Natural Environment Research Council
BRITISH GEOLOGICAL SURVEY

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Sheet SP 37 SW

STONELEIGH

Part of 1:50 000 Sheet 184 (Warwick)

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Geological notes and local details
for 1:10 000 sheets: SP 37 SW (Stoneleigh)
(Keyworth: British Geological Survey)

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CONTENTS

Summary	1
Introduction	2
Geological Sequence	3
Cambrian	5
Upper Carboniferous (Westphalian) and Lower Permian (Autunian)	5
Productive Coal Measures	6
Etruria Marl Formation	8
Halesowen Formation	8
Keele Formation	9
Enville Group	9
Coventry Sandstone Formation	11
Tile Hill Mudstone Formation	11
Kenilworth Sandstone Formation	12
Ashow Formation	14
Triassic	14
Bromsgrove Sandstone Formation	14
Mercia Mudstone Group	15
Structure	15
Pre-Westphalian Structures	15
Post-Westphalian Structures	15
Post-Triassic Structures	15
Quaternary	16
Baginton Sand and Gravel	16
Till (Boulder Clay)	18
Wolston Clay	18
River Terrace Deposits	19
Alluvium	20
Economic Geology	20
Building Stone	20
Coal	20
Sand and Gravel	21
References	22
Appendix: Schedule of boreholes for SP37SW	25

SUMMARY

The geology of Sheet SP37SW (Stoneleigh) is described with emphasis on significant exposed sections and borehole logs.

The Cambrian and Lower Carboniferous formations are not represented at outcrop and are known only from a number of boreholes which are summarised in graphic form. The rocks at outcrop belong mainly to the Enville Group, with smaller outcrops of poorly exposed Triassic rocks. Details of the more important sections are given.

Details are given of the lithologies and thicknesses of the drift deposits and a diagram shows the elevation of the sub-drift topography.

Attention is drawn to the important coal reserves underlying the area and to other mineral resources. A schedule of boreholes is appended.

INTRODUCTION

This report describes the geology of 1:10 000 sheet SP37SW (Stoneleigh) (Figure 1). The area was first geologically surveyed on the one-inch scale by H.H. Howell and was included in Old Series One-Inch Sheet 53 published in 1855.

The primary 1:10 000 survey of the area was carried out in 1977-78, with minor revisions in 1987, by R.A. Old, and is included in 1:50 000 geological Sheet 184 (Warwick) published in 1984; an accompanying Memoir is also published (Old and others, 1987). The mapping and the production of this report were partly funded by the Department of the Environment.

Palaeontological contributions to this report are by Drs N.J. Riley and A.W.A. Rushton.

Copies of this report, and uncoloured copies of the 1:10 000 map may be purchased from the British Geological Survey, Keyworth.

Parallel reports covering adjoining sheets are:

SP27SE Kenilworth (Old, 1988a)
SP37NW Coventry Central (Old, 1988b)
SP37SE Bubbenhall (Sumbler, 1988)
SP36NW Royal Leamington Spa (Ambrose, 1986)

GEOLOGICAL SEQUENCE

Beds down to the upper part of the Coventry Sandstone are represented at outcrop or beneath drift. Lower beds are known from boreholes.

Quaternary		
	Alluvium	
	Boulder Clay	)
	Wolston Clay	) Glacial deposits
	Baginton Sand and Gravel	)
Triassic		
	Mercia Mudstone Group	Undivided red mudstone
	Sherwood Sandstone Group	Bromsgrove Sandstone
Permian		
	Enville Group	(Ashow Formation
		(Kenilworth Sandstone Formation
		(
Carboniferous		(
Westphalian D		(Tile Hill Mudstone
		(Coventry Sandstone Formation
		Keele Formation
		Halesowen Formation
Westphalian C		Etruria Marl Formation
		Aegiranum Marine Band
Westphalian A & B		Productive Coal Measures
Cambrian		Merevale Shales

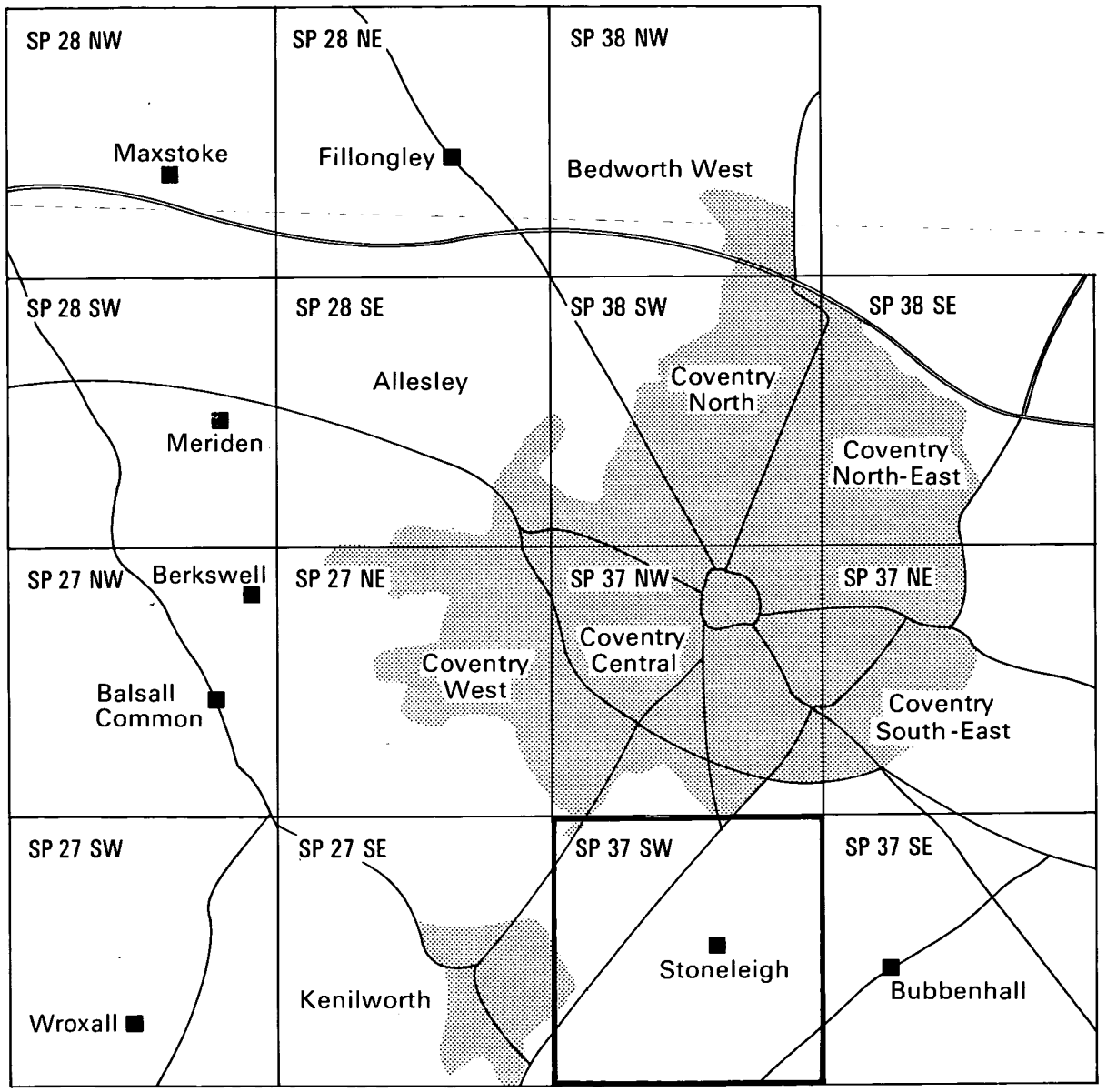


Figure 1. Area of this report relative to area of whole contract is shown with bold outline

Cambrian

Wherever proved the pre-Carboniferous rocks beneath the area are of Cambrian age; they are assigned to the Merevale Shales (Tremadoc Series). Boreholes penetrating Cambrian rocks from which cores were obtained are tabulated below:

Borehole	BGS Reg.No. (SP37SW)	NGR	Thickness proved (m)	Dip (azimuth where known from dipmeter)
Ashow	100	3053 7161	6	0°
Black Spinney	101	3436 7325	8	5°SW
Crewe Farm	110	3136 7200	6	10°
Finham Brook	119	3339 7445	13	10°-65°
Stareton	111	3321 7218	13	15°
Wainbody Wood	60	3139 7419	26	20-25°S

Because the small thicknesses penetrated do not contain any distinctive lithologies, no detailed correlation is possible between the boreholes.

The predominant lithology is dark grey mudstone, which in some boreholes becomes paler and green-grey for a few metres below the unconformity with the Westphalian. The top 30cm of mudstone at Finham Brook are penetrated by roots from the Westphalian and sphaerosiderite occurring abundantly for over 5m below the unconformity may have formed during the Westphalian. A few beds of sandstone, and siltstone, up to 0.5m thick, are present in several of the boreholes and sandstone and siltstone laminae are common in the mudstones. The laminated beds display a variety of cross-bedding, soft-sediment deformation structures and penecontemporaneous microfaults.

Fossils from the Black Spinney, Crewe Farm and Stareton cores are diagnostic of the Dictyonema Flabelliforme Zone of Tremadian. The Black Spinney cores yielded Dictyonema flabelliforme flabelliforme and Lingulella sp.; those from Crewe Farm Lingulella sp., Linnarssonia belti and Dictyonema sp.; the fauna from Stareton included Lingulella nicholsoni, cf. Beyrichona triceps, Dictyonema flabelliforme, Tomaculum problematicum and a variety of burrows. At Ashow the fauna, indicating the slightly higher 'Transition Beds'zones between the D. flabelliforme and Clonograptus tenellus, includes Sponge spicules (cruciform), Eurytreta sabrinae, Linnarssonia cf. belti, Lingulella nicholsoni, Shumardia curta and a variety of burrows.

Upper Carboniferous (Westphalian) and Lower Permian (Autunian)

The Westphalian beds rest directly on Cambrian strata; below the upper part of the Coventry Sandstone they do not crop out in the area, and are known only

from boreholes (Figure 2). The sequence consists mainly of mudstones, siltstones, sandstones and seatearths. The lower part (Productive Coal Measures) and the Halesowen Formation are grey-coloured and coal-bearing; the intervening Etruria Marl Formation is variegated grey, green and red brown; the Keele Formation and the Enville Group consist almost entirely of red measures, predominantly argillaceous in the former and arenaceous in the latter. The only well identified Westphalian subdivision is that between Westphalian B and C marked by the Aegiranum Marine Band.

Productive Coal Measures

The Productive Coal Measures include all the Westphalian strata below the Etruria Marl. Because the Vanderbeckei Marine Band is not developed in this area the position of the Westphalian A/B boundary is uncertain, but by comparison with those areas of the Warwickshire Coalfield where the marine band has been proved, the boundary is unlikely to be more than about 10m below the base of the Thick Coal (Cope and Jones, 1970).

The beds below the Thick Coal are between 35 and 60m thick (Figure 2). They consist of grey mudstone, siltstone, seatearth and sandstone with impersistent coals up to 0.5m thick. Breccio-conglomerates up to 1m thick, with clasts of Cambrian mudstone and quartz pebbles, occur at the unconformity with the Cambrian at Crewe Farm and Wainbody Wood.

Details of the Thick Coal, the only seam of economic importance in the area, are confidential. The area lies within the zone of Splitting Thick Coal (National Coal Board 1985, Old and others 1987) and the maximum thickness of coal proved, excluding partings, was 4.5m at Wainbody Wood.

The beds between the top of the Thick coal and the base of the Etruria Marl are from 60 to 70m thick. They are predominantly grey mudstone with siltstone, seatearth and sandstone in lesser proportions. Non-marine bivalves occur in the roof of the Thick Coal and sporadically in the beds between the Thick Coal and the Half Yard.

The impersistent thin coal about 10m above the Thick Coal is probably the Four Feet. The Half Yard is persistent but somewhat variable in thickness.

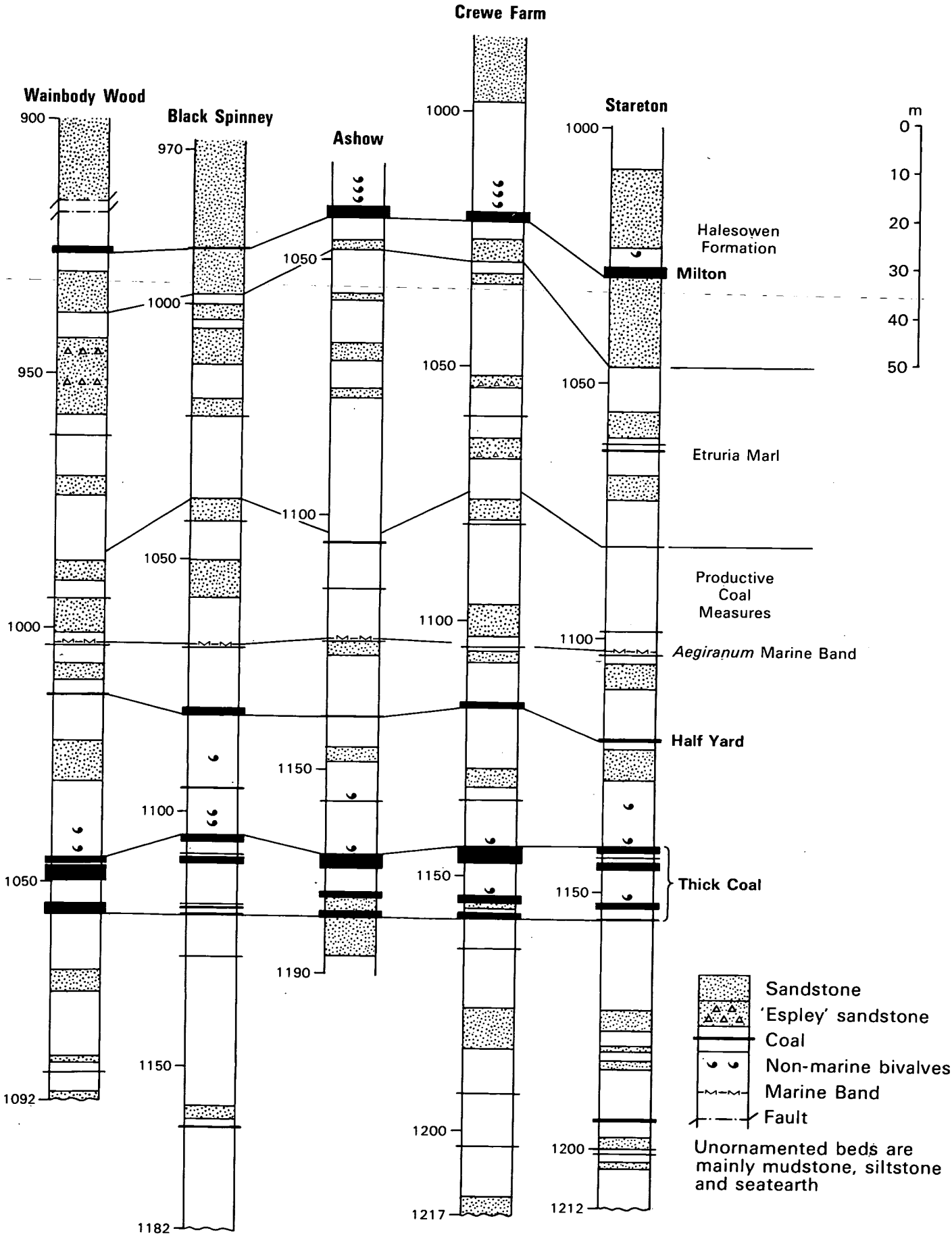


Figure 2. Comparative Westphalian successions in cored boreholes

The Aegisanum Marine Band, which is underlain by a thin persistent coal, consists of about 1m of black or dark grey mudstone with marine brachiopods. At Crewe Farm the Marine Band was not recorded and may have been 'washed out' by sandstone. Lingula mytilloides and Orbiculoidea sp. occured in the Marine Band at Ashow, and Serpuloides sp. and conodont debris additionally at Black Spinney.

Etruria Marl Formation

The base of the Etruria Marl is marked by the appearance of brightly coloured beds;in places the change is gradational so that the formational boundary is somewhat imprecise. The top of the Formation is more clearly defined at the base of thick grey Halesowen sandstone, overlying coloured mudstone. The variation in thickness of 35 to 55m of the Formation is due to the combined effects of a diachronous junction with the Productive Coal Measures and possibly an unconformity at the base of the Halesowen Formation.

The argillaceous beds of the Formation are characterised by a variable development of colours in shades of brown, red, purple and green-grey. Some beds are variegated, some show colours blotched over a grey background and others are predominantly of one colour. Intervals of grey beds, indistinguishable from Productive Coal Measures also occur.

Some of the sandstones in the Etruria Marl are of 'espley' facies, containing breccio-conglomerate bands with angular to rounded clasts of exotic lithologies such as Cambrian mudstone, vein quartz and igneous rocks, as well as pebbles of Westphalian type.

Halesowen Formation

The Halesowen Formation comprises 100 to 150m of pale grey sandstone with subordinate grey mudstone, siltstone and seatearth and a few thin coals. The top of the Formation has not been cored and is taken by British Coal to be at a persistent high gamma peak in borehole gamma logs which occurs at or close to the junction with the predominantly red-brown Keele Formation beds above. The base is a convenient, although arbitrary, base for Westphalian D.

The sandstones commonly have erosive or load casted bases with thin intra-formational breccias or conglomerates. They may occur in fining-upwards units with a variety of cross-bedding structures, or they may be massively bedded. Many sandstones are micaceous and a calcareous cement is typical. Coaly laminae and debris are abundant.

The Milton seam (Figure 2) persists throughout the area and attains a maximum thickness of 1.6m at Crewe Farm. The roof of the seam is commonly a mudstone containing non-marine bivalves and at Ashow, abundant Spirorbis.

The British Coal log of the Wainbody Wood Borehole records Lingula, Orbiculoidea and ostracods immediately above a fault some 9m above the Milton seam. Specimens have not been preserved from these mudstones.

Keele Formation

The Keele Formation has not been cored in this area and is known mainly from chipping samples and geophysical borehole logs. In the district to the north it consists predominantly of red-brown mudstones with subordinate sandstones, and a few thin beds of Spirorbis limestone (Eastwood and others, 1923). From the few cores available in other areas there appears to be a gradual transition from the predominantly grey Halesowen Formation to the red measures of the Keele. The geophysical logs from the boreholes show a remarkably high gamma radiation over a narrow zone at about this level, and this has been taken as the base of the Keele Formation, although it may not correspond precisely with the lithological boundary: the geophysical correlation of the sandstone beds in the overlying beds seems to confirm that this is a widely persistent marker. The Formation is distinguished from the overlying Coventry Sandstone Formation by its more argillaceous nature and its top is thus rather indefinite. As thus defined the formation is about 255 to 295m in thickness.

Enville Group

The Enville Group of the Warwickshire Coalfield was first defined as comprising all the pre-Triassic strata that succeed the Keele Formation (Eastwood and others, 1923, p.77). This report follows the modified of Shotton (1929, p.169)which includes all the pre-Triassic rocks above the Tile Hill Beds of the earlier writers.

Almost the whole area is underlain by rocks of the Enville Group. The predominant dip is southerly and the beds at crop include, from north to south, part of the Coventry Sandstone, the upper part of the Tile Hill Mudstone, the Kenilworth Sandstone and the lower part of the Ashow Formation. The total thickness of the Group at crop and proved in boreholes is about 780m.

The base of the Permian has been placed by the Geological Society at the base of the 'Kenilworth Breccia Group' (Smith and others, 1974; Ramsbottom and others, 1978). This conclusion is founded on the supposed correlation of the Kenilworth and Clent Breccias (Shotton, 1929 , p.201), and on the assumption that the unconformity at the base of the latter marks the base of the Permian. Due to the thin and impersistent nature of the breccias in the Kenilworth Sandstone, the base of Shotton's 'Kenilworth Breccia Group' can be recognised only locally and does not provide a satisfactory position for the boundary between two systems. In contrast, the base of the Kenilworth Sandstone Formation (as defined below) can be traced over wide areas and is easily recognisable in downhole geophysical logs. It is consequently taken here as a convenient, if arbitrary, base to the Permian in the light of present day knowledge.

The occurrance at Kenilworth, probably in the Kenilworth Sandstone, of the pelycosaurs Sphenacodon brittanicus and Haptodus grandis (Paton, 1974) and the amphibian Dascyceps bucklandi (Paton, 1975) lends support to the Permian age for the upper part of the Enville Group. All these species are confined to Autunian strata. A jaw-bone of the pelycosaur Ophiacodon, discovered near the top of the Coventry Sandstone '3/4 mile northwest of Coventry' (Murchison and Strickland 1837, p.347),is assigned a late-Stephanian to early-Autunian age by Paton (1974). Less well attested are the views of Haubold and Sergeant (1973, p.908) and Haubold and Katzung (1975, p.118), based on scanty evidence from reptile footprints, that the base of the Permian should be placed at the base of the Enville Group.

There is no chronologically significant fossil evidence for the age of the Enville Group below the top of the Coventry Sandstone, but the general concensus is that it is uppermost Carboniferous, Westphalian D or Stephanian. Dix (1935) reviewed the floral evidence and placed the whole of the Enville Group in the Permian, but no significant plant fossils occur below the Tile Hill Mudstones. Three specimens of 'Strophalosia' from the Enville Group

figured by Howell (1859, p.32) have been reidentified as the gymnosperm seeds Cariocarpon reniforme and C.ottonis (Cox, 1953).

The Geological Society's proposed schemes of correlation for the Permian (Smith and others, 1974) and the Silesian (Ramsbottom and others, 1978) have not clarified the position. In the former, the Ashow, Kenilworth and Gibbet Hill subdivisions are considered to be groups (following Shotton, 1929, p.170): in the latter the Gibbet Hill and lower named subdivisions are thought of as members of an Enville Formation.

Coventry Sandstone Formation

Based on the interpretation of geophysical borehole logs, the Coventry Sandstone increases in thickness from about 260m in the west to about 330m in the east. No cores have been taken but borehole chippings are mainly of red-brown sandstone with subordinate mudstone.

A small outcrop of beds near the top of the Coventry Sandstone occurs north of the Princethorpe Fault. Small exposures of red-brown sandstone are found along the south bank of the River Sowe at Coventry Golf Course [334 749 to 336 747].

Tile Hill Mudstone Formation

The Tile Hill Mudstone totals about 265m in thickness of which only the upper half comes to crop in the area. The full thickness of the Formation has been proved in a number of coal exploration boreholes, none of which was cored at this level. The Formation is generally more argillaceous than those above and below, but includes sandstones which tend to be impersistent. Both the mudstones and the sandstones are predominantly red-brown and commonly include grey-green reduction spots or 'fish-eyes'.

At Finham Sewage Works [3375 7408] temporary excavations revealed up to 5m of soft, red-brown, thin bedded sandstone; nearby [3359 7411] 4m of the same sandstone is exposed in the banks of Finham Brook. A 5cm sandstone within mudstone, exposed in a ditch on St. Martin's Road [3317 7402], showed ripple marks with steeper sides facing SSE and cross-bedding dipping NNW.

A thin section (E 51559) of sandstone from the bank of the River Sowe at Baginton [3405 7602] consists mainly of angular grains of quartz, quartzite and argillaceous rocks, with a few of altered andesite or rhyolite. The small percentage of other mineral grains includes muscovite, biotite, microcline, albite and amphibole. The cement is calcite in large plates.

Kenilworth Sandstone Formation

The whole of this formation, about 95m thick, crops out in this area. Its base is marked by the incoming of thick, massive sandstones which give rise to a prominent northeast-facing escarpment. The top of the Formation is taken at the base of the thick mudstones of the Ashow Formation. The Formation includes the 'Kenilworth Breccia' and 'Gibbet Hill' groups of Shotton (1929).

Red, massive, and commonly soft sandstones form the bulk of the Formation, with subordinate thin lensing mudstones. Near the base the impersistent Gibbet Hill Conglomerate marks the site of a fluvial channel, and thin lenses of breccia occur beneath some sandstone beds, probably as channel lag deposits. There are few localities where any appreciable thickness of sandstone is exposed. In 1978, however, a pipe-trench was excavated across virtually the whole width of the Kenilworth Sandstone outcrop between Gibbet Hill [307 748] and Crewe Farm [313 720]. This confirmed that most of the sandstones are rather soft, at least to depths of 2-3m, and include a few very hard, flaggy, calcareous, lustre-mottled bands. Red-brown mudstones with green spots were also encountered, varying from blocky to thinly bedded. A number of small exposures show mudstone clasts in sandstone bands. A disused sandstone quarry on Motslow Hill [3294 7233] shows the following section:

	Thickness (m)
Sandstone, brown and red-brown, soft, massive or cross-bedded with foresets dipping towards 260° and 325°	2.0
Sandstone, grey to grey brown, hard, coarse with common mudstone clasts and a 10cm band with abundant mudstone clasts	2.0

Thin sections of Kenilworth Sandstone from Motslow Hill (E 51562) and Stoneleigh (E 51561) show that these rocks are polylithic arenites. The grains are predominantly angular or sub-angular and moderately well sorted.

Quartz, quartzite and micaceous siltstone are the most important constituents and mudstone fragments are common. Altered rhyolite or andesite is also present together with rare mica schist. The carbonate cement forms a fine mosaic in E 51561 and large plates in E 51562.

The type locality of the **Gibbet Hill Conglomerate** lies just within the area to the north [3405 7521] and was first described by Shotton (1929, pp.173-175). He estimated that the Conglomerate occurs approximately 60m above the base of the 'Gibbet Hill Group', but it is in fact only about 25m.

An excavation at Cryfield Grange [3005 7471] showed 1m of bedded conglomerate with well rounded pebbles of dark grey and brown quartzite, red-brown chert and a few of white quartz, together with clasts of red-brown mudstone. The sandy matrix had a lustre-mottled carbonate cement. Similar conglomerate appears as loose blocks in a field at Wainbody Wood Farm [3145 7435]. This latter occurrence was considered to be 'Kenilworth Breccia' by Shotton (1929, p.177, loc.d), but the conglomerate contains almost entirely rounded pebbles, unlike typical 'Kenilworth Breccia', and it lies close to the base of the Kenilworth Sandstone, well below the level of the breccia at Kenilworth.

The outcrop of the conglomerate could not be traced east of a fault at Wainbody Wood Farm, but the bed is said to have been found in excavations at New Era Farm [3173 7414]. Two conglomerate beds 0.3 and 0.6m thick were encountered at depths of 4.6 and 5.5m respectively in a borehole at Kingswood Farm [3200 7325].

Lensing breccias occur within the Kenilworth Sandstone at a number of horizons, but can be used for stratigraphical correlation only very locally and lack the regional significance ascribed to them by Shotton (1929). The following downwards sequence was measured in a trench west of Westley Bridge [3136 7367]: conglomerate with flattened pebbles of mudstone, siltstone and ironstone and rare quartzite and red chert 0.2m; very hard calcareous sandstone with partings of mudstone clasts and a few pebbles 0.2m; breccia with quartzite and chert pebbles and clasts 0.1m. This occurrence is about 30m above the base of the Formation, and so is very near to the horizon of the Gibbet Hill Conglomerate. A breccia recorded by Shotton (1929, p.177, loc.c) in 'the bank of a pool 1000 yards (305m) south of Gibbet Hill cross-roads' may be at, or a little above, this horizon, and is well below the level of Shotton's 'lower breccia' at Kenilworth.

Ashow Formation

The Ashow Formation is equivalent to the Ashow Group of Shotton (1929), and comprises all the Enville Group above the Kenilworth Sandstone. It is predominantly argillaceous, but contains several thick sandstones. The total thickness of the formation is about 170m, the lowest 115m of which crops out in this area. The base of the formation is marked by the incoming of a sequence of mudstones 50 to 65m thick, divided in places by a sandstone up to 15m thick. These are the 'Whitemoor Marls' and 'Whitemoor Sandstone' named by Richardson and Fleet (1926, pp.297-298) after the former Whitemoor Brickworks, Kenilworth [295 717]. The mudstones, temporarily exposed to a depth of 8m in a trench at Victoria Spinney [306 721], were red-brown with green reduction spots and included silty beds with small-scale cross bedding. Reduction spots from Windy Arbour [304 721] are described by Mykura and Hampton (1984). Slightly lower in the sequence a trench near Crewe Farm, [310 717], proved the presence of thin intercalations of sandstone.

The major sandstone above these mudstones is approximately 60m thick, and forms the long dip-slope on which Ashow is built. An almost complete traverse of the outcrop was provided by a trench west of Ashow. The sandstone is soft, flaggy, cross-laminated and deeply weathered, with a few hard calcareous bands, micaceous bedding planes and thin mudstone bands. A thin section of this sandstone from Ashow (E 51563) consists of about 70% of well sorted angular quartz grains, with quartzites and mudstones forming the bulk of the remainder. Among the mineral grains muscovite and plagioclase are common and biotite rare.

Triassic

Bromsgrove Sandstone Formation

The Bromsgrove Sandstone overlies the Enville Group unconformably in the east of the area, commonly forming a prominent feature. Exposures are poor and the detailed succession is unknown, but in general the Formation consists of about 20m of pale buff or grey-brown, soft, micaceous sandstone with minor red-brown mudstone. The only exposure of note is in a small quarry 200m north of Chantry Heath Cottages [3451 7290] where the section is:

	Thickness (m)
Sandstone, pale brown, soft, flaggy; cross bedded units contain abundant siltstone and mudstone clasts and dip NE	1.5
Sandstone, pale brown to white, massive, micaceous with mudstone partings	1.7

Mercia Mudstone Group

Two small outcrops of Mercia Mudstone occur. The first, in the extreme northeast of the area is entirely drift covered and has only been confirmed in the adjacent areas. In the extreme southeast the base of the Mercia Mudstone consists locally of green mudstone and siltstone about 2m thick, overlain by red-brown mudstone. There are no exposures.

Structure

A synthesis of the structure of the Warwick district is given by Old and others (1987). This area forms part of the Coventry Horst.

Pre-Westphalian Structures

Viewed in their regional setting (Old and others 1987, Fig.2) the Cambrian rocks lie on the NW limb of a broad NE-SW syncline, which has been identified by plotting the faunal zones proved in boreholes. The varied dips proved in the boreholes listed earlier are not necessarily in accord with this structure and the folding of these beds is evidently more complicated in detail. The structure, in the Cambrian rocks presumably date mainly from the Caledonian orogeny.

Post-Westphalian - Pre-Triassic Structures

Following the deposition of the Enville Group the Carboniferous rocks were gently folded (Old and others 1987, fig.19) and this area lies on the eastern limb of an open syncline plunging gently southwards.

Post-Triassic Structures

Little structural information is available for the Triassic rocks, but they

appear to be tilted gently southeastwards. Most of the faults have a predominantly NE-SW trend and small throws, and are probably mainly of post-Triassic age.

Quaternary

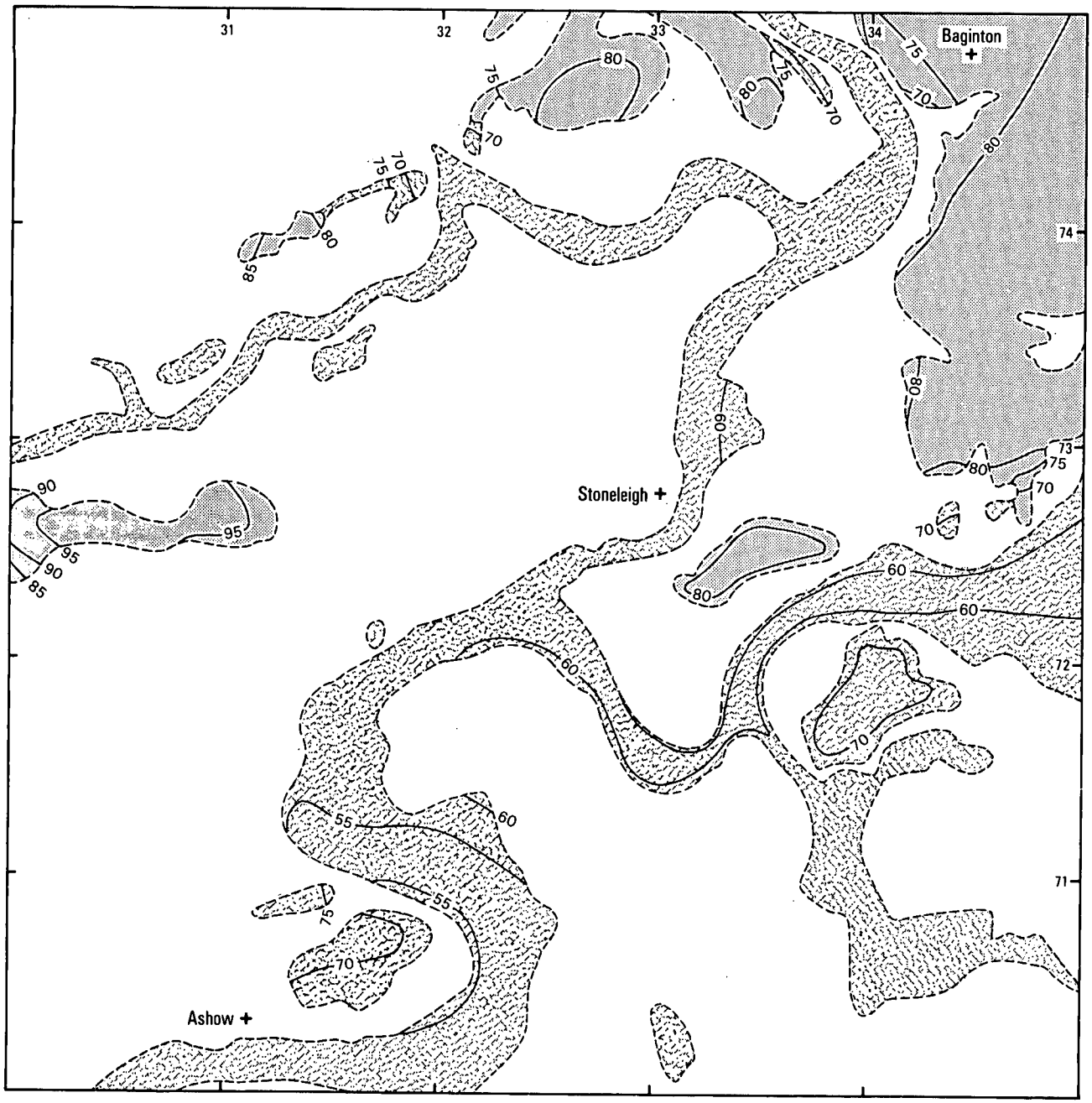
The older Quaternary deposits are the product of a single glacial stage, the Wolstonian, and lie close to the type area to the east where Shotton (1953) identified a stratigraphic sequence within these deposits. The nomenclature used in this report is that of Sumbler (1983). Only much dissected remnants of more extensive glacial deposits are preserved (Figure 3).

Baginton Sand and Gravel

The Baginton Sand and Gravel is the oldest unit in the glacial sequence and was deposited by a river, the 'proto-Soar', flowing towards the northeast (Shotton 1953). Old and others (1987) summarise the faunal evidence from the Sand and Gravel and conclude that it points to a cold steppe environment. In this area only fragmentary evidence is found for the major tributary along the course of the present day Finham Brook, postulated by Tomlinson (1935, p.449). Shotton (1953) named the Baginton facies of the 'Baginton-Lillington Gravel' after sand and gravel workings at Baginton Hill [346 749] which have since been back-filled. He divided the deposits into an upper sand (Baginton Sand) and a lower gravel (Baginton Gravel). The section given by Shotton (1929, p.212) reads:

	Thickness (m)
Boulder Clay	1.2
Fine red sand with few layers of pebbles	3.7
Coarse red and yellow gravel	c.3.1

The Baginton Sand can be traced around Baginton itself where it rarely exceeds 2m in thickness. It gives rise to a noticeably sandy, and virtually pebble-free, soil. Shotton (1953) mapped the Baginton Sand southwards from Baginton to Chantry Heath Wood, but it could not be confirmed during the present survey. All the fields in that area are extremely pebbly and augering nearly always proved gravel.



Outcrop of post-glacial drift

Outcrop of glacial drift

75 Rockhead elevation contour in metres

0 1 2

kilometres

Figure 3. Rockhead elevation at the base of the drift deposits

The Baginton Gravel consists almost entirely of well rounded pebbles of quartzite and quartz, presumably derived from the Triassic 'Bunter' Pebble Beds, with a little locally derived material. In contrast to the river terrace deposits the gravel is normally flint-free (Shotton 1953 p.215), but a mound of gravel 450m north of Baginton Church [3438 7429] yields abundant angular flints. Flints were also seen in fields 300m northeast of Chantry Heath Wood, and in 5m of gravel exposed by the side of the A444 at Motslow Hill [3319 7239].

Between the River Sowe and Knowle Hill [300 726] Baginton Sand and Gravel occurs in small irregular patches, probably the eroded remnants of a once continuous spread. At King's Hill a gravel-filled valley falls gradually southwestwards. A borehole towards the upstream end of the channel [3270 7501] proved 9m of sand and gravel. These gravels were included by Shotton (1953 p.228) in the fourth terrace, but they are at too high an elevation (around 76m OD) and contain only a few flints. A similarly orientated gravel-filled channel falling gently northeast is preserved 500m northwest of Westley Bridge. Excavations for a gas main [3132 7396] revealed 2m of sandy and silty mainly 'Bunter' gravel with a few flints. Large sandstone and subordinate limestone boulders occurred towards the contact with the underlying Kenilworth Sandstone. Old pits proving up to 5m of 'Bunter' gravel occur at the golf course east of Knowle Hill [355 726].

Till (Boulder Clay)

Two small outcrops of till occur;both contain Chalk erratics and are comparable to the Oadby Till. The till at Knowle Hill oversteps the Baginton Sand and Gravel and occupies lower ground. Very chalky till with a few flints was seen overlying sand and gravel in a trench 300m north-northeast of Kingswood Farm [3140 7333].

Wolston Clay

Smooth,grey brown,stoneless clay overlies Baginton Sand and Gravel at King's Hill. It is correlated with the Wolston Clay of the area to the east,but it is uncertain whether the upper or lower subdivision is present here.

River Terrace Deposits

Flights of river terrace deposits are well developed along the rivers Avon and Sowe and to a lesser extent along Finham Brook. All post-date the glacial deposits are are of broadly similar lithology, consisting of gravelly sands and silt. The pebbles are mainly 'Bunter' quartzite and flints.

The Fourth Terrace deposits always form isolated outcrops, in contrast with those of the lower terraces which are always contiguous. Typically, at Ashow and Stareton for example, they occur as wide spreads with base levels at c.69m OD about 9 to 16m above the tope of the alluvium. These spreads are evidently dissected remnants of a single extensive gravel surface. The gravels are very flinty, resembling closely those of the Dunsmore Gravel (Sumbler, 1983) from which they were probably derived.

A low ridge of flinty gravel, at about 76m OD north of Ashow [314 708], lies above the general level of the Fourth Terrace hereabouts. Small spreads of Fourth Terrace along Finham Brook also have a base at around 76m OD.

Second Terrace deposits occur mainly along the rivers Avon and Sowe where the terrace flats lie up to 5 to 6m above the alluvium. The terrace may be subdivided in places into levels 2a and 2b separated by a low rise.

At Stoneleigh [3311 7275] excavations revealed 0.6m of bedded orange-brown sand and red-brown silty sand overlying at least 0.8m of bedded sand and gravel with angular flints and rare bone fragments. Excavations at Finham Sewage Works [3375 7407] exposed flinty gravel with sandy and clayey bands. The gravel thinned downslope from 2.0m to 1.1m and had a very uneven base.

An alluvial flat with slightly higher marginal gravel spreads, probably of Second Terrace age, extends more than 1km southeast from Stareton [3417 7135] to the A445. There is a marked feature at the back of the First Terrace at Stareton and the stream flowing over the second terrace is incised. Towards the R. Avon the terrace deposits are gravelly, but become increasingly muddy when traced upstream.

The First Terrace, in places subdivided into 1a and 1b levels, forms a clearly defined flat attaining a height of up to 2m above the flood plain. It rarely exceeds 150m in width but above Cloud Bridge [3438 7235] it extends for more than 700m from the flood plain.

Sections in the First Terrace deposits are largely confined to river banks where the flood plain is absent. A section 400m upstream from Cloud Bridge [3478 7245] reveals 1.8m of very flintly gravel, imbricated in parts. Abundant sandstone fragments occur towards the contact with the underlying Kenilworth Sandstone. First Terrace deposits in the bank of the R. Sowe at Baginton [3412 7441] comprise 0.7m sandy alluvium, on 0.3m coarse brown sand, on 0.6m bedded sand and gravel.

Alluvium

The larger streams and rivers have continuous alluvial flood plains. The alluvium probably does not exceed a few metres in thickness and small exposures of rock are common in river banks. The flood plain attains a width in excess of 300m at Stoneleigh Abbey [318 710] but is normally no more than 100m wide. Most exposures of alluvium reveal a red-brown silty loam grading downwards into sand. Lenticular beds of gravel are common in the lower parts of the alluvium.

Economic Geology

Building Stone

Sandstone from the Enville Group has been widely quarried on a small scale for building as it can provide a good quality, durable freestone.

Coal

The area lies at the southern end of the South Warwickshire Prospect, a coalfield completely concealed by younger rocks. Details of the coal-bearing strata are given in the Westphalian section of this report. All of the recoverable reserves are in the Thick Coal and isopachytes and nomenclature for this seam have been published by British Coal (National Coal Board 1985; British Coal Corporation, 1987). The coal would provide excellent domestic, industrial and power station fuels.

Sand and Gravel

The Baginton Sand and Gravel was formerly quarried extensively around Baginton, and the majority of the outcrops of this deposit have small, old workings. The area with the greatest potential as a resource lies within the boundary of Coventry (Baginton) Airport.

Small areas of Fourth Terrace have been worked at Baginton in combination with Baginton Sand and Gravel. No significant workings occur in the river terrace deposits elsewhere and their resource potential is unknown.

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APPENDIX: Schedule of boreholes for SP37SW

BOREHOLE REF.NO. SP37SW	BOREHOLE NAME	GRID REF. EAST	NORTH	DEPTH (m)	DATE
1	COVENTRY CORP SEWERAGE BH F5	3369	7385	9.14	1963
2	COVENTRY CORP SEWERAGE BH F6	3375	7395	6.10	1963
3	COVENTRY CORP SEWERAGE BH F7	3380	7405	5.79	1963
4	COVENTRY CORP SEWERAGE BH F8	3385	7390	3.88	1963
5	COVENTRY CORP SEWERAGE BH F9	3371	7419	9.44	1963
6	COVENTRY CORP SEWERAGE BH F10	3365	7430	9.14	1963
7	COVENTRY CORP SEWERAGE BH F11	3358	7437	6.10	1963
8	COVENTRY CORP SEWERAGE BH A1	3393	7393	10.21	1963
9	COVENTRY CORP SEWERAGE BH A2	3401	7398	3.05	1963
10	COVENTRY CORP SEWERAGE BH A2A	3403	7398	3.96	1963
11	COVENTRY CORP SEWERAGE BH A2B	3408	7400	7.62	1963
12	COVENTRY CORP SEWERAGE BH A3	3415	7405	9.60	1963
13	COVENTRY CORP SEWERAGE BH A4	3435	7434	23.47	1963
14	COVENTRY CORP SEWERAGE BH A6	3457	7460	19.81	1963
15	COVENTRY CORP SEWERAGE BH A5A	3477	7484	21.64	1963
16	COVENTRY CORP SEWERAGE BH 1	3318	7446	5.49	1963
17	COVENTRY CORP SEWERAGE BH 3	3320	7474	4.42	1963
18	COVENTRY CORP SEWERAGE BH 4	3319	7492	20.12	1963
19	COVENTRY CORP SEWERAGE BH FB1	3393	7390	9.14	1963
20	COVENTRY CORP SEWERAGE BH FB2	3396	7386	7.01	1963
21	COVENTRY CORP SEWERAGE BH FB3	3399	7384	9.45	1963
22	COVENTRY CORP SEWERAGE BH FB4	3389	7391	4.12	1963
23	COVENTRY CORP SEWERAGE BH FB5	3388	7386	4.42	1963
24	KENILWORTH EASTERN BY-PASS BH3/20A	3001	7051	12.19	1969
25	KENILWORTH EASTERN BY-PASS BH3/20B	3046	7123	9.14	1969
26	KENILWORTH EASTERN BY-PASS BH3/21	3139	7231	2.43	1969
27	KENILWORTH EASTERN BY-PASS BH3/22	3141	7234	2.43	1969
28	KENILWORTH EASTERN BY-PASS BH3/23	3203	7342	13.26	1969
29	KENILWORTH EASTERN BY-PASS BH3/24	3200	7349	12.19	1969
30	KENILWORTH EASTERN BY-PASS BH3/25	3248	7396	9.45	1969
31	KENILWORTH EASTERN BY-PASS BH3/26	3252	7393	9.45	1969
32	KENILWORTH EASTERN BY-PASS BH3/27	3273	7426	13.71	1969
33	KENILWORTH EASTERN BY-PASS BH3/27A	3281	7432	2.13	1969
34	KENILWORTH EASTERN BY-PASS BH3/27B	3287	7439	13.71	1969
35	KENILWORTH EASTERN BY-PASS BH3/28	3277	7420	14.02	1969
36	KENILWORTH EASTERN BY-PASS BH3/28A	3284	7428	1.82	1969
37	KENILWORTH EASTERN BY-PASS BH3/28B	3291	7434	13.71	1969
38	KENILWORTH EASTERN BY-PASS BH3/29	3315	7455	10.51	1969
39	KENILWORTH EASTERN BY-PASS BH3/30	3320	7458	9.14	1969
40	KENILWORTH EASTERN BY-PASS BH3/31	3316	7462	9.14	1969
41	KENILWORTH EASTERN BY-PASS BH3/33	3320	7466	10.05	1969
42	KENILWORTH EASTERN BY-PASS BH10	3005	7055	4.70	1969
43	KENILWORTH EASTERN BY-PASS BH11	3012	7065	2.60	1969
44	KENILWORTH EASTERN BY-PASS BH12	3059	7126	4.00	1969
45	KENILWORTH EASTERN BY-PASS BH13	3067	7141	4.80	1969
46	KENILWORTH EASTERN BY-PASS BH14	3084	7164	2.40	1969
47	KENILWORTH EASTERN BY-PASS BH15	3100	7185	3.00	1969
48	KENILWORTH EASTERN BY-PASS BH17	3183	7314	3.80	1969
49	KENILWORTH EASTERN BY-PASS BH16	3176	7301	3.10	1969

BOREHOLE REF.NO. SP37SW		BOREHOLE NAME	GRID REF. EAST	NORTH	DEPTH (m)	DATE
50		KENILWORTH EASTERN BY-PASS BH18A	3191	7333	2.50	1969
51		KENILWORTH EASTERN BY-PASS BH18	3192	7336	2.10	1969
52		KENILWORTH EASTERN BY-PASS BH19	3208	7348	3.80	1969
53		KENILWORTH EASTERN BY-PASS BH20	3220	7368	3.70	1969
54		KENILWORTH EASTERN BY-PASS BH21	3283	7327	2.70	1969
55		KENILWORTH EASTERN BY-PASS BH22	3342	7495	3.10	1969
56		J.D.BLAKEMORES HOUSE COVENTRY WARKS	3107	7447	48.77	1925
57	A	OLD STONE WELL STONELEIGH	3256	7448	8.53	----
57	B	KINGS HILL FARM STONELEIGH	3260	7441	32.61	1927
58		NEW HOUSE ASHOW WARKS	3094	7046	42.67	1922
59		COVENTRY GOLF COURSE FINHAM COVENTRY	3339	7481	34.75	1922
60	c	WAINBODY WOOD BH COVENTRY	3139	7419	1119.00	1976
61		CANLEY FOUL SEWER COVENTRY BH1	3301	7483	11.58	1966
62		CANLEY FOUL SEWER COVENTRY BH8	3311	7434	5.28	1966
63		CANLEY FOUL SEWER COVENTRY BH9	3278	7423	5.49	1966
64		CANLEY FOUL SEWER COVENTRY BH10	3201	7461	4.27	1966
65		PROPOSED EXTENSION STONELEIGH BH 1A	3219	7138	9.14	1971
66		PROPOSED EXTENSION STONELEIGH BH 2A	3218	7134	4.57	1971
67		PROPOSED EXTENSION STONELEIGH BH 3A	3221	7134	4.87	1971
68		PROPOSED EXTENSION STONELEIGH BH 1B	3221	7148	5.03	1971
69		PROPOSED EXTENSION STONELEIGH BH 2B	3225	7148	1.83	1971
70		STONELEIGH ESTATE CHANTRY HEATH SE-CH-1	3435	7336	49.53	----
71		STONELEIGH ESTATE CHANTRY HEATH SE-CH-2	3452	7332	31.85	----
72		STONELEIGH ESTATE CHANTRY HEATH SE-CH-3	3472	7315	57.00	----
73		STONELEIGH ESTATE CHANTRY HEATH SE-CH-4	3474	7296	17.07	----
74		STONELEIGH ESTATE CHANTRY HEATH SE-CH-6	3476	7276	5.48	----
75		STONELEIGH ESTATE CHANTRY HEATH SE-CH-7	3488	7309	51.82	----
76		STONELEIGH ESTATE CHANTRY HEATH SE-CH-8	3463	7304	20.73	----
77		STONELEIGH ESTATE CHANTRY HEATH SE-CH-9	3434	7291	13.72	----
78		STONELEIGH ESTATE CHANTRY HEATH SE-CH10	3427	7308	16.61	----
79		STONELEIGH ESTATE CHANTRY HEATH SE-CH11	3415	7316	7.62	----
80		STONELEIGH ESTATE CHANTRY HEATH SE-CH12	3422	7340	10.36	----
81		STONELEIGH ESTATE CHANTRY HEATH SE-CH13	3426	7320	20.42	----
82		STONELEIGH ESTATE CHANTRY HEATH SE-CH14	3426	7279	5.81	----
83		KENILWORTH BY-PASS WARKS BH15	3032	7069	4.57	1966
84		KENILWORTH BY-PASS WARKS BH16	3045	7104	4.70	1966
85		KENILWORTH BY-PASS WARKS BH17	3054	7116	3.35	1966
86		KENILWORTH BY-PASS WARKS BH18	3059	7132	9.14	1966
87		KENILWORTH BY-PASS WARKS BH19	3069	7153	9.14	1966
88		KENILWORTH BY-PASS WARKS BH23	3112	7208	3.50	1966
89		KENILWORTH BY-PASS WARKS BH24	3135	7222	4.57	1966
90		KENILWORTH BY-PASS WARKS BH25	3144	7232	4.57	1966
91		KENILWORTH BY-PASS WARKS BH27	3170	7276	4.57	1966
92		KENILWORTH BY-PASS WARKS BH28	3180	7302	10.67	1966
93		KENILWORTH BY-PASS WARKS BH2A	3200	7325	10.67	1966
94		KENILWORTH BY-PASS WARKS BH29	3187	7322	10.67	1966
95		KENILWORTH BY-PASS WARKS BH32	3216	7358	13.72	1966
96		KENILWORTH BY-PASS WARKS BH33	3230	7377	7.77	1966
97		KENILWORTH BY-PASS WARKS BH34	3240	7386	4.57	1966
98		KENILWORTH BY-PASS WARKS BH53	3328	7476	4.88	1966

BOREHOLE REF.NO. SP37SW		BOREHOLE NAME	GRID REF. EAST	NORTH	DEPTH (m)	DATE
99		KENILWORTH BY-PASS WARKS BH54	3340	7485	9.14	1966
100	c	ASHOW BH	3053	7161	1244.00	1977
101	c	BLACK SPINNEY	3436	7326	1172.00	1977
102		BAGINTON SLUDGE PUMPING MAIN F1	3476	7398	5.60	1964
103		BAGINTON SLUDGE PUMPING MAIN F2	3435	7397	4.90	1964
104		KENILWORTH EASTERN BY-PASS 31	3204	7346	12.19	----
105		KENILWORTH EASTERN BY-PASS 84	3206	7350	3.35	----
106		KENILWORTH EASTERN BY-PASS 86	3200	7342	12.19	----
107		KENILWORTH EASTERN BY-PASS 87	3198	7343	3.66	----
108		KENILWORTH EASTERN BY-PASS 88	3199	7345	12.19	----
109	c	MILBURN GRANGE BH WARKS	3041	7379	1150.00	1979
110	c	CREWE FARM WARKS	3136	7200	1222.00	1980
111	c	STARETON BH WARKS	3321	7218	1125.00	1980
112		IMAU GOSPEL OAK CY43	3446	7357	2.50	1980
113		IMAU TANTARA LODGE CY51	3453	7218	3.30	1980
114		FINHAM SEWAGE WORKS BH E	3335	7380	4.40	1986
115		FINHAM SEWAGE WORKS BH F	3331	7377	4.95	1986
116		FINHAM SEWAGE WORKS BH G	3332	7382	3.85	1986
117		FINHAM SEWAGE WORKS BH H	3329	7394	6.73	1986
118		FINHAM SEWAGE WORKS BH J	3329	7391	4.64	1986
119	c	FINHAM BROOK	3335	7444	1066.50	1982
120		WESTLEY BRIDGE BH NO.1	3181	7370	6.80	1978
121		WESTLEY BRIDGE BH 1	3179	7372	6.00	1979
122		WESTLEY BRIDGE BH 2	3176	7370	6.10	1979
123		WESTLEY BRIDGE BH 3	3179	7368	5.80	1979
124		STONELEIGH BRIDGE BH 1	3323	7270	4.50	1981
125		STONELEIGH BRIDGE BH 2	3320	7275	6.00	1981
126		STONELEIGH BRIDGE BH 3	3320	7272	6.00	1981
127		LABORATORIES FINHAM BH 1	3330	7451	4.57	1969
128		LABORATORIES FINHAM BH 2	3332	7454	4.57	1969
129		LABORATORIES FINHAM BH 3	3329	7457	3.66	1969
130		GLASSHOUSE LANE KENILWORTH TP 1	3028	7249	2.30	----
131		GLASSHOUSE LANE KENILWORTH TP 2	3014	7216	2.30	----
132		GLASSHOUSE LANE KENILWORTH TP 3	3002	7277	2.00	----
133		GLASSHOUSE LANE KENILWORTH TP 4	3003	7257	2.20	----
134		GLASSHOUSE LANE KENILWORTH TP 5	3011	7255	1.50	----
135		GLASSHOUSE LANE KENILWORTH TP 6	3015	7245	2.00	----
136		GLASSHOUSE LANE KENILWORTH TP 1A	3041	7220	1.75	----
137		GLASSHOUSE LANE KENILWORTH TP 2A	3032	7202	1.50	----
138		GLASSHOUSE LANE KENILWORTH TP 3A	3030	7182	1.75	----
139		GLASSHOUSE LANE KENILWORTH TP 4A	3034	7168	2.50	----
140		GLASSHOUSE LANE KENILWORTH TP 5A	3023	7159	1.50	----
141		GLASSHOUSE LANE KENILWORTH TP 6A	3006	7152	1.25	----
142		GLASSHOUSE LANE KENILWORTH TP 7A	3024	7142	1.00	----
143		GLASSHOUSE LANE KENILWORTH TP 8A	3041	7165	1.50	----
144		GLASSHOUSE LANE KENILWORTH TP 9A	3054	7187	1.25	----
145		GLASSHOUSE LANE KENILWORTH TP 10A	3040	7193	2.00	----
146		WINDY ARBOUR KENILWORTH TP 1	3012	7183	2.00	1976
147		WINDY ARBOUR KENILWORTH TP 2	3005	7180	1.50	1976
148		WINDY ARBOUR KENILWORTH TP 4	3037	7165	1.50	1976

BOREHOLE REF.NO. SP37SW	BOREHOLE NAME	GRID REF. EAST	NORTH	DEPTH (m)	DATE
149	DALEHOUSE LANE KENILWORTH TP 1	3044	7307	2.95	1987
150	DALEHOUSE LANE KENILWORTH TP 2	3047	7305	3.50	1987
151	DALEHOUSE LANE KENILWORTH TP 3	3040	7307	2.90	1987
152	DALEHOUSE LANE KENILWORTH TP 4	3033	7302	3.90	1987
153	DALEHOUSE LANE KENILWORTH TP 5	3039	7296	2.50	1987
154	DALEHOUSE LANE KENILWORTH TP 6	3038	7299	2.90	1987
155	DALEHOUSE LANE KENILWORTH TP 7	3042	7300	2.70	1987
156	DALEHOUSE LANE KENILWORTH TP 8	3045	7300	2.90	1987
157	DALEHOUSE LANE KENILWORTH TP 9	3048	7299	2.80	1987
158	DALEHOUSE LANE KENILWORTH TP 10	3050	7302	3.90	1987
159	DALEHOUSE LANE KENILWORTH TP 11	3035	7296	2.90	1987
160	DALEHOUSE LANE KENILWORTH TP 12	3031	7294	2.00	1987
161	DALEHOUSE LANE KENILWORTH TP 13	3031	7301	3.40	1987
162	STONELEIGH TRIAL BOREHOLE	3220	7280	196.75	----

c denotes confidential record details of which may be released only by permission of the client.