
Blackbrook Reservoir

[SK 464 171]

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Introduction

This site is of considerable stratigraphical importance since it contains the type section for the South Quarry Breccia Member (Moseley and Ford, 1985). This is a prominent and easily mappable marker horizon, whose top surface coincides with that of the Ives Head Formation (Figure 2.1). It is also an excellent example of one of the particularly coarse-grained units that punctuate the Charnian sequence. The exposures show that the breccia component is confined to a 2–3 m-thick layer just above the base of this c. 35 m-thick unit. The site also includes exposures of coarse-grained strata at the base of the South Quarry Breccia Member, and finely laminated beds of the Ives Head Formation, just below (Figure 2.4).

Description

The best section, at the northern end of the viaduct across Blackbrook Reservoir, commences in strata forming an exceptionally well-laminated sequence of pale grey to pale green volcanoclastic mudstones and siltstones. Minor soft-sediment disruption is indicated by gently wavy lamination and low-angle truncations between laminae sets. They are abruptly succeeded by the South Quarry Breccia, which commences in a few metres of stratified to massive, pink-weathering, medium- to coarse-grained volcanoclastic sandstone. The overlying breccia facies is a further few metres in thickness and is exposed at the summit of One Barrow Plantation. Its most striking feature are slivers and rafts, up to 1.5 m long, consisting of white-weathering, laminated volcanoclastic siltstone and mudstone showing gentle flexuring within the breccia matrix (Figure 2.5). This matrix is pale grey, coarse-grained and poorly sorted, with up to 60 per cent quartz and plagioclase crystals and with prominent small (3–16 mm-size) clasts of cream or black volcanic rocks. In thin sections, the more intact crystals show some euhedral faces and the lithic clasts, representing fragments of dacite or acid tuff, contain euhedral and commonly embayed quartz and plagioclase crystals enclosed within a fine-grained felsic groundmass. The 29 m thickness of interbedded fine- and coarse-grained 'rhyodacitic tuffs' comprising the topmost part of the member (Moseley and Ford, 1985) are not exposed here, but are seen on Moulton Hill, about 200 m along the strike to the south-east.

Further exposures of the Ives Head Formation in the lane to the NNE of the viaduct consist mainly of laminated volcanoclastic mudstones and siltstones with sporadic thin beds of medium- to coarse-grained sandstone showing sharp, loaded bases. Cross-lamination is present, one example suggesting a SSE current direction; laminae also show rafting and minor convolutions. This sequence prominently displays the highly penetrative Charnian cleavage, which is sub-vertical with an ESE (110–120°) strike. A second foliation is seen as widely spaced (5–15 mm) systems of tension fractures, which are commonly filled by quartz and/or haematite; they are sub-vertical and strike at 070–100°.

Interpretation

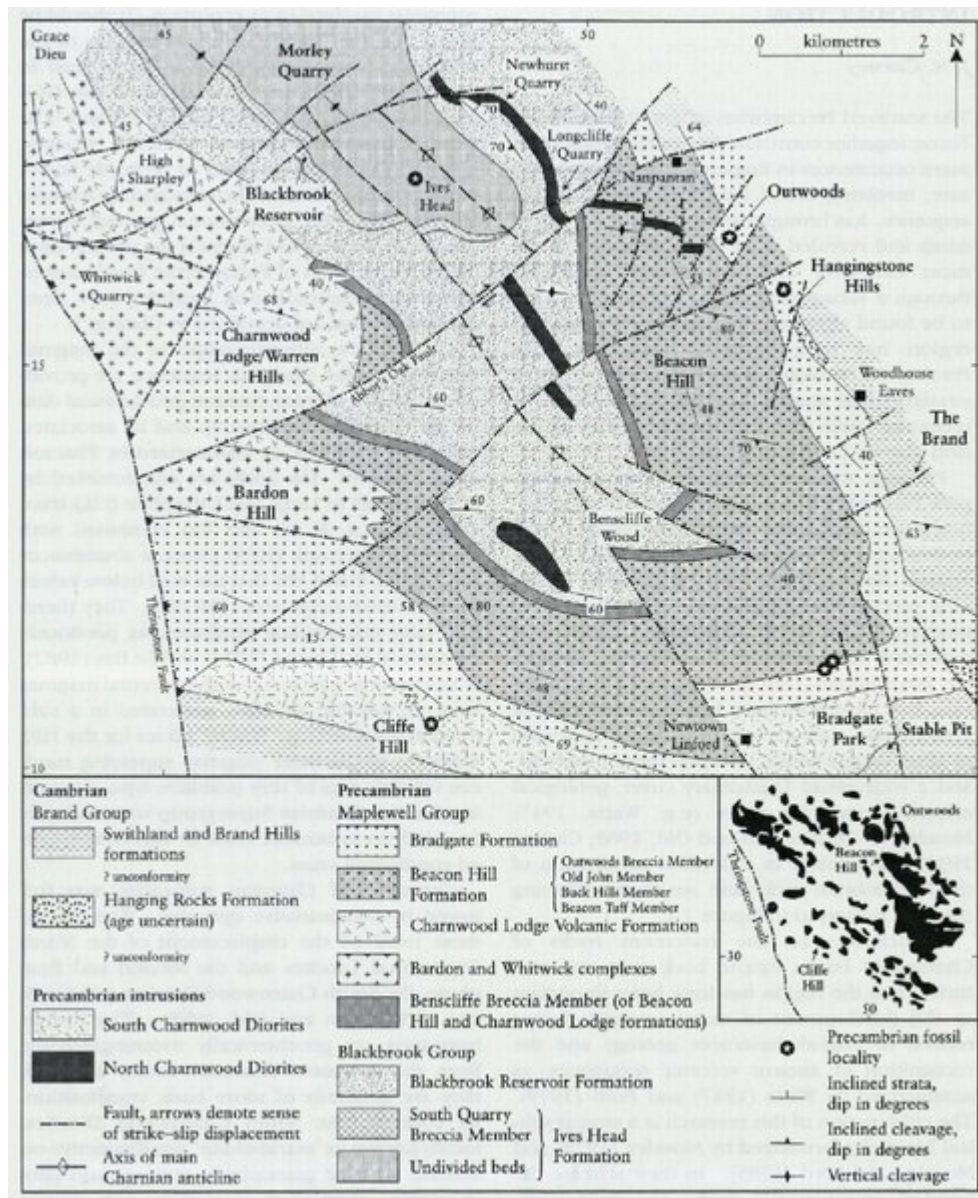
The South Quarry Breccia Member was interpreted (Moseley and Ford, 1989) as a slump breccia. It was attributed to an episode of powerful dacitic pyroclastic activity in the volcanic hinterland, suggested by the very coarse-grained crystal and lithic-rich nature of the breccia matrix. However, its final emplacement, they suggested, was due to the liquefaction and subsequent movement of water-saturated sediment, resulting in the rafting of previously deposited siltstone layers. There is little petrographical evidence for the presence of juvenile pyroclastic material (e.g. vitric shards) in the breccia matrix, and so the involvement of pyroclastic activity in forming the pre-slump sequence cannot be proved. As noted by Cas and Wright (1991), however, pyroclastic flows can lose 'fines' such as volcanic ash upon entry into water, leaving behind a deposit enriched in the denser (lithic and crystal) constituents. The sharpness with which the member succeeds

the underlying distal turbidites is perhaps further evidence for a major volcanic or tectonic event that marked the passage from the Ives Head Formation into the overlying Blackbrook Reservoir Formation.

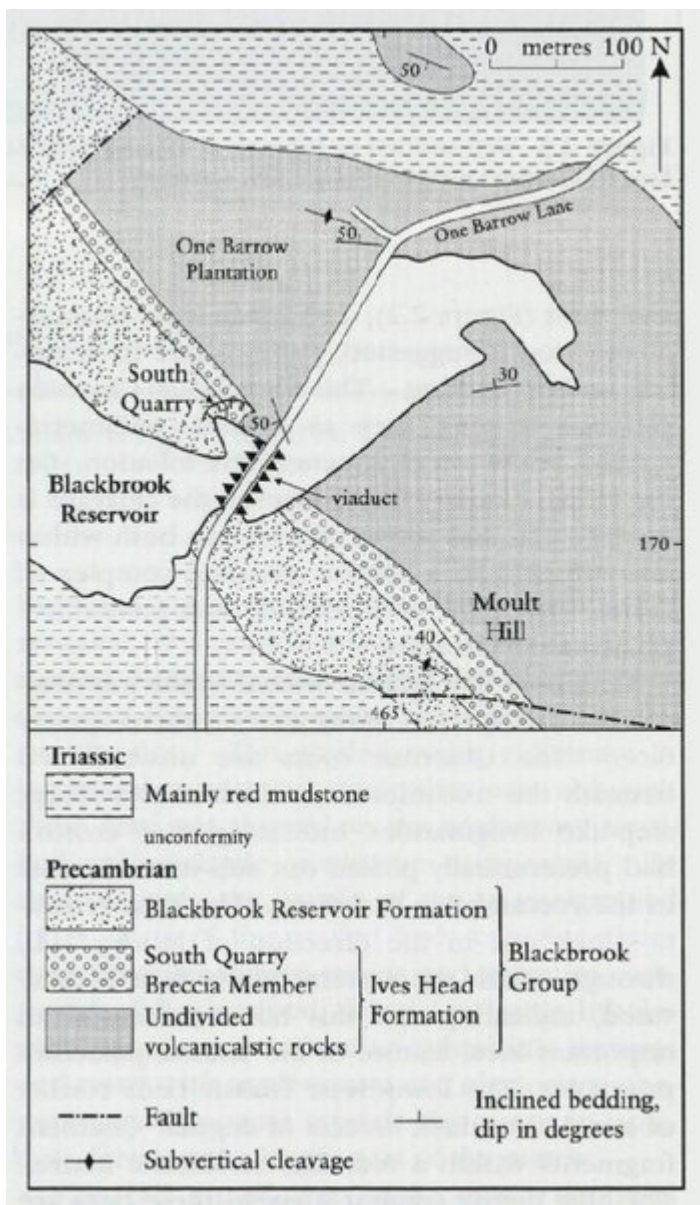
Conclusions

The Blackbrook Reservoir site offers easily accessible exposures in strata defining the top of the Ives Head Formation, and in particular it includes one of the classic occurrences of a typical intraformational breccia within the Charnian Supergroup. The 'slump' origin of the South Quarry Breccia Member is demonstrated by its content of laminated siltstone clasts and rafts, which prove that a pre-existing bedded sequence had been disrupted, and is indicative of a phase of gravitational instability within the Charnian sedimentary pile. Detailed examination of the breccia matrix may show whether or not the very coarse-grained constituents (crystals and volcanic fragments) were supplied directly from erupting volcanoes by pyroclastic flows operating prior to slumping.

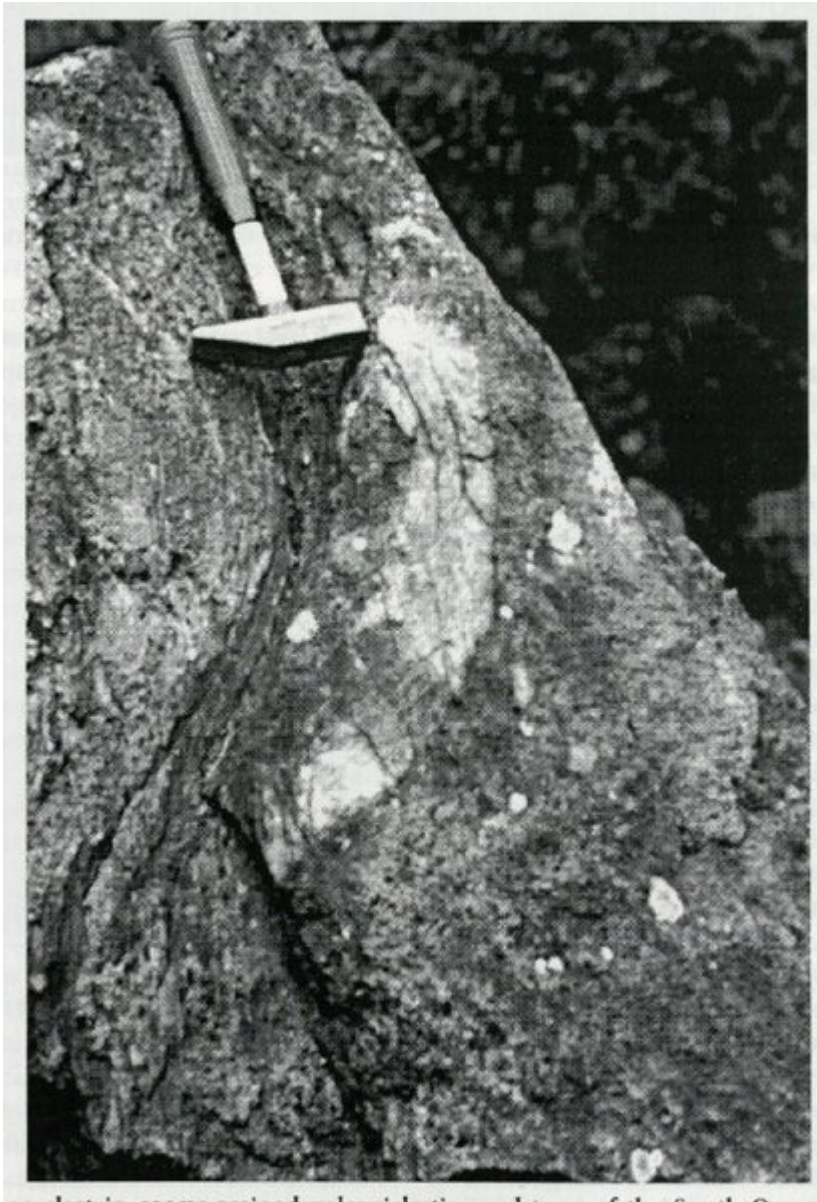
References



(Figure 2.1) Geological map of Precambrian and Cambrian rocks in Charnwood Forest, showing the locations of the GCR sites (in bold lettering). Note that younger rocks are omitted for clarity. The inset shows the actual extent of the 'basement' inliers (dark shading) between this younger cover. The latter mainly consists of Triassic strata, with Coal Measures included to the west of the Thringstone Fault; extensive veneers of Quaternary drift are also present (modified from Worssam and Old, 1988).



(Figure 2.4) Geological map of the Blackbrook Reservoir site.



(Figure 2.5) Siltstone clast in coarse-grained volcaniclastic sandstone of the South Quarry Breccia Member, Blackbrook Reservoir. (Photo: J.N. Carney.)