

THE STRATIGRAPHY OF THE MERCIA MUDSTONE GROUP SUCCESSION (MID TO LATE TRIASSIC) PROVED IN THE WISCOMBE PARK BOREHOLES, DEVON



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The type sections of the Sidmouth Mudstone, Dunscombe Mudstone and Branscombe Mudstone formations of the Mercia Mudstone Group are the almost complete sections exposed in the cliffs between Sidmouth and Axmouth on the Devon coast. The partially cored Wiscombe Park No. 1 and No. 2 mineral-exploration boreholes, drilled by British Gypsum Ltd in 1972, were sited about 5.8 and 4.7 km north of the cliff sections respectively. The first of these penetrated the whole of the Sidmouth Mudstone and Dunscombe Mudstone formations and the lower part of the Branscombe Mudstone Formation. The lithological succession proved in the cored parts of the boreholes can be correlated with that exposed in the cliffs. Geophysical logs made through the full length of the boreholes enable the complete succession proved there to be correlated with that exposed in the cliffs. The calibrated geophysical logs have been used to correlate the succession at outcrop with those proved in uncored but geophysically logged hydrocarbon-exploration boreholes throughout the Wessex Basin. The Sidmouth Mudstone and Branscombe Mudstone successions proved in the Wiscombe Park boreholes are similar in thickness and lithology to those elsewhere in the Wessex Basin. In contrast, the Dunscombe Mudstone succession in the boreholes expands from 35 m in thickness to over 500 m by the addition of thick beds of halite in parts of the basin.

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INTRODUCTION

The Wiscombe Park No. 1 [SY 1819 9382] and No. 2 [SY 1845 9273] boreholes were drilled by British Gypsum Ltd in 1972 as part of a mineral-exploration programme in east Devon. The boreholes were sited about 1100 m apart on the Wiscombe Park estate, Southleigh (Figure 1). The Wiscombe Park No. 1 Borehole was drilled to a total depth of 164.59 m, of which the interval from 48.77 m to 164.59 m was continuously cored. Note that borehole depths (in feet and inches on the cores) are recalculated to metric here; allowances have been made for core losses.

The Wiscombe Park No. 2 Borehole was drilled to a total depth of 304.80 m, of which 76.20 m to 117.65 m was cored. The cores are housed in the British Geological Survey (BGS) National Geoscience Data Centre at Keyworth, Nottingham. The following geophysical logs were made in both boreholes: caliper, temperature, total gamma ray (GR) and density.

An almost complete section through the c. 450 m-thick Mercia Mudstone Group is exposed in the 9 miles (14 km) of cliffs between Sidmouth [SY 129 873] and Culverhole Point, Axmouth [SY 274 893] on the east Devon coast. The previously un-named lower and middle parts of the Mercia Mudstone Group exposed there, has been divided into three formations and nine members (Gallois, 2001, figure 2). The lowest and highest of these formations, the Sidmouth Mudstone (c. 195 m thick) and Branscombe Mudstone (c. 220 m thick), consist of relatively monotonous red mudstones. In the type section on the coast, the intervening Dunscombe Mudstone Formation consists of a 40 to 43 m-thick succession of laminated green, purple and grey mudstones, limestones and breccias with a lenticular bed of calcareous fine-grained sandstone/siltstone (the Lincombe Member) in the lower part (Gallois and Porter, 2006). Lithologically similar beds of sandstone are present in

the lower part of the Dunscombe Mudstone Formation in the Taunton, North Curry and Sutton Mallet areas in Somerset (Ruffell, 1991; Ruffell and Warrington, 1998; Warrington and Williams, 1984), but none of these is laterally persistent over distances of more than a few kilometres.

The Wiscombe Park boreholes and the Mercia Mudstone exposures on the nearby coast are sited on the East Devon structural high, an area bounded by the N-S trending Sid Valley and Axe Valley fault belts in which sedimentation was relatively attenuated in the mid to late Triassic. The lithologies exposed in the coastal sections can be correlated with the geophysical-log signatures of the Mercia Mudstone Group successions proved in inland boreholes throughout the Wessex Basin. This has shown that the Dunscombe Mudstone in some inland borehole successions east of the structural high expands to over 500 m by the addition of thick beds of halite (Gallois, 2003).

SUCCESSION PROVED IN THE WISCOMBE PARK BOREHOLES

Both boreholes were sited on the Branscombe Mudstone Formation close to the base of the unconformable Upper Greensand in an area where the outcrop of the Mercia Mudstone is largely hidden beneath extensive sheets of Head deposits derived from the Cretaceous rocks. The Wiscombe Park No. 1 Borehole commenced at a level in the middle part of the Littlecombe Mudstone Member, and the No. 2 Borehole near the top of the member, close below the Red Rock Gypsum Member (Figure 2). Exposures of the Red Rock Gypsum are confined to rapidly eroding sections on the coast due to the high solubility of the gypsum, and it has not been recorded at outcrop inland.

Coring was confined to the highest part of the Hook Ebb Mudstone and Little Weston Mudstone members and the lower