Stiff silty brown clay near base	1.2	1.4
	Stiff brown clay with black iron-staining and a few subangular flint cobbles	3.6	5.0
Upper Chalk	Soft white chalk	0.1+	5.1
	No grading information available		

TL 00 SE 22 0744 0022 Sheepcote Spring, Abbots Langley **Block E**

Surface level (+100.0 m) +328 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Waste 4.1 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Glacial Sand and Gravel	Brown sandy pebbly clay with some rounded black flint pebbles and a few subangular brown flint pebbles	0.8	1.3
	Brown clay with a few angular and subangular flint cobbles	2.8	4.1
Upper Chalk	Soft white chalk	0.1+	4.2

TL 00 SE 23 0867 0382 Harthall Lane, Abbots Langley **Block B**

Surface level (+130.2 m) +427 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Overburden 4.0 m
Mineral 2.9 m
Bedrock 2.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.9	0.9
Glacial Sand and Gravel	Soft grey and brown mottled clay becoming brown and sandy at 1.5 m	3.1	4.0
	Sandy gravel Gravel: fine to coarse, angular to rounded flint with a trace of quartz. No gravel in top metre. Cobbles of Hertfordshire Pudding-stone at 6.7 m Sand: fine to coarse; brown	2.9	6.9
Reading Beds	Brown and grey mottled sandy clay	0.1	7.0
	Very clayey sand Sand: mainly fine with traces of medium and coarse; grey and green mottled. Grey and brown mottled clay lumps near base	1.0	8.0
	Grey and brown mottled sandy clay with angular flint cobbles near base	1.2	9.2
Upper Chalk	Soft, powdery white chalk	0.1+	9.3

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
10	58	32	4.0–5.0	16	15	67	1	1	0
			5.0–6.0	4	8	22	26	26	14
			6.0–6.9	9	21	7	5	23	35
			Mean	10	14	33	11	16	16

TL 00 SE 24 0889 0235 Long Wood, Abbots Langley **Block B**

Surface level (+121.6 m) +399 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Waste 2.5 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Glacial Sand and Gravel	Yellow and grey mottled clay with a few angular flint pebbles	0.6	0.7
	Soft brown and grey mottled clay with a few angular flint cobbles near base	1.8	2.5
Upper Chalk	Soft white chalk	0.1+	2.6

TL 00 SE 25 0925 0418 Harthall Farm, Abbots Langley **Block B**

Surface level (+124.7 m) +409 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Overburden 3.2 m
Mineral 2.3 m
Waste 0.2 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.7	0.7
Glacial Sand and Gravel	Grey and brown mottled clay becoming sandy and pebbly towards base	2.5	3.2
	Sandy gravel Gravel: fine to coarse, subangular to subrounded flint with some rounded quartzite and quartz. Little gravel from 4.2 m to 5.2 m Sand: mainly medium with some fine and coarse; brown	2.3	5.5
	Brown clay with a few angular flint cobbles	0.2	5.7
Upper Chalk	Soft white chalk	0.1+	5.8

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
10	50	40	3.2–4.2	10	3	14	8	41	24
			4.2–5.2	8	23	48	4	8	9
			5.2–5.5	13	8	36	7	14	22
			Mean	10	12	31	7	23	17

TL 00 SE 26 0957 0356 Bedmond, Abbots Langley **Block B**

Surface level (+136.9 m) +449 ft
Water from (+131.2 m) to (+129.4 m)
Shell and auger (modified) 6 in (152 mm) diameter
September 1972

Overburden 0.5 m
Mineral 7.0 m
Bedrock 5.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Glacial Sand and Gravel	Gravel Gravel: fine to coarse, subangular to rounded flint with a trace of quartz Sand: medium with some fine and coarse; brown	7.0	7.5
Reading Beds	Brown and grey mottled clay	0.5	8.0
	Red, grey and green mottled clay	2.0	10.0
	Grey and green mottled sandy clay with angular flint cobbles near base	3.1	13.1
Upper Chalk	Soft, powdery white chalk with angular flint pebbles	0.1+	13.2

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
6	32	62	0.5–1.5	14	13	27	2	27	17
			1.5–2.5	5	13	19	8	25	30
			2.5–3.5	3	4	14	11	33	35
			3.5–4.5	6	10	20	10	34	20
			4.5–5.5	5	2	11	12	40	30
			5.5–6.5	4	2	9	7	31	47
			6.5–7.5	4	3	16	11	25	41
			Mean	6	7	16	9	31	31

TL 10 NW 30 1163 0507 Potterscrouch, St Michael **Block B**

Surface level (+118.3 m) +388 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
February 1972

Overburden 1.8 m
Mineral 5.5 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.7	0.7
Glacial Sand and Gravel	Brown sandy pebbly clay	1.1	1.8
	'Very clayey' gravel Gravel: fine to coarse, subangular to well-rounded flint with some subangular quartzite. Flint cobbles from 3.8 m to 4.8 m and from 6.8 m to base Sand: mainly fine to medium with some coarse; brown	5.5	7.3
Upper Chalk	Soft white chalk with some subangular flint cobbles	0.1+	7.4

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
30	29	41	1.8–2.8	25	17	30	6	13	9
			2.8–3.8	33	14	13	5	18	17
			3.8–4.8	42	5	7	1	20	25
			4.8–5.8	20	3	11	6	21	39
			5.8–6.8	31	14	11	3	16	25
			6.8–7.3	No grading information available					
			Mean	30	11	14	4	18	23

TL 10 NW 31 1199 0986 New Jerome's Farm, Redbourn **Block A**

Surface level (+88.1 m) + 289 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
February 1972

Waste 4.6 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Valley Gravel	Brown and grey mottled sandy clay	1.8	2.4
	Brown pebbly clay with medium to coarse, angular flint gravel. Becoming less gravelly with depth	2.2	4.6
Upper Chalk	Soft white chalk	0.3+	4.9

TL 10 NW 32 1265 0825 Maye's Farm, St Michael **Block A**

Surface level (+83.8 m) +275 ft
Water struck at (+79.7 m)
Shell and auger, 6 in (152 mm) diameter
February 1972

Overburden 0.6 m
Mineral 6.7 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Valley Gravel	'Clayey' gravel Gravel: fine to coarse, mainly angular to subangular with some subrounded to rounded flint. Rounded flint becoming more predominant with depth Sand: mainly coarse with some fine and medium; brown. Top 2.0 m 'very clayey'	6.7	7.3
Upper Chalk	Soft white chalk	0.3+	7.6

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
13	30	57	0.6–1.6	40	2	5	9	26	18
			1.6–2.6	23	4	9	12	23	29
			2.6–3.6	7	11	29	17	17	19
			3.6–4.6*	9	2	6	12	48	23
			4.6–5.6*	5	1	7	17	37	33
			5.6–6.6*	2	2	10	26	38	22
			6.6–7.3*	3	1	4	17	40	35
			Mean	13	4	10	16	32	25

TL 10 NW 33 1277 0670 Prae Wood Farm, St Albans **Block B**

Surface level (+118.9 m) +390 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
March 1972

Overburden 2.8 m
Mineral 4.0 m
Waste 1.0 m
Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Glacial Sand and Gravel	Soft brown sandy clay	1.2	1.8
	Brown sandy pebbly clay with well-rounded flint pebbles	1.0	2.8
	'Very clayey' sandy gravel Gravel: fine to coarse with some cobbles from 4.8 m to 5.8 m; mainly flint Sand: mainly medium with some fine and coarse but mainly fine and medium from 3.8 m to 4.8 m	4.0	6.8
	Soft brown clay with a few angular flint cobbles	1.0	7.8
Upper Chalk	Soft white chalk with some subangular flint pebbles	0.4+	8.2

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
22	43	35	2.8–3.8	15	10	27	7	22	19
			3.8–4.8	34	26	36	1	2	1
			4.8–5.8	24	8	20	5	25	18
			5.8–6.8	16	8	16	7	18	35
			Mean	22	13	25	5	17	18

TL 10 NW 34 1334 0622 Lawrence House, St Albans (Urban Area)

Surface level (+116.4 m) +382 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
February 1972

Overburden 0.7 m
Mineral 1.0 m
Waste 1.0 m
Mineral 1.0 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Glacial Sand and Gravel	Stiff, red and brown mottled clay with few well-rounded flint pebbles	0.3	0.7
	a 'Very clayey' gravel Gravel: fine to coarse, angular black flint Sand: fine to coarse; brown	1.0	1.7
	Brown sandy pebbly clay with angular flint pebbles	1.0	2.7
	b 'Clayey' gravel Gravel: fine to coarse, subrounded flint Sand: mainly medium to coarse with some fine; brown	1.0	3.7
Upper Chalk	White chalk	0.2+	3.9

GRADING

	Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
a	37	18	45	0.7–1.7	37	7	6	5	23	22
b	14	34	52	2.7–3.7	14	7	15	12	25	27
a + b	25	27	48	Mean	25	7	11	9	24	24

TL 10 NW 35 1062 0951 Baker's Farm, Redbourn

Surface level (+134.4 m) +441 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Waste 4.4 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Clay-with-flints	Brown clay with a few angular flint pebbles	0.7	0.8
	Brown and black mottled clay with some angular flint pebbles	3.6	4.4
Upper Chalk	Soft, white and powdery chalk with lumps of brown clay	0.2+	4.6

TL 10 NW 36 1104 0759 Gorhambury, St Michael

Surface level (+126.2 m) +414 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
November 1972

Waste 2.6 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.4	1.4
Clay-with-flints	Brown and black mottled, stiff clay with some flint pebbles, more abundant near base	1.2	2.6
Upper Chalk	Soft white chalk	0.2+	2.8

TL 10 NW 37 1210 0700 Prae Wood, St Michael

Surface level (+129.8 m) +426 ft
Water not struck
Shell and auger (modified) 6 in (152 mm) diameter
November 1972

Waste 18.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Pebbly Clay and Sand	Sandy pebbly clay Gravel: fine to coarse, subrounded to rounded flint with some subangular flint and quartzite Sand: pale brown Clay: becoming stiff and hard at 1.7 m	1.7	2.0
	Pebbly clay Gravel: fine to coarse, subangular to rounded flint with some quartzite Clay: red-brown from 2.0 m to 2.3 m; pale brown from 2.3 m to 4.0 m then red-brown and orange-brown mottled; stiff	7.7	9.7
	Brown sandy pebbly clay. Patches of gravel and coarse sand in hard brown clay	8.9+	18.8

TL 10 NW 38 1365 0976 Batchwood, St Michael

Surface level (+128.9 m) +423 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
August 1972

Waste 1.9 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Clay-with-flints	Brown stiff clay with a few flint pebbles. Pebbles compacted in lowest 0.1 m	1.4	1.9
Upper Chalk	Soft white chalk	0.1+	2.0

TL 10 NE 6 1699 0966 Jersey Farm, Sandridge **Block C**

Surface level (+105.5 m) +346 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
March 1972

Waste 1.8 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.3	0.3
Glacial Sand and Gravel	Brown pebbly clay	1.5	1.8
Upper Chalk	Soft white chalk	0.2+	2.0

TL 10 NE 7 1809 0844 Newgate, Colney Heath **Block C**

Surface level (+77.7 m) +255 ft
Water struck at(+69.8 m)
Shell and auger, 6 in (152 mm) diameter
February 1972

Overburden 0.5 m
Mineral 2.0 m
Waste 3.3 m
Mineral 3.0 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Glacial Sand and Gravel	Brown, slightly sandy soft clay with a few rounded flint and quartz pebbles	0.1	0.5
	a 'Very clayey' sandy gravel Gravel: fine to coarse, angular to rounded black flint and rounded brown flint with a trace of quartz and quartzite Sand: mainly fine from 0.5 m to 1.5 m; mainly medium to coarse from 1.5 m to base; brown	2.0	2.5
	Soft, brown, sandy pebbly clay	3.3	5.8
	b 'Clayey' gravel Gravel: fine to coarse, rounded brown flint with some quartzite and a few large flint cobbles Sand: fine to coarse; brown	3.0	8.8
Upper Chalk	Soft white chalk	0.2+	9.0

GRADING

	Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
a	28	42	30	0.5–1.5	15	48	14	2	17	4
				1.5–2.5	41	2	10	8	22	17
				Mean	28	25	12	5	20	10
b	18	28	54	5.8–6.8	14	11	15	10	17	33
				6.8–7.8	26	6	10	8	26	24
				7.8–8.8*	15	5	11	6	25	38
				Mean	18	8	12	8	22	32
a + b	22	33	45	Mean	22	15	12	6	22	23

TL 10 NE 8 1784 0756 Home Wood, Colney Heath Block C

Surface level (+86.9 m) +285 ft
Water from (+80.0 m) to (+79.0 m) and from (+74.9 m) to (+73.9 m)
Shell and auger, 6 in (152 mm) diameter
February 1972

Overburden 4.9 m
Mineral 5.7 m
Waste 1.4 m
Mineral 2.3 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.2	1.2
Chalky Boulder Clay	Brown clay with angular flint pebbles and chalk fragments	3.7	4.9
Glacial Sand and Gravel	**a** 'Very clayey' gravel	5.7	10.6
	Gravel: fine to coarse, subangular to subrounded flint Sand: medium with some fine and coarse; brown		
	Brown clay becoming brown and red mottled and sandy with depth	1.4	12.0
	b 'Clayey' gravel	2.3	14.3
	Gravel: fine to coarse, subangular to rounded flint. Gravel content decreasing with depth Sand: fine to coarse; brown		
Upper Chalk	Soft white chalk	0.3+	14.6

GRADING

	Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
a	24	31	45	4.9–5.9	21	13	17	9	19	21
				5.9–6.9	15	7	15	12	26	25
				6.9–7.9*	40	4	12	6	12	26
				7.9–8.9	10	10	18	13	19	30
				8.9–9.9	23	7	15	5	24	26
				9.9–10.6	36	8	11	7	17	21
				Means	24	8	15	8	20	25
b	17	36	47	12.0–13.0*	9	11	15	11	22	32
				13.0–14.0	16	8	20	11	24	21
				14.0–14.3	45	13	9	4	19	10
				Mean	17	10	16	10	23	24
a + b	21	33	46	Mean	21	9	15	9	21	25

TL 10 NE 9 1723 0561 Little Cellbarnes, St Albans **Block C**

Surface level (+82.3 m) +270 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
March 1972

Overburden 2.1 m
Mineral 6.1 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Chalky Boulder Clay	Brown sandy clay	1.5	2.1
Glacial Sand and Gravel	'Clayey' gravel Gravel: fine to coarse, subangular to rounded flint with cobbles near base Sand: mainly medium to coarse; brown	6.1	8.2
Upper Chalk	Soft white chalk	0.3+	8.5

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
13	30	57	2.1–3.1	3	3	11	8	36	39
			3.1–4.1	16	7	19	10	23	25
			4.1–5.1	25	5	11	7	24	28
			5.1–6.1	11	8	16	15	21	29
			6.1–7.1	12	6	15	7	17	43
			Mean	13	6	15	9	24	33

TL 10 NE 10 1844 0909 Oak Farm, Colney Heath **Block C**

Surface level (+94.5 m) +310 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
February 1972

Overburden 2.5 m
Mineral 13.0 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Chalky Boulder Clay	Soft brown clay	1.7	2.0
Glacial Sand and Gravel	Brown sandy pebbly clay	0.5	2.5
	'Clayey' sandy gravel Gravel: fine to coarse, angular to well-rounded flint with some quartzite. Little gravel from 2.5 m to 6.5 m; flint cobbles near base Sand: mainly fine with a trace of medium and coarse from 2.5 m to 5.5 m then mainly medium with some fine and coarse; brown	13.0	15.5
Upper Chalk	Soft white chalk	0.3+	15.8

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
20	40	40	2.5–3.5	40	29	13	3	6	9
			3.5–4.5	37	52	10	1	0	0
			4.5–5.5	30	59	9	1	1	0
			5.5–6.5	32	31	34	1	1	1
			6.5–7.5	12	12	41	5	9	21
			7.5–8.5	13	7	13	10	20	37
			8.5–9.5	17	8	4	7	10	54
			9.5–10.5	12	8	14	12	26	28
			10.5–11.5	12	7	13	8	20	40
			11.5–13.0	11	4	12	6	18	49
			13.0–14.5	5	9	16	10	21	39
			14.5–15.5	30	7	13	5	13	32
			Mean	20	18	16	6	13	27

TL 10 NE 11 1835 0726 Oaklands, Colney Heath **Block C**

Surface level (+84.1 m) +276 ft
Water from (+74.4 m) to (+71.6 m)
Shell and auger, 6 in (152 mm) diameter
April 1972

Overburden 1.3 m
Mineral 1.0 m
Waste 4.1 m
Mineral 3.0 m
Waste 6.3 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Chalky Boulder Clay	Soft brown sandy clay	0.6	0.8
	Brown clay with chalk fragments	0.5	1.3
Glacial Sand and Gravel	**a** 'Very clayey' sandy gravel Gravel: fine and coarse, subangular to rounded flint Sand: fine and medium with some coarse; brown. Brown and grey mottled clay near top	1.0	2.3
	Soft brown clay, sandy from 3.8 m to 4.2 m	4.1	6.4
	b 'Clayey' gravel Gravel: fine and coarse, subangular to rounded flint Sand: medium and coarse with some fine; brown	3.0	9.4
Chalky Boulder Clay	Brown clay	0.6	10.0
	Stiff grey clay with chalk fragments and rare flint pebbles from 10.4 m	1.0	11.0
Glacial Sand and Gravel	Brown sandy clay with bands of brown and grey mottled sandy clay with manganiferous staining, and with angular to subrounded flint pebbles from 14.5 m to 15.5 m	4.7	15.7
Upper Chalk	Soft white chalk with angular flint cobbles	0.3+	16.0

GRADING

	Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
a	33	43	24	1.3–2.3	33	20	18	5	12	12
b	15	35	50	6.4–7.4	13	5	18	15	27	22
				7.4–8.4	22	3	15	12	18	30
				8.4–9.4	9	6	20	13	25	27
				Mean	15	4	18	13	24	26
a + b	19	37	44	Mean	19	8	18	11	21	23

TL 10 NE 12 1845 0638 Hill End Farm, Colney Heath **Block C**

Surface level (+83.2 m) +273 ft
Water struck at (+73.7 m)
Shell and auger, 6 in (152 mm) diameter
February 1972

Overburden 4.7 m
Mineral 7.8 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Chalky Boulder Clay	Soft brown sandy clay with chalk and flint fragments becoming less sandy with depth	4.4	4.7
Glacial Sand and Gravel	'Clayey' sandy gravel Gravel: fine to coarse, subangular to rounded flint with some well rounded quartzite. Proportion of gravel decreases with depth to 8.7 m and then increases again towards base Sand: mainly medium with some fine and coarse to 9.5 m, then mainly medium and coarse with some fine; brown	7.8	12.5
Upper Chalk	Soft white chalk	0.3+	12.8

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
14	52	34	4.7–5.7	21	10	23	9	23	14
			5.7–6.7	12	15	46	7	12	8
			6.7–7.7	18	12	60	3	4	3
			7.7–8.7	36	23	33	2	4	2
			8.7–9.5	17	9	40	14	13	7
			9.5–10.5*	1	3	24	11	31	30
			10.5–11.5*	7	3	13	15	34	28
			11.5–12.5*	2	9	19	10	31	29
			Mean	14	11	32	9	19	15

TL 10 NE 13 1847 0533 High Wick, Colney Heath **Block C**

Surface level (+82.6 m) +271 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
March 1972

Overburden 7.0 m
Mineral 2.7 m
Waste 2.3 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Chalky Boulder Clay	Brown clay with chalk fragments	6.4	7.0
Glacial Sand and Gravel	'Clayey' sand Gravel: a trace of fine flint Sand: fine to medium; brown	2.7	9.7
	Brown clay with a trace of well-rounded flint gravel	1.9	11.6
	Brown sandy clay with some fine well-rounded flint pebbles	0.4	12.0
Upper Chalk	Soft white chalk	0.2+	12.2

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
14	84	2	7.0–8.0	12	34	51	2	1	0
			8.0–9.0	15	24	56	1	3	1
			Mean	14	29	53	2	2	0

TL 10 NE 14 1946 0966 Cooper's Green, Hatfield **Block C**

Surface level (+81.4 m) +267 ft
Water from (+79.0 m) to (+76.1 m)
and from (+70.4 m) to base
Shell and auger, 6 in (152 mm) diameter
April 1972

Overburden 0.8 m
Mineral 4.5 m
Waste 5.7 m
Mineral 4.5 m
Waste 0.7 m
Bedrock 2.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Glacial Sand and Gravel	Brown and grey mottled pebbly clay with subrounded to rounded flint pebbles	0.5	0.8
	a 'Clayey' sandy gravel Gravel: fine and coarse, subangular flint with a trace of subrounded quartz; becoming predominantly coarse with depth Sand: medium with some fine and coarse; yellow and grey to brown	4.5	5.3
Chalky Boulder Clay	Soft brown clay with flint fragments	1.7	7.0
	Dark grey clay with chalk fragments	2.1	9.1
	Brown sandy clay with grey silty bands	1.9	11.0
Glacial Sand and Gravel	**b** Sandy gravel Gravel: fine to coarse, mainly flint and chert with some quartzite, subangular. Scattered rounded cobbles. Concentration of large black flint cobbles at 15.4 m Sand: fine to medium, orange	4.5	15.5
	Flint and chert pebbles in a chalky matrix. Some sand	0.7	16.2
Upper Chalk	Chalky marl with fine flint gravel passing, at 17.3 m into hard granular chalk	2.1+	18.3

GRADING

	Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
						−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
a	17	46	37	0.8–1.8	29	5	13	11	32	10
				1.8–2.8	29	18	26	6	19	2
				2.8–3.8*	9	12	40	9	19	11
				3.8–4.8*	9	7	37	8	17	22
				4.8–5.3*	2	3	22	6	23	44
				Mean	17	10	28	8	22	15
b	8	47	45	11.0–12.0*	No grading information available					
				12.0–13.0*	20	7	14	11	30	18
				13.0–14.0*	4	12	25	17	30	12
				14.0–15.0*	0	8	32	13	28	19
				Mean	8	9	24	14	29	16
a + b	13	46	41	Mean	13	9	27	10	25	16

TL 10 NE 15 1946 0865 Beech Farm, Colney Heath **Block C**

Surface level (+76.8 m) +252 ft
Water struck at (+70.6 m)
Shell and auger, 6 in (152 mm) diameter
April 1972

Overburden 0.6 m
Mineral 7.1 m
Waste 2.9 m
Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Chalky Boulder Clay	Soft brown sandy clay	0.3	0.6
Glacial Sand and Gravel	'Very clayey' gravel Gravel: fine and coarse, angular to subrounded flint with a trace of rounded quartzite Sand: mainly medium to coarse with some fine; brown. Clay bands from 2.6 m to 3.1 m–brown and grey mottled sandy pebbly clay; and from 4.4 m to 4.7 m–soft brown sandy clay	7.1	7.7
	Brown sandy pebbly clay with subangular flint cobbles and subrounded to rounded flint pebbles	2.9	10.6
Upper Chalk	Very clayey brown sand with lumps of soft chalk passing into soft chalk	0.4+	11.0

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
16	40	44	0.6–1.6	28	4	12	12	24	20
			1.6–2.6	27	9	21	10	19	14
			3.1–4.4	13	8	17	8	20	34
			4.7–5.7	21	10	26	10	20	13
			5.7–6.7	7	10	26	16	23	18
			6.7–7.7	2	7	17	16	30	28
			Mean	16	8	20	12	22	22

TL 10 NE 16 1936 0639 Smallford, Colney Heath **Block C**

Surface level (+70.1 m) +230 ft
Water struck at (+67.7 m)
Shell and auger, 6 in (152 mm) diameter
March 1972

Overburden 2.4 m
Mineral 1.9 m
Waste 4.4 m
Mineral 3.7 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	2.4	2.4
Glacial Sand and Gravel	**a** 'Clayey' sandy gravel Gravel: mainly fine with a little coarse, well rounded flint Sand: mainly medium; brown	1.9	4.3
Chalky Boulder Clay	Brown and grey mottled clay with chalk fragments and some sandy layers	4.4	8.7
Glacial Sand and Gravel	**b** Gravel Gravel: fine to coarse, subangular to subrounded black and brown flint Sand: mainly medium to coarse with some fine; brown	3.7	12.4
Upper Chalk	Soft white chalk	0.1+	12.5

GRADING

	Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
a	15	60	25	2.4–3.4*	23	7	27	6	24	13
				3.4–4.3*	6	9	67	7	7	4
				Mean	15	8	46	6	16	9
b	8	24	68	8.7–9.7*	17	2	2	4	42	33
				9.7–10.7*	5	3	19	12	32	29
				10.7–11.7*	2	3	16	10	34	35
				Mean	8	3	12	9	36	32
a + b	11	38	51	Mean	11	5	25	8	28	23

TL 10 SW 16 1069 0423 Sergehill, St Stephen **Block B**

Surface level (+134.4 m) +441 ft
Water from (+133.9 m) to (+132.0 m)
Shell and auger, 6 in (152 mm) diameter
January 1972

Overburden 0.5 m
Mineral 1.9 m
Bedrock 6.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Glacial Sand and Gravel	'Clayey' gravel Gravel: fine to coarse, subrounded flint Sand: fine to coarse; brown	1.9	2.4
Reading Beds	Red, green and yellow mottled clay	4.6	7.0
	Yellow and green mottled clayey sand with small oyster shells. Lowest 0.2 m is gravelly clay with subangular flint	0.7	7.7
Upper Chalk	White chalk with subangular flint cobbles	0.8+	8.5

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
15	39	46	0.5–1.5*	10	7	20	8	20	35
			1.5–2.4*	21	11	17	15	24	12
			Mean	15	9	19	11	22	24

TL 10 SW 17 1056 0355 Job's Wood, St Stephen **Block B**

Surface level (+127.4 m) +418 ft
Water from (+120.4 m) to (+119.4 m)
Shell and auger, 6 in (152 mm) diameter
March 1972

Waste 5.0 m
Bedrock 5.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Glacial Sand and Gravel	Soft brown and grey mottled sandy clay, with a few well rounded flint and quartz pebbles	4.9	5.0
Reading Beds	Dark red clay	2.0	7.0
	Greenish grey sandy clay	1.0	8.0
	Brown, grey and green sandy clay with well-rounded black flint pebbles and angular flint cobbles near base	2.4	10.4
Upper Chalk	Hard white chalk	0.2+	10.6

TL 10 SW 18 1093 0196 Fortunes Farm, Abbots Langley **Block B**

Surface level (+94.2 m) +309 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
January 1972

Overburden 0.2 m
Mineral 2.6 m
Waste 0.1 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Glacial Sand and Gravel	'Clayey' sandy gravel Gravel: fine to coarse, subangular to subrounded flint Sand: mainly medium with some fine and coarse; brown. Bands of orange sand from 0.8 m to 0.9 m and from 1.6 m to 2.2 m	2.6	2.8
	Soft brown clay with black streaks and a few subangular flint cobbles	0.1	2.9
Upper Chalk	Soft white chalk	0.1+	3.0

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
15	51	34	0.2–1.2	20	8	16	14	23	19
			1.2–2.2	8	17	39	14	15	7
			2.2–2.8	20	10	23	7	15	25
			Mean	15	12	27	12	18	16

TL 10 SW 19 1185 0330 Holt Farm, St Stephen **Block B**

Surface level (+91.7 m) +301 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
February 1972

Overburden 2.5 m
Mineral 6.0 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Glacial Sand and Gravel	Soft brown clay with well-rounded flint pebbles. Becoming sandy with depth	1.2	1.5
	Brown sandy clay	1.0	2.5
	'Clayey' sandy gravel Gravel: fine (angular) to coarse (subangular to subrounded) flint Sand: mainly medium with some fine and coarse; brown	6.0	8.5
Upper Chalk	Soft, white chalk with a few subangular flint cobbles	0.2+	8.7

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
15	49	36	2.5–3.5	16	9	29	9	23	14
			3.5–4.5	16	2	45	7	20	10
			4.5–5.5	2	20	31	10	19	18
			5.5–6.5	13	8	28	13	26	12
			6.5–7.5	22	8	23	13	17	17
			7.5–8.5	19	7	22	11	22	19
			Mean	15	7	31	11	21	15

TL 10 SW 20 1142 0263 Oaklea, St Stephen **Block B**

Surface level (+89.3 m) +293 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
January 1972

Overburden 3.3 m
Mineral 1.3 m
Waste 1.7 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Glacial Sand and Gravel	Soft brown sandy clay with a few flint pebbles	2.8	3.3
	'Clayey' sandy gravel Gravel: fine to coarse, subrounded to well-rounded flint with some quartzite Sand: fine to medium with some coarse; brown. Lumps of brown clay from 3.6 m to 4.6 m	1.3	4.6
	Brown sandy clay with black iron-staining and a few flint cobbles	1.7	6.3
Upper Chalk	White chalk	0.1+	6.4

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
17	49	34	3.3–4.3	17	22	19	8	17	17
			4.3–4.6	17	27	16	7	11	22
			Mean	17	23	19	7	16	18

TL 10 SW 21 1151 0146 Garston Manor, St Stephen **Block B**

Surface level (+79.6 m) +261 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Overburden 5.4 m
Mineral 3.8 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Glacial Sand and Gravel	Brown sandy pebbly clay with well-rounded flint and quartz pebbles	0.9	1.4
	Grey and brown mottled clay	2.2	3.6
	Soft brown sandy clay with black streaks and a few well-rounded flint pebbles	1.8	5.4
	Gravel Gravel: fine and coarse, subangular to well-rounded flint with some well-rounded quartzite Sand: medium with some coarse and fine; brown	3.8	9.2
Upper Chalk	Soft white chalk	0.1+	9.3

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
6	45	49	5.4–6.4	4	14	31	7	27	17
			6.4–7.4	6	7	39	12	25	11
			7.4–8.4	11	3	21	8	27	30
			8.4–9.2	3	5	18	11	20	43
			Mean	6	7	28	10	25	24

TL 10 SW 22 1257 0449 Bone Hill, St Stephen **Block B**

Surface level (+112.4 m) +369 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
January 1972

Overburden 3.1 m
Mineral 3.0 m
Waste 1.9 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Glacial Sand and Gravel	Brown sandy clay	2.7	3.1
	'Very clayey' gravel Gravel: mainly coarse with some fine, subangular to well-rounded flint with some quartz and quartzite Sand: mainly fine to medium with some coarse; brown	3.0	6.1
	Brown and black mottled stiff clay with angular flint cobbles	0.5	6.6
	Brown, pebbly sandy clay with rounded flint pebbles	0.1	6.7
	Brown and black mottled stiff clay with angular flint cobbles	1.3	8.0
Upper Chalk	Soft white chalk	0.2+	8.2

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
28	32	40	3.1–4.1	35	29	14	3	10	9
			4.1–5.1	15	13	11	8	20	33
			5.1–6.1	33	7	6	6	16	32
			Mean	28	16	10	6	15	25

TL 10 SW 23 1260 0371 Noke Farm, St Stephen **Block B**

Surface level (+80.8 m) +265 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
March 1972

Overburden 0.3 m
Mineral 5.7 m
Waste 3.0 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Glacial Sand and Gravel	'Very clayey' sandy gravel Gravel: fine and coarse, subangular to rounded flint Sand: medium with some fine and coarse, brown. 'Clayey' from top to 3.3 m	5.7	6.0
	Soft brown and grey mottled sandy clay with rounded black flint pebbles from 7.6 m to base	2.3	8.3
	Chalky clay with flint pebbles	0.7	9.0
Upper Chalk	Soft white chalk	0.2+	9.2

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
28	40	32	0.3–1.3	43	5	10	7	21	14
			1.3–2.3	30	7	14	12	22	15
			2.3–3.3	42	6	10	7	20	15
			3.3–4.3	17	11	30	17	18	7
			4.3–5.3	17	13	26	11	22	11
			5.3–6.0	17	13	36	12	18	4
			Mean	28	9	20	11	21	11

TL 10 SW 24 1264 0026 Munden Spring, St Stephen **Block D**

Surface level (+75.6 m) +248 ft
Water from (+70.6 m) to (+70.4 m)
Shell and auger, 6 in (152 mm) diameter
February 1972

Overburden 5.3 m
Mineral 6.7 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Chalky Boulder Clay	Soft brown and grey mottled clay, sandy in parts with a few flint pebbles and chalk fragments	1.7	1.8
	Brown clayey sand	0.1	1.9
	Stiff brown clay with chalk fragments and layers of grey laminated clay	3.4	5.3
Glacial Sand and Gravel	'Very clayey' sandy gravel Gravel: fine to coarse, but mainly fine, subangular flint Sand: fine to coarse, brown	6.7	12.0
Upper Chalk	Soft white chalk	0.2+	12.2

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
26	40	34	5.3–6.3	43	19	10	5	14	9
			6.3–7.3	20	15	20	14	21	10
			7.3–8.3	23	16	20	8	11	22
			8.3–9.3	46	7	10	4	15	18
			9.3–10.3	11	8	5	23	31	22
			10.3–11.3	17	11	19	18	32	3
			11.3–12.0	18	9	28	18	20	7
			Mean	26	12	16	12	21	13

TL 10 SW 25 1350 0043 Munden House, St Stephen **Block D**

Surface level (+67.4 m) +221 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
February 1972

Overburden 1.1 m
Mineral 2.0 m
Waste 2.4 m
Mineral 2.0 m
Waste 0.4 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Glacial Sand and Gravel	Soft, brown pebbly clay with subangular to subrounded flint pebbles	0.6	1.1
	a 'Clayey' sandy gravel Gravel: fine to coarse, subangular to well-rounded flint Sand: mainly medium with some fine and coarse; brown	2.0	3.1
Chalky Boulder Clay	Brown clay with a few subangular flint pebbles	2.4	5.5
Glacial Sand and Gravel	**b** 'Clayey' sandy gravel Gravel: fine to coarse, subrounded flint Sand: mainly medium with some fine and coarse; brown	2.0	7.5
	Brown sandy pebbly clay with angular to well-rounded flint pebbles	0.4	7.9
Upper Chalk	Soft white chalk	0.3+	8.2

GRADING

	Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
a	12	46	42	1.1–2.1	5	4	32	13	22	24
				2.1–3.1	19	7	22	14	28	10
				Mean	12	6	27	13	25	17
b	24	41	35	5.5–6.5	13	10	20	13	26	18
				6.5–7.5	35	11	18	11	13	12
				Mean	24	10	19	12	20	15
a + b	18	44	38	Mean	18	8	23	13	22	16

TL 10 SW 26 1462 0334 Hyde Lane, St Stephen **Block D**

Surface level (+71.9 m) +236 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
March 1972

Overburden 1.4 m
Mineral 2.3 m
Waste 7.1 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Glacial Sand and Gravel	Brown, soft sandy clay	1.1	1.4
	'Clayey' sandy gravel Gravel: fine to coarse, angular to subrounded flint with a trace of subrounded quartz Sand: mainly medium to coarse with some fine; brown	2.3	3.7
	Grey clay becoming brown and green mottled with depth. Sandy bands from 3.7 m to 4.7 m and sandy from 4.7 m to 5.6 m	3.7	7.4
?Chalky Boulder Clay	Brown sandy pebbly clay with subangular to subrounded flint pebbles	1.2	8.6
	Brown clay	0.2	8.8
	Grey chalky clay	1.2	10.0
	Brown pebbly sand with subangular flint pebbles	0.3	10.3
	Brown chalky clay	0.5	10.8
Upper Chalk	Soft white chalk with a few subangular flint cobbles	0.3+	11.1

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
18	43	39	1.4–2.4	15	4	12	22	31	16
			2.4–3.4	21	9	20	18	18	14
			Mean	18	7	16	20	24	15

TL 10 SW 27 1451 0190 Hansteads House, St Stephen **Block D**

Surface level (+66.8 m) +219 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
April 1972

Overburden 3.3 m
Mineral 5.0 m
Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Chalky Boulder Clay	Brown clay with chalk fragments and subangular flint pebbles; more sandy towards base	3.0	3.3
Glacial Sand and Gravel	Sandy gravel Gravel: fine to coarse, subangular flint with some quartzite. Proportion of gravel increases with depth Sand: mainly medium with some fine and coarse. Top metre 'very clayey'	5.0	8.3
Upper Chalk	Soft white chalk with a few angular flint fragments	0.7	9.0
	Compacted chalk with a few flint fragments	0.3+	9.3

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
9	61	30	3.3–4.3	24	12	30	10	19	5
			4.3–5.3	5	15	65	6	7	2
			5.3–6.3	7	13	31	11	24	14
			6.3–7.3	No grading information available					
			7.3–8.3	2	7	27	16	18	30
			Mean	9	12	39	10	17	13

TL 10 SW 28 1398 0083 Little Munden Farm, Aldenham **Block A**

Surface level (+60.4 m) +198 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
January 1972

Overburden 0.4 m
Mineral 3.4 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Valley Gravel	Brown pebbly clay with rounded flint pebbles	0.2	0.4
	'Clayey' gravel Gravel: fine to coarse, rounded and well-rounded flint and some quartz Sand: fine to coarse; brown	3.4	3.8
Upper Chalk	Soft white chalk	0.1+	3.9

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
18	35	47	0.4–1.4	20	5	15	11	25	24
			1.4–2.4	17	7	16	12	28	20
			2.4–3.4	16	11	18	12	34	9
			Mean	18	7	17	11	29	18

TL 10 SE 1 1567 0458 Hedges Farm, St Albans Block D

Surface level (+88.4 m) +290 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
February 1972

Overburden 2.2 m
Mineral 3.4 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Chalky Boulder Clay	Brown soft clay with some subangular flint pebbles	1.9	2.2
Glacial Sand and Gravel	'Very clayey' sandy gravel Gravel: fine to medium angular flint Sand: mainly medium with some fine and coarse; brown. Lower 0.4 m has brown clay lumps	3.0	5.2
	Brown clay with fine to coarse angular flint pebbles	0.4	5.6
Upper Chalk	Soft white chalk	0.2+	5.8

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
23	44	33	2.2–3.2	16	7	13	12	25	27
			3.2–4.2	27	8	35	12	11	7
			4.2–5.2	19	5	47	7	9	13
			5.2–5.6	42	3	5	3	17	30
			Mean	23	6	29	9	16	17

TL 10 SE 2 **1569 0334** **Radlett Aerodrome, St Stephen** **Block D**

Surface level (+74.1 m) +243 ft
Water struck at (+70.1 m)
Shell and auger, 6 in (152 mm) diameter
March 1972

Overburden 1.4 m
Mineral 2.0 m
Waste 5.6 m
Mineral 5.0 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Glacial Sand and Gravel	Brown soft sandy clay	1.1	1.4
	a 'Very clayey' gravel Gravel: fine to coarse, subangular to well-rounded flint Sand: mainly medium to coarse with some fine; brown	2.0	3.4
	Sandy pebbly clay with subangular to well-rounded flint	1.0	4.4
Chalky Boulder Clay	Brown clay with chalk fragments	2.9	7.3
	Brown and grey mottled sandy clay	0.7	8.0
	Brown and grey mottled sandy pebbly clay with chalk fragments	1.0	9.0
Glacial Sand and Gravel	**b** Gravel Gravel: fine to coarse, subangular to well-rounded flint Sand: medium to coarse with some fine; brown	5.0	14.0
Upper Chalk	Soft brown-stained chalk	0.2+	14.2

GRADING

	Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
a	26	20	54	1.4–2.4	32	3	6	6	22	31
				2.4–3.4	19	3	10	13	34	21
				Mean	26	3	8	9	28	26
b	6	36	58	9.0–10.0*	16	6	15	15	23	25
				10.0–11.0*	2	3	11	13	33	38
				11.0–12.0*	1	7	36	8	24	24
				12.0–13.0*	0	2	12	16	37	33
				13.0–14.0*	13	1	11	20	15	40
				Mean	6	4	17	15	26	32
a + b	12	31	57	Mean	12	3	15	13	27	30

TL 10 SE 3 1548 0255 Colney Street, St Stephen **Block D**

Surface level (+73.8 m) +242 ft
Water from (+71.2 m) to (+69.2 m)
from (+66.2 m) to (+65.2 m)
and from (+59.9 m) to (+57.9 m)
Shell and auger, 6 in (152 mm) diameter
March 1972

Overburden 0.6 m
Mineral 8.0 m
Waste 3.3 m
Mineral 4.0 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.6	0.6
Glacial Sand and Gravel	**a** 'Very clayey' sandy gravel Gravel: fine to coarse, subangular to well-rounded flint with a trace of quartzite. Only small amounts of gravel from 3.6 m to 4.6 m, from 5.6 m to 6.6 m and from 7.6 m to 8.6 m Sand: mainly medium with equal amounts of fine and coarse; brown. 'Very clayey' from 0.6 m to 2.6 m and in same horizons where there is only a little gravel (see above)	8.0	8.6
Chalky Boulder Clay	Brown clay with chalk fragments; grey in parts	3.3	11.9
Glacial Sand and Gravel	**b** 'Clayey' gravel Gravel: mainly fine with some coarse, angular and subangular brown flint with some well rounded black flint. Equal amounts of fine and coarse from 13.9 m to base Sand: mainly coarse and medium with some fine; brown	4.0	15.9
Upper Chalk	Soft white chalk with angular flint cobbles	0.1+	16.0

GRADING

	Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
a	21	46	33	0.6–1.6	21	8	18	13	19	21
				1.6–2.6	26	6	18	10	19	21
				2.6–3.6*	5	8	23	16	23	25
				3.6–4.6*	46	24	23	4	1	2
				4.6–5.6	5	5	22	15	26	27
				5.6–6.6	24	25	35	7	6	3
				6.6–7.6	6	6	12	16	32	28
				7.6–8.6*	32	8	42	7	9	2
				Mean	21	11	24	17	17	16
b	12	37	51	11.9–12.9	15	10	28	14	24	9
				12.9–13.9	13	4	16	17	41	9
				13.9–15.9*	9	6	16	8	30	31
				Mean	12	6	19	12	31	20
a + b	18	43	39	Mean	18	9	23	11	22	17

TL 10 SE 4 1512 0041 Oakridge Lane, Aldenham **Block D**

Surface level (+96.0 m) +315 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
January 1972

Waste 2.8 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Glacial Sand and Gravel	Brown sandy pebbly clay with some fine to coarse flint gravel at base. Lumps of grey and brown mottled laminated clay	2.5	2.8
Upper Chalk	Soft white chalk	0.2+	3.0

TL 10 SE 5 1647 0337 Napsbury Hospital, London Colney **Block D**

Surface level (+70.4 m) +231 ft
Water from (+66.3 m) to (+65.3 m)
Shell and auger, 6 in (152 mm) diameter
February 1972

Overburden 3.1 m
Mineral 2.0 m
Waste 3.1 m
Mineral 1.7 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Chalky Boulder Clay	Brown sandy clay	0.4	0.6
	Brown clay with chalk fragments	1.5	2.1
Glacial Sand and Gravel	Brown sandy clay	1.0	3.1
	a 'Clayey' sand Gravel: fine Sand: fine to medium; brown	2.0	5.1
Chalky Boulder Clay	Stiff grey clay with chalk fragments	2.7	7.8
Glacial Sand and Gravel	Brown sandy clay	0.4	8.2
	b 'Very clayey' pebbly sand Gravel: mainly fine with some coarse flint Sand: mainly medium with some fine and coarse	1.7	9.9
Upper Chalk	Soft white chalk	0.3+	10.2

GRADING

	Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
a	16	83	1	3.1–4.1	22	32	42	3	1	0
				4.1–5.1*	9	31	58	1	1	0
				Mean	16	31	50	2	1	0
b	30	53	17	8.2–9.9	30	15	29	9	12	5
a + b	22	70	8	Mean	22	24	40	6	6	2

TL 10 SE 6 1603 0212 Old Parkbury, St Stephen **Block D**

Surface level (+67.4 m) +221 ft
Water struck at (+64.5 m)
Shell and auger, 6 in (152 mm) diameter
March 1972

Overburden 2.9 m
Mineral 5.5 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.6	0.6
Glacial Sand and Gravel	Brown sandy clay with a few well-rounded flint pebbles	0.4	1.0
	Soft brown clay; sandy near the top	1.9	2.9
	Gravel Gravel: fine to coarse, angular to subrounded brown and black flint with a trace of quartz. Coarse material predominant Sand: mainly medium with some fine and coarse; brown. Lumps of brown clay near base	5.5	8.4
Upper Chalk	Soft white chalk	0.2+	8.6

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
7	44	49	2.9–3.9*	10	8	31	12	17	22
			3.9–4.9*	13	10	23	8	15	31
			4.9–5.9*	8	9	31	12	15	25
			5.9–6.9*	2	3	8	13	23	51
			6.9–7.9*	4	2	39	9	19	27
			7.9–8.4*	No grading information available					
			Mean	7	7	26	11	18	31

TL 10 SE 7 1728 0340 South Cottages, London Colney **Block D**

Surface level (+68.9 m) +226 ft
Water struck at (+62.6 m)
Shell and auger, 6 in (152 mm) diameter
February 1972

Overburden 3.4 m
Mineral 5.1 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Glacial Sand and Gravel	Soft brown and grey mottled sandy clay with a few subrounded and rounded flint pebbles	0.9	1.5
	Brown sandy clay	0.3	1.8
Chalky Boulder Clay	Brown and grey mottled clay with chalk fragments	1.6	3.4
Glacial Sand and Gravel	'Clayey' sandy gravel Gravel: fine to coarse, subangular to subrounded flint with a trace of rounded quartz Sand: mainly medium with some fine and coarse	5.1	8.5
Upper Chalk	Soft white chalk	0.2+	8.7

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
12	46	42	3.4–4.4	20	25	24	9	14	8
			4.4–5.4	25	7	11	9	25	23
			5.4–6.4	14	26	39	7	11	3
			6.4–7.4*	2	7	19	14	22	36
			7.4–8.5*	2	5	15	12	32	34
			Mean	12	14	22	10	21	21

TL 10 SE 8 1780 0262 All Saints Convent, London Colney Block D

Surface level (+68.6 m) +225 ft
Water from (+65.1 m) to (+63.6 m)
Shell and auger (modified), 6 in (152 mm) diameter
August 1972

Overburden 1.5 m
Mineral 3.5 m
Bedrock 3.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.8	0.8
Glacial Sand and Gravel	Brown silty pebbly clay with subangular to subrounded flints. Gravel content increasing with depth	0.7	1.5
	Pebbly sand Gravel: fine subrounded to rounded flint with some rounded quartz and quartzite. Gravel content decreasing with depth; no gravel from 3.5 m to base Sand: fine to coarse; brown. Mainly medium from 1.5 m to 2.5 m, mainly fine and medium from 2.5 m to 3.5 m and mainly fine from 3.5 m to base	3.5	5.0
Reading Beds	Soft grey and brown mottled clay becoming brown at 5.9 m and red and brown mottled at 6.4 m	2.8	7.8
	Grey and brown mottled sandy pebbly clay with rounded black flints	0.4	8.2
Upper Chalk	Soft white chalk with fragments of rock chalk	0.2+	8.4

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
10	69	21	1.5–2.5	15	10	20	8	33	14
			2.5–3.5	8	37	31	7	10	7
			3.5–4.5	7	78	13	2	0	0
			4.5–5.0	No grading information available					
			Mean	10	42	21	6	14	7

TL 10 SE 9 1833 0450 Bowmansgreen, Ridge **Block C**

Surface level (+80.2 m) +263 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Overburden 2.5 m
Mineral 5.8 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Glacial Sand and Gravel	Brown sandy clay with a few angular flint pebbles	1.9	2.5
	'Very clayey' sandy gravel Gravel: fine and coarse, mainly angular and subangular flint with a trace of subrounded and rounded flint. No gravel from top to 5.2 m and from 6.7 m to 7.3 m Sand: medium with a trace of fine and coarse, brown. Brown clay bands from 4.3 m to 5.2 m and from 6.7 m to 7.3 m	5.8	8.3
Upper Chalk	Soft brown clay and white chalk passing into soft white chalk	0.3+	8.6

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
11	66	23	2.5–3.5	12	55	30	3	0	0
			3.5–4.3	7	17	72	4	0	0
			5.2–6.2	13	7	39	6	17	18
			6.2–6.7	16	5	15	9	35	20
			7.3–8.3	10	16	34	4	18	18
			Mean	11	22	39	5	12	11

TL 10 SE 10 1968 0433 Garden Wood, Ridge **Block C**

Surface level (+71.9 m) +236 ft
Water struck at (+67.5 m)
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Overburden 1.1 m
Mineral 11.6 m
Waste 2.5 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Glacial Sand and Gravel	Grey and brown mottled clay	0.5	1.1
	Sandy gravel Gravel: fine to coarse, subrounded to rounded flint with traces of subrounded to rounded quartz and fine, subangular and angular flint. Fine gravel predominates to 6.1 m then equal proportions of fine and coarse to 10.1 m and then fine predominates again Sand: equal proportions of coarse and medium with some fine near the top but proportion of medium increasing with depth. Also proportion of fine sand is greatly increased from 7.1 m to base. Brown in colour with lumps of grey chalky clay near base	11.6	12.7
Chalky Boulder Clay	Soft grey clay with chalk fragments becoming brown at 14.8 m	2.5	15.2
Upper Chalk	Soft white chalk	0.2+	15.4

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
6	54	40	1.1–2.1	11	4	9	8	40	28
			2.1–3.1	11	3	9	7	43	27
			3.1–4.1	13	4	15	8	38	22
			4.1–5.1*	4	2	10	9	40	35
			5.1–6.1*	1	2	24	9	40	24
			6.1–7.1*	4	4	52	10	16	14
			7.1–8.1*	9	21	51	7	6	6
			8.1–9.1*	4	20	53	10	8	5
			9.1–10.1*	4	11	47	7	16	15
			10.1–11.1*	No grading information available					
			11.1–12.1*	No grading information available					
			12.1–12.7*	7	28	40	12	12	1
			Mean	6	12	33	9	24	16

TL 10 SE 11 1877 0238 Dell Grove, Shenley **Block D**

Surface level (+76.2 m) +250 ft
Water struck at (+66.2 m)
Shell and auger, 6 in (152 mm) diameter
January 1972

Overburden 3.9 m
Mineral 6.8 m
Waste 0.4 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Glacial Sand and Gravel	Stiff brown sandy pebbly clay with streaks of grey sand	2.4	2.9
	Brown sandy clay with a few pebbles. No pebbles from 3.9 m to base	1.0	3.9
	'Clayey' pebbly sand Gravel: fine to coarse, subrounded flint Sand: mainly medium with some fine and a trace of coarse; brown. Lumps of brown and black mottled clay from 6.9 m to 7.9 m	6.8	10.7
?Chalky Boulder Clay	Stiff brown clay becoming blue-grey at 11.0 m	0.4	11.1
Upper Chalk	Soft white chalk	0.2+	11.3

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
20	63	17	3.9–4.9	28	12	29	9	15	7
			4.9–5.9	39	18	24	4	7	8
			5.9–6.9	18	34	42	3	3	0
			6.9–7.9	25	27	28	6	8	6
			7.9–8.9	8	12	53	8	12	7
			8.9–9.9	13	12	50	7	15	3
			9.9–10.7*	3	3	53	9	14	18
			Mean	20	17	39	7	10	7

TL 10 SE 12 1967 0306 Salisbury Hall, Shenley **Block D**

Surface level (+76.2 m) +250 ft
Water struck at (+59.1 m)
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Waste 20.1 m
Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.7	0.7
Glacial Sand and Gravel	Grey and brown mottled pebbly clay with angular and subangular flint pebbles. Becoming sandy with depth	4.4	5.1
	Gravel Gravel: fine to coarse, subrounded and rounded flint and a few subrounded quartz and angular to subangular flints Sand: mainly medium with some fine and coarse; brown	0.8	5.9
Chalky Boulder Clay	Brown sandy clay	0.4	6.3
	Stiff grey clay, with chalk fragments from 6.9 m to 13.5 m and then grey and silty to base	8.8	15.1
Glacial Sand and Gravel	Brown sandy clay with flint pebbles from 15.6 m	0.7	15.8
	Gravel Gravel: fine to coarse, well-rounded black flint with subangular and subrounded brown flint and traces of subrounded quartz, angular flint, quartz and jasper. Increasing number of chalk pebbles towards base Sand: medium and coarse with some fine; brown	4.3	20.1
Upper Chalk	Soft white chalk	0.4+	20.5

TL 10 SE 13 1929 0078 Shenley **Block F**

Surface level (+130.5 m) +428 ft
Water struck at (+129.3 m)
Shell and auger, 6 in (152 mm) diameter
January 1972

Overburden 1.2 m
Mineral 2.8 m
Bedrock 29.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.7	0.7
Pebble Gravel	Brown clay	0.5	1.2
	'Clayey' sandy gravel Gravel: mainly fine in top metre but fine to coarse below, subangular flint Sand: mainly medium with some fine and coarse; sharp and white. 'Clayey' mainly in top metre	2.8	4.0
London Clay	Stiff brown weathered clay	1.0	5.0
	Stiff blue-grey clay	28.5+	33.5

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
10	63	27	1.2–2.2	15	7	26	10	28	14
			2.2–3.2	5	10	48	25	7	5
			3.2–4.0	10	17	40	7	8	18
			Mean	10	11	38	14	15	12

TL 10 SE 14 1753 0111 Wild Farm, Aldenham **Block E**

Surface level (+105.2 m) +345 ft
Water from (+102.4 m) to (+101.3 m)
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Waste 5.0 m
Bedrock 14.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.7	0.7
?Glacial Sand and Gravel	Grey and brown mottled sandy pebbly clay with well-rounded flint and quartz pebbles	1.4	2.1
	Soft brown sandy clay with grey streaks and wood fragments	0.4	2.5
	Grey and brown mottled sandy pebbly clay with subrounded, mainly black, flint pebbles	2.5	5.0
London Clay	Stiff brown silty clay	0.8	5.8
	Stiff grey silty clay	2.5	8.3
Reading Beds	Brown and grey mottled sandy clay	2.9	11.2
	'Very clayey' sand Gravel: fine with some coarse (especially from 18.2 m to base), well-rounded flint with angular flint near base Sand: fine with some medium and a trace of coarse sand; grey and green mottled	7.7	18.9
Upper Chalk	Soft brown, iron-stained, chalk	0.1+	19.0

TQ 09 NW 4 0061 9673 Lodge Farm, Chenies **Block E**

Surface level (+121.9 m) +400 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Waste 0.8 m
Bedrock 4.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Pebbly Clay and Sand	Brown sandy pebbly clay with well-rounded flint pebbles	0.4	0.8
?Reading Beds	Brown sandy clay becoming green at 3.6 m and green and brown mottled with rounded black flint pebbles at 4.2 m	3.7	4.5
	Stiff brown clay with subangular and angular flint cobbles	0.6	5.1
Upper Chalk	Soft white chalk	0.2+	5.3

TQ 09 NW 5 0119 9790 Manor House, Chenies **Block E**

Surface level (+118.3 m) +388 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Waste 6.6 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Pebbly Clay and Sand	Brown sandy pebbly clay with rounded black flint pebbles	2.7	3.1
	Brown clay with a few subangular flint cobbles	3.5	6.6
Upper Chalk	Soft white chalk	0.2+	6.8

TQ 09 NW 6 0135 9627 Newhouse Farm, Chorleywood **Block E**

Surface level (+110.6 m) +363 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Overburden 1.7 m
Mineral 2.7 m
Waste 1.0 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Glacial Sand and Gravel	Brown sandy pebbly clay with subrounded to rounded flint pebbles	1.3	1.7
	Sandy gravel Gravel: fine to coarse, subrounded and rounded flint with some angular and subangular flint and a trace of subrounded quartz. Flint cobbles in top metre Sand: medium with traces of fine and coarse; brown	2.7	4.4
	Brown clay with black iron-staining and a few angular to subangular flint cobbles	1.0	5.4
Upper Chalk	Soft white chalk	0.1+	5.5

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
9	47	44	1.7–2.7	8	13	23	4	18	34
			2.7–3.7	11	5	33	6	18	27
			3.7–4.4	6	23	31	8	22	10
			Mean	9	12	29	6	19	25

TQ 09 NW 7 0232 9720 Green Street, Chenies **Block E**

Surface level (+116.1 m) +381 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Waste 4.5 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Glacial Sand and Gravel	Brown sandy pebbly clay with rounded flint pebbles and a few subrounded to rounded quartz pebbles	1.9	2.5
	Stiff brown clay with black iron-staining and a few angular flint cobbles	2.0	4.5
Upper Chalk	Soft white chalk	0.2+	4.7

TQ 09 NW 8 0335 9669 Chorleywood House, Chorleywood **Block E**

Surface level (+108.8 m) +357 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Waste 4.6 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Glacial Sand and Gravel	Brown sandy pebbly clay with rounded black flint pebbles and some subangular flint and quartz pebbles	2.8	3.2
	Stiff brown clay with black iron-staining and a few angular flint cobbles	1.4	4.6
Upper Chalk	Soft white chalk	0.2+	4.8

TQ 09 NW 9 0496 9943 Deadman's Ash Hill, Sarratt **Block E**

Surface level (+114.0 m) +374 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Overburden 0.6 m
Mineral 2.1 m
Waste 1.7 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Glacial Sand and Gravel	Brown sandy clayey gravel: subrounded to rounded flint pebbles and a few subangular flint pebbles. Subrounded flint cobbles near base	2.1	2.7
	Brown sandy clay with a few subangular to subrounded flint cobbles	1.7	4.4
Upper Chalk	Soft white chalk	0.2+	4.6

TQ 09 NW 10 0457 9873 Greenend Farm, Sarratt **Block E**

Surface level (+112.8 m) +370 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Waste 5.1 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Glacial Sand and Gravel	Brown sandy pebbly clay with subrounded flint pebbles	2.5	2.8
	Stiff brown clay with black iron-staining and a few subangular to subrounded flint cobbles	2.3	5.1
Upper Chalk	Soft white chalk	0.1+	5.2

TQ 09 NE 2 0589 9865 White House, Sarratt **Block E**

Surface level (+105.5 m) +346 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Overburden 1.0 m
Mineral 1.7 m
Waste 1.4 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	1.0	1.0
Glacial Sand and Gravel	Brown clayey pebbly sand with subrounded to rounded flint pebbles	1.7	2.7
	Brown clay with black iron-staining and a few angular to subangular flint cobbles	1.4	4.1
Upper Chalk	Soft white chalk	0.2+	4.3

TQ 09 NE 3 0557 9778 Micklefield Hall, Sarratt **Block E**

Surface level (+101.2 m) +332 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Overburden 1.9 m
Mineral 3.2 m
Waste 1.1 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.9	1.9
Glacial Sand and Gravel	Brown clayey sand	0.8	2.7
	Brown clayey pebbly sand; some rounded flint pebbles	2.4	5.1
	Stiff brown clay with a few angular to subangular flint cobbles	1.1	6.2
Upper Chalk	Soft white chalk	0.1+	6.3

TQ 09 NE 4 0681 9708 Redheath, Sarratt **Block E**

Surface level (+85.3 m) +280 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Overburden 2.0 m
Mineral 2.4 m
Waste 0.6 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.7	0.7
Glacial Sand and Gravel	Brown sandy pebbly clay with subangular to subrounded flint pebbles	1.3	2.0
	'Clayey' sandy gravel Gravel: fine to coarse flint; fine gravel, mainly angular and subangular; coarse gravel, subrounded to rounded. Little gravel in top metre Sand: medium with some fine and coarse; brown	2.4	4.4
	Brown clay with black iron-staining and a few angular to subangular flint cobbles	0.6	5.0
Upper Chalk	White powdery chalk	0.2+	5.2

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
14	49	37	2.0–3.0	20	30	40	4	6	0
			3.0–4.0	8	6	12	10	27	37
			4.0–4.4	12	10	22	9	22	25
			Mean	14	16	26	7	17	20

TQ 09 NE 5 0615 9667 Thurlwood House, Sarratt **Block E**

Surface level (+84.1 m) +276 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Waste 6.1 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Glacial Sand and Gravel	Brown sandy pebbly clay with subangular to rounded flint pebbles and a few subrounded to rounded quartz pebbles	4.7	5.3
	Brown clay with black iron-staining and a few angular to subangular flint cobbles	0.8	6.1
Upper Chalk	White powdery chalk	0.1+	6.2

TQ 09 NE 6 0636 9535 Scotsbridge Mill, Rickmansworth **Block A**

Surface level (+50.0 m) +164 ft
Water struck at (+48.0 m)
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Overburden 2.0 m
Mineral 3.0 m
Waste 0.4 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.5	1.5
Alluvium	White and brown mottled chalky clay with small gastropod shells. Sandy in parts	0.5	2.0
	Gravel Gravel: fine to coarse, angular to rounded flint with a trace of subrounded to rounded quartz; flint cobbles and chalk fragments near base Sand: coarse with some medium; brown	3.0	5.0
	Brown sandy gravel and soft white chalk	0.4	5.4
Upper Chalk	Soft white chalk	0.2+	5.6

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
1	23	76	2.0–3.0*	1	0	7	12	41	39
			3.0–4.0*	0	0	3	18	35	44
			4.0–5.0*	2	1	12	17	29	39
			Mean	1	0	8	15	35	41

TQ 09 NE 7 0782 9720 Dell Wood, Sarratt **Block E**

Surface level (+75.9 m) +249 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Waste 2.6 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Glacial Sand and Gravel	Brown sandy pebbly clay with a few subangular and subrounded flint pebbles	1.0	1.1
	Stiff brown clay with black iron-staining and a few angular to subangular flint cobbles	1.5	2.6
Upper Chalk	White powdery chalk	0.1+	2.7

TQ 09 NE 8 0865 9758 Jacotts Hill, Watford **Block E**

Surface level (+76.3 m) +252 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Overburden 3.0 m
Mineral 1.2 m
Waste 0.3 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.7	0.7
Glacial Sand and Gravel	Soft brown and grey mottled clay becoming sandy and pebbly at 2.3 m with subangular to rounded flint pebbles	2.3	3.0
	Brown clayey sand with fine and some coarse subangular to rounded flint pebbles	1.2	4.2
	Brown sandy clay	0.1	4.3
	Brown clay with a few angular to subangular flint cobbles	0.2	4.5
Upper Chalk	Soft white chalk	0.2+	4.7

TQ 19 NW 20 1263 9933 Near Binghams, Watford **Block D**

Surface level (+57.3 m) +188 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
February 1972

Waste 1.8 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Glacial Sand and Gravel	Brown soft clay with a few well-rounded black flint pebbles	1.5	1.8
Upper Chalk	Soft white chalk	0.2+	2.0

TQ 19 NW 21 1350 9909 Wall Hall, Aldenham **Block D**

Surface level (+71.0 m) +233 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Overburden 4.6 m
Mineral 8.1 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.7	0.7
Glacial Sand and Gravel	Brown sandy pebbly clay with subangular to well-rounded flint pebbles	1.6	2.3
?Chalky Boulder Clay	Brown and grey mottled clay with white concretions. Passing into blue-grey, very stiff, fissured clay with depth	2.3	4.6
Glacial Sand and Gravel	'Clayey' sandy gravel Gravel: fine to coarse, angular to rounded flint with a trace of quartz and jasper Sand: medium with some coarse and fine; brown	8.1	12.7
Upper Chalk	Soft white chalk	0.2+	12.9

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
11	50	39	4.6–5.6	29	7	14	5	27	18
			5.6–6.6	10	45	38	2	5	0
			6.6–7.6	5	12	32	10	21	20
			7.6–8.6	5	3	14	18	42	18
			8.6–9.6	20	3	27	16	30	4
			9.6–10.6	6	18	26	10	26	14
			10.6–11.6	5	5	45	11	26	8
			11.6–12.7	6	9	22	11	33	19
			Mean	11	12	28	10	26	13

TQ 19 NW 22 1369 9864 Aldenham **Block D**

Surface level (+73.2 m) +240 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
March 1972

Overburden 0.6 m
Mineral 10.0 m
Waste 1.4 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Glacial Sand and Gravel	Orange-brown sandy clay	0.3	0.6
	'Clayey' sandy gravel Gravel: fine to coarse, flint with some quartzite. Proportion of gravel increases with depth Sand: medium with some fine and coarse. Clay concentrated in top 3.0 m	10.0	10.6
	Brown clayey sand with traces of soft white chalk	1.4	12.0
Upper Chalk	Soft white chalk	0.1+	12.1

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
19	43	38	0.6–1.6	32	5	27	11	15	10
			1.6–2.6	43	30	17	3	3	4
			2.6–3.6	41	14	12	6	14	13
			3.6–4.6	18	15	23	12	22	10
			4.6–5.6	13	6	16	22	28	15
			5.6–6.6	11	11	23	18	25	12
			6.6–7.6	4	10	27	7	17	35
			7.6–8.6	10	8	22	7	23	30
			8.6–10.6	9	7	23	11	27	23
			Mean	19	11	22	10	21	17

TQ 19 NW 23 1359 9679 Grange Farm, Bushey **Block D**

Surface level (+73.8 m) +242 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
September 1972

Overburden 2.5 m
Mineral 1.8 m
Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Glacial Sand and Gravel	Soft brown sandy pebbly clay with well-rounded flint pebbles	1.1	1.5
	Grey, green, red and brown mottled sandy clay	1.0	2.5
	'Clayey' gravel Gravel; fine to coarse, rounded black flint with some fine angular flint Sand: brown	1.8	4.3
Reading Beds	Grey and brown mottled sandy clay. Pebbly at base	0.7	5.0
	Purple clay	0.2	5.2
Upper Chalk	Soft white chalk with nodular flints	0.1+	5.3

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
13	14	73	2.5–3.5	13	5	5	1	31	45
			3.5–4.3	14	8	5	6	24	43
			Mean	13	7	5	2	29	44

TQ 19 NW 24 1472 9949 Kemprow Farm, Aldenham **Block D**

Surface level (+98.1 m) +322 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
March 1972

Overburden 0.9 m
Mineral 9.3 m
Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.8	0.8
Glacial Sand and Gravel	Brown sandy pebbly clay with well-rounded flint and quartz pebbles	0.1	0.9
	'Clayey' gravel Gravel: fine to coarse, subangular to subrounded flint; some flint cobbles at base Sand: mainly medium with some coarse and fine; brown; very loosely packed material	9.3	10.2
Upper Chalk	Soft white chalk	0.6+	10.8

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
16	37	47	0.9–2.9	26	7	23	8	22	14
			2.9–3.9	18	10	18	11	21	22
			3.9–4.9	17	6	21	7	26	23
			4.9–5.9	9	7	23	9	21	31
			5.9–6.9	17	3	12	9	33	26
			6.9–8.9	7	6	28	8	19	32
			8.9–10.2	No grading information available					
			Mean	16	6	22	9	23	24

TQ 19 NE 19 1779 9852 Little Organ Hall, Shenley

Surface level (+80.2 m) +263 ft
Water not struck
Shell and auger (modified), 6 in (152 mm) diameter
October 1972

Waste 1.3 m
Bedrock 4.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Flood Plain Gravel	Brown sandy pebbly clay with grey streaks and some well-rounded flint and subrounded quartz pebbles	0.8	1.3
London Clay	Brown silty clay with sandy patches and a few selenite crystals	3.6	4.9
	Grey silty clay with a few selenite crystals	0.4+	5.3

TQ 19 NE 20 1767 9763 Organhall Farm, Aldenham

Surface level (+78.6 m) +258 ft
Water from (+77.8 m) to (+77.1 m)
Shell and auger, 6 in (152 m) diameter
April 1972

Waste 1.5 m
Bedrock 4.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Flood Plain Gravel	Grey and brown mottled pebbly clay with some rounded quartzite and flint pebbles	0.5	0.8
	Sandy gravel with some rounded flint and quartzite pebbles in brown sand	0.7	1.5
London Clay	Stiff, brown and grey mottled silty clay	1.5	3.0
	Brown silty clay with selenite crystals	2.5	5.5
	Blue-grey silty clay with selenite crystals	0.7+	6.2

TQ 19 NE 21 1927 9968 Kitwells, Shenley **Block F**

Surface level (+129.5 m) +425 ft
Water from (+125.9 m) to (+125.3 m)
Shell and auger, 6 in (152 mm) diameter
March 1972

Overburden 1.1 m
Mineral 3.0 m
Waste 0.3 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Pebble Gravel	Orange and grey mottled silty pebbly clay with some rounded flint and quartz	0.7	1.1
	'Clayey' gravel Gravel: fine to coarse, well-rounded flint with some quartz Sand: mainly medium to coarse with some fine; yellow and grey	3.0	4.1
	Brown sandy pebbly clay	0.3	4.4
London Clay	Stiff brown silty clay becoming grey with depth	0.3+	4.7

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
11	35	54	1.1–2.1	12	8	15	8	23	34
			2.1–3.1	14	6	18	10	26	26
			3.1–4.1*	7	4	17	18	30	24
			Mean	11	6	17	12	26	28

TQ 19 NE 22 **1969 9891** **Green Street, Shenley** **Block F**

Surface level (+129.2 m) +424 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
March 1972

Waste 0.4 m
Bedrock 6.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
London Clay	Brown silty clay	0.4	0.8
	Brown and yellow mottled clay with selenite crystals	4.0	4.8
	Brown silty clay with micaceous silt bands	1.6	6.4
	Blue-grey silty clay with micaceous silt bands and selenite crystals	0.1+	6.5

APPENDIX G

LIST OF THE SAND AND GRAVEL WORKINGS

Name of workings	*Grid reference*	*Remarks*
Westwood Quarry, Chandler's Cross	073 987	Working
Moor Mill Pit, Colney Street	147 027	Being backfilled
Riverside Pit, Bricket Wood	149 014	Being backfilled
Harper Lane Pit, Colney Street	162 027	Being backfilled
Harper Lane Pit, Colney Street	170 030	Working
Bell Lane Pit, London Colney	180 030	Being backfilled
Hatfield Pit, Smallford	188 087	Working
Colney Heath Pit, Colney Heath	199 063	Being backfilled
Colney Heath Pit, Colney Heath	196 060	Being backfilled
Smallford	194 068	Backfilled
South of Smallford	190 055	Backfilled

All these pits are in the Glacial Sand and Gravel.
Several small pits, long since abandoned, have been omitted from this list.

APPENDIX H

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

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

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INSTITUTE OF GEOLOGICAL SCIENCES

INDUSTRIAL MINERALS ASSESSMENT UNIT

THE SAND AND GRAVEL RESOURCES OF THE COUNTRY AROUND HEMEL HEMPSTEAD, ST ALBANS AND WATFORD (SHEETS TL 00 & TL 10 & Parts of TQ 09 & TQ 19)

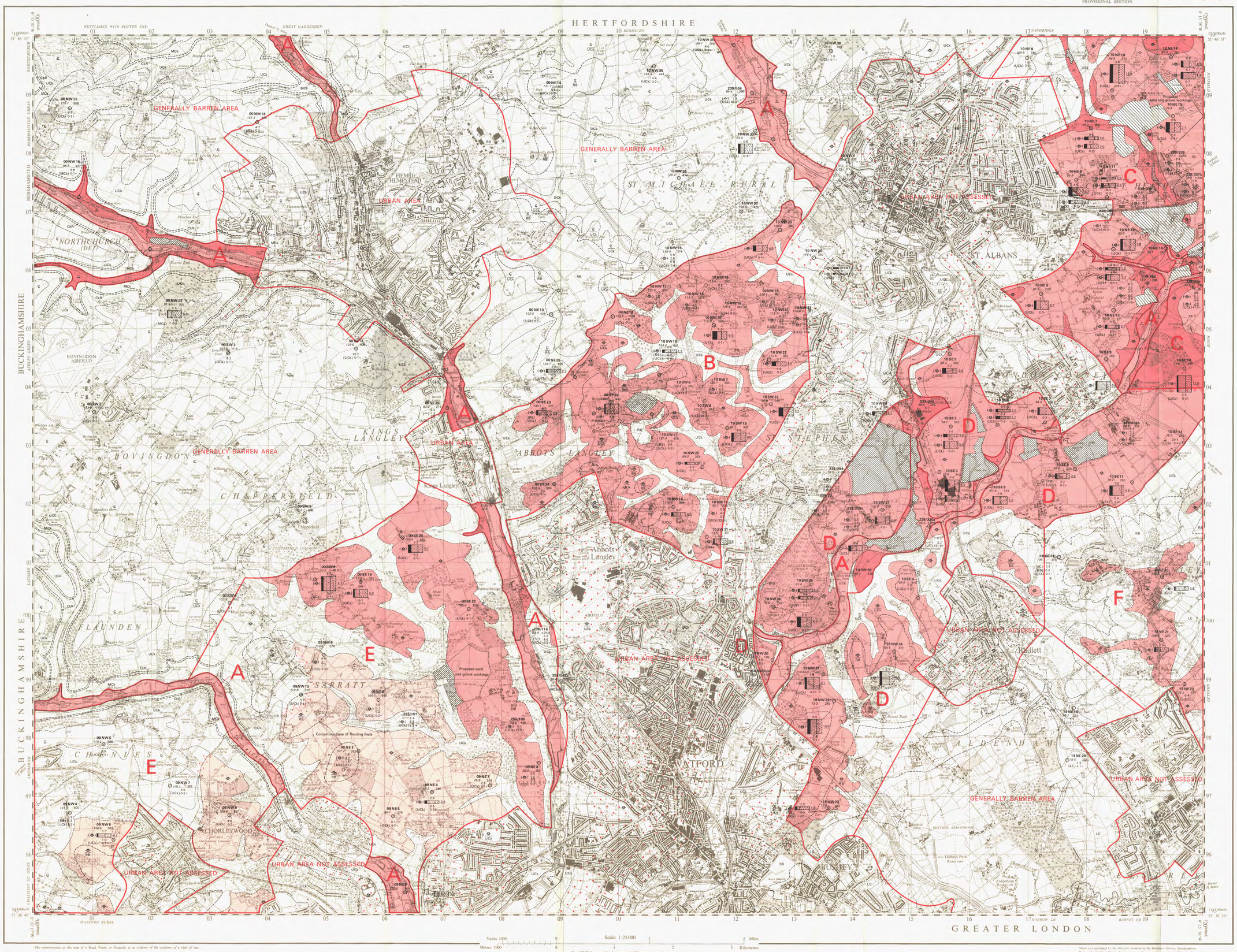
Scale 1:25 000 or about 2½ Inches to 1 Mile

ORDNANCE SURVEY
SHEETS TL 00/10 & PARTS OF SHEETS TQ 09/19
PROVISIONAL EDITION

THE SAND AND GRAVEL RESOURCES OF THE COUNTRY AROUND HEMEL HEMPSTEAD, ST ALBANS AND WATFORD (SHEETS TL 00 & TL 10 & Parts of TQ 09 & TQ 19)

71

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



EXPLANATION OF SYMBOLS AND ABBREVIATIONS

DRIFT (RECENT AND PLEISTOCENE)

- **Alluvium** -clay and silt with some sand and gravel. A-47
- **Flood Plain Gravel** -brown and grey sandy clay with some pebbles FP-2
- **Brickearth** -brown and grey sandy clay B-13
- **Valley Gravel** -sand with fine and coarse flint gravel VG-3
- **Boulder Clay** -stiff dark grey clay with chalk and flint pebbles BC-26
- **Glacial Sand and Gravel** -quartz sand and flint gravel with quartzite pebbles GS-50
- **Clay-with-Flints** -clay with angular flint pebbles CF-7
- **Pebbly Clay and Sand** -sandy clay with flint pebbles PC-2
- **Pebble Gravel** -flint and quartz pebbles with sand PG-4

SOLID (EOCENE; CRETACEOUS)

- CL **Claygate Beds**
- LC **London Clay**
- RB **Reading Beds**
- UCk **Upper Chalk**
- CkR **Chalk Rock**
- MCk **Middle Chalk**

- **Made ground** MG-2
- **Worked out area** WO-11

BOUNDARY LINES

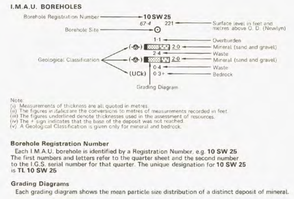
- Geological boundary,Drift.
- Geological boundary,Solid.
- Fault at surface, crossmark indicates downthrow side.
- Inferred boundary between recognised categories of deposits.
- Resource Block boundary and boundary of urban areas.

Broken line denotes uncertainty.

BOREHOLE DATA
SITE LOCATIONS

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

I.M.A.U. BOREHOLES



Notes
(a) Measurements of thickness are all quoted in metres.
(b) The figures in italics are the conversions in metres of measurements recorded in feet (metres above O.D. (Newlyn)) in the original records used in the assessment of resources.
(c) The + sign indicates that the base of the deposit was not reached.
(d) A 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. **10 SW 25**
The first numbers and letters refer to the quarter sheet and the second number to the I.G.S. serial number for that quarter. The unique designation for **10 SW 25** is **TL 10 SW 25**.

Grading Diagrams
Each grading diagram shows the mean particle size distribution of a distinct deposit of mineral.

The height of the diagram is proportional to the mineral thickness.
The widths of the divisions show 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 except for records in the Hydrogeological Department: for example **239-538** signifies Hydrogeological Department borehole **538** on the New Series 1:50 000 Geological Sheet 239.

CATEGORIES OF DEPOSITS

- **Exposed mineral.** CAT-E6
- **Continuous or almost continuous spreads of mineral beneath overburden. (overburden generally greater than 1m)** CAT-C3
- **Discontinuous spreads of mineral beneath overburden.** CAT-D1
- **Exposed sand and gravel (as mapped) but not assessed.** CAT-N5
- **Sand and gravel either not potentially workable (see Report) or absent.** CAT-A2

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

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

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Yards 1000 0 — Metres 1000 0

Scale 1:25000

1 2 Miles
1 2 3 Kilometres

The GRID lines on this sheet are at 1 Kilometre interval.
Heights are in feet above Mean Sea Level at Newlyn.

1 square inch on this map represents 39·67 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.

Geological information from six inch surveys between 1936 and 1972 by C. E. N. Bromehead, A. C. G. Cameron, H. G. Dines, J. A. Howe, A. J. Jukes-Browne, A. H. Noble, R. W. Pocock, C. Reid, T. Robertson and R. L. Sherlock.
Minor amendments by S. Buchan, 1976.

Sand and Gravel Survey by D. R. Parker in 1972-73.
R. G. Thurrell, Head, Industrial Minerals Assessment Unit.

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

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

Made and published by the Director General of the Ordnance Survey, Southampton. Reprinted with the addition of new major roads, reservoir and some building development.

Compiled from 6" sheets last fully revised 1912-39.
Other partial systematic revision 1937-55 has been incorporated.
Building development and Hillfield Park Reservoir revised 1968.
Major roads revised 1969-70.
Greater London boundaries revised 1969.

	238	239	
SP 91	TL 01	TL 11	TL 21
SP 90	TL 00	TL 10	TL 20
SU 99	TQ 09	TQ 19	TQ 29
SU 98	TQ 08	TQ 18	TQ 28
	255	256	

Diagram showing the relation between the National Grid (10 000 metre squares), the One Inch Geological Sheets 238 and 256 and 1:50 000 Geological Sheets 239 and 255