
Buller's Hill Quarry, Devon

[SX 882 846]

Highlights

This is now the best exposure of the Haldon Gravels and is the only extant site to show the Buller's Hill Gravel resting on the Tower Wood Gravel. The site demonstrates how the residual facies was in time replaced by gravels laid down in fast-flowing rivers.

Introduction

Buller's Hill Quarry (Figure 7.6) occurs at grid reference [SX 882 846], approximately 1 km SSE, from Tower Wood Quarry. According to Edwards and Freshney (1982), this is the best exposure of the Haldon Gravels'. Here the Buller's Hill Gravel is seen to rest on the Tower Wood Gravel, which in turn lies unconformably on the Upper Greensand.

A review of the earlier work on the Haldon Gravels as a whole is included in the account of Tower Wood Quarry. Buller's Hill Quarry itself has only been mentioned by name in relatively recent years. Brief descriptions occur in Edwards and Freshney (1982, p. 234) and Selwood *et al.* (1984, p. 128). There is a possibility that Kiddens Quarry, referred to by Pickard (1949), may be Buller's Hill Quarry but this is unproven.

Earlier views as to the age and origin of the Haldon Gravels have already been referred to in the introduction to the account of Tower Wood Quarry. Work by Hamblin (1969, 1973a,b, 1974) suggests a fluvial origin for the Buller's Hill Gravel. In age, the latter is probably Eocene, and correlation with the 'Bagshot Beds' further (1973a) commenting that such a range of ideas exist has been suggested. reflects a failure to perceive the complexity of the formation.

Description

Comparison with other localities

In Buller's Hill Quarry, the Buller's Hill Gravel Member (the 'Haldon Fluvial Gravel' of Hamblin, 1969) rests on the Tower Wood Gravel.

Lithological succession

The succession comprises abraded gravels of the Buller's Hill Gravel Member above the unabraded gravels of the Tower Wood Gravel Member. As at Tower Wood Quarry, the pebbles have been subjected to shattering by frost and Pleistocene cryoturbation has made the boundary between the two units difficult to define. Hamblin (1973a) has referred to large unabraded flints standing vertically in the Buller's Hill Gravel which had migrated upwards from the underlying Tower Wood Gravel.

Estimates of thickness of the two units vary. Hamblin (1973a) referred to several metres of the Buller's Hill Gravel resting on the Tower Wood Gravel, whilst Edwards and Freshney (1982) wrote of 2 m of the former resting on 7 m of the latter. As a working quarry until recently, measured thickness variation may reflect changing exposure over a period of some years.

Sedimentology

The Buller's Hill Gravel comprises abraded 'chatter-marked' flints. The pebbles are closely packed (an intact framework) with an interclast matrix of sandy clay. Hamblin's (1974) broader study of this unit has shown that a variety of exotic pebbles also occur within the gravel, including vein quartz, tourmaline rock, quartzite and thermally altered Carboniferous

shale and chert. Hamblin (1973b) pointed out that the matrix is more sandy than that of the Tower Wood Gravel and that the clay present comprises more or less equal amounts of well-ordered and disordered kaolinite and a greater proportion of illite than occurs in the latter.

Interpretation and evaluation

The Haldon Gravels and their origin have been of interest to geologists since the 19th century. Their formation under marine, fluvial or glacial regimes has been suggested, with Hamblin Buller's Hill Quarry represents one of the few extant exposures of the Haldon Gravels. Whilst it is important in that two contrasting units of the latter are present, it is now the only site where Buller's Hill Gravel may be observed. Elsewhere on Great Haldon and Little Haldon, Edwards and Freshney (1982) indicated a thickness of up to 10 m for the Buller's Hill Gravel, whilst Selwood *et al.* (1984) recognized some 21 m of gravel, probably mostly Buller's Hill Gravel, at the Haldon Plantation [SX 883 854] following a seismic survey of the area.

Significance of the Buller's Hill Gravel

A proper evaluation of the Buller's Hill Gravel is vital to our understanding of the palaeogeography of the land area which lay to the west of the Hampshire Basin. Whilst Waters (1960a,b) thought that the Haldon Gravels were marine shingle, Hamblin (1973a) has shown them to be fluvial in nature. All the exotic pebbles have a westerly derivation whereas a transgressive marine gravel would probably have included exotics from the east (Purbeck or Portland, cherts for example). Hamblin also referred to the lack of 'all over' chatter marks (thought to be characteristic of marine pebbles) to support a fluvial origin. Furthermore, he considered that since kaolinite is common in fluvial sediments but rare in marine, this also supported this interpretation.

Unfortunately, and no doubt in part due to Pleistocene cryoturbation, the Buller's Hill Gravel contains no internal structures which might facilitate the interpretation of the depositional environment. Hamblin (1973a) argued that this thin tabular sheet of gravel accumulated on an essentially flat plain by sheet flooding, although this was challenged by Green (1974). What is clear is that the absence of thick, wedge-shaped, less mature rudite bodies denies the existence, at least in this area, of early Palaeogene uplands which had been postulated to account for the presence of temperate plant remains in some of the 'tropical' Eocene floras obtained from localities further to the east in the London and Hampshire basins.

Provenance

Aspects of the petrology and mineralogy of the Buller's Hill Gravel in the quarry and elsewhere shed some light on the evolving palaeogeography of the area. Whilst the exotic pebbles suggest a probable Dartmoor aureole origin, many are very well-rounded for the short distance (as little as 6 km) they have travelled from the west. It may be, therefore, that, as Hamblin (1973a) suggested, there has been some recycling of material. Possible sources of such clasts are the basal pebble bed of the former Chalk cover or later gravels derived from that source. An Upper Greensand basal conglomerate derivation is unlikely in view of the absence of Upper Greensand chert accompanying the pebbles (Hamblin, 1973a).

The sand content of the Buller's Hill Gravel resembles that of the Upper Greensand Chert Beds (Hamblin, 1973a) and could have been derived from the latter or recycled from the Tower Wood Gravel. The mixture of well-ordered kaolinite and disordered kaolinite is perhaps more revealing. Whilst the former could have been reworked from the Tower Wood Gravel, the latter probably derives from the weathering of sedimentary strata, such as the Cu1m, which are thought to be the source of the kaolinite within the majority of the ball clay deposits of Devon and Dorset, together with lenticular clay horizons elsewhere within the Buller's Hill Gravel.

Age and correlation

The age of the gravels of Buller's Hill Quarry is difficult to determine since no contemporaneous fossils have been recorded. What can be said with certainty is that they post-date the youngest derived fossils found, i.e. those of Campanian age. Some indication of age may be derived from comparisons with strata both to the west, and to the east.

To the west, the Aller Gravel, with which the Buller's Hill Gravel has been correlated by Edwards (1973), underlies the Bovey Formation, the lowest part of which is thought to be of Eocene age (Edwards, 1976, p. 4). Hamblin (1973a) has argued that the derivation of the gravel from the west could hardly have persisted after the formation of the Bovey Basin and considers the Aller Gravel to be younger than the Buller's Hill Gravel (Hamblin, 1974).

Reid (1898b; and in Ussher, 1913) was the first to infer that the Buller's Hill Gravel be correlated with the 'Bagshot Beds' to the east. Hamblin (1973a, table 1, p. 470) supported this view by indicating that the former is equatable with the Reading Formation to Bournemouth Freshwater Beds. He quoted various examples of south-westerly derived detritus found further east, and appeared in part to base his conclusions concerning correlation on Groves' (1931) finding that whilst Dartmoor detritals are abundant in the 'Bagshot Beds', they are absent from the Bracklesham and Barton Beds. More recent heavy mineral studies by Morton (1982b), however, suggest that early inferences regarding provenance may be a little simplistic. He concluded that Cornubian detritus did not arrive in the Hampshire Basin until late Wittering Formation times, but stressed that the presence of such material reflected regressive periods whereas sediments of a transgressive nature (e.g. the Barton Group) tended to be dominated by material derived from Scotland via the 'North Sea'.

Positive support for Hamblin's (1973a) suggested correlation comes from the gravels preserved at Blackdown and Bincombe. In both cases, whilst the exotic pebbles are of sedimentary origin rather than derived from aureole rocks, it has been suggested that they might have come from Palaeozoic sources from and around the Dartmoor Granite (Plint, 1982). The latter author does, however, concede that they may have been polycyclic and derived relatively locally from rudites of Mesozoic age.

Clearly, the Tower Wood Gravel predates the Buller's Hill Gravel. Hamblin (1973a) has suggested a pre-'Bagshot-Beds', and possibly even pre-Reading Beds age for this member.

Conclusions

This site is important as it is the only remaining exposure portraying both the Tower Wood Gravel and the Buller's Hill Gravel. Furthermore, it is the type locality for the latter member.

Buller's Hill Quarry illustrates the evolution of the Haldon Gravels where those of residual nature are replaced by those of fluvial origin. The Tower Wood Gravel is the residual remains of a thick cover of Chalk, which extended formerly over this area, whilst the interclast matrix indicates a later infilling of material derived from the Dartmoor Granite and its associated hydrothermal 'china clay'. The Buller's Hill Gravel reflects the accumulation of material in a high-energy, probably braided fluvial complex, which derived material both from the granite and its aureole as well as weathered Palaeozoic sedimentary rocks. Some of the material may however have been recycled.

If the correlation with the early Eocene and possibly Palaeocene strata to the east is correct, then Buller's Hill Quarry sheds light on the western hinterland of the Palaeogene depositional basin represented now by the strata of the London and Hampshire tectonic basins further eastwards. What does seem clear is that southwestern England at this time did not comprise an upland area subject to deep dissection and rapid erosion.

[References](#)



(Figure 7.6) Buller's Hill Quarry, Great Haldon, Devon. 'Haldon Gravels' unconformably overlying the Upper Greensand (mainly talus-covered). Both the Tower Wood Gravel and the Buller's Hill Gravel are represented by the former although these cannot be distinguished in the photograph. Photograph taken in 1971, reproduced courtesy of the British Geological Survey (BGS photograph A11558).