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## Dee Cliffs section, Cheshire

[SJ 409 546]–[SJ 415 541]

### Introduction

The Dee Cliffs section exposes the Chester Pebble Beds Formation, a sequence of sandstones and pebbly sandstones with large-scale tabular cross-stratification, smaller scale trough cross-stratification, and planar bedding. Sand body units are separated by prominent erosion surfaces. The depositional environment can be interpreted as that of a low-sinuosity sandy braided river that drained west and north-west towards the East Irish Sea Basin. The site provides a good opportunity to study the characteristic features and sedimentary structures of sandy braided river deposits typical of the Lower Triassic deposits in Britain. The Chester Pebble Beds here are finer-grained than farther south in the Cheshire Basin.

The site has been described by Thompson (1970a,b) and Earp and Taylor (1986, pp. 16–19).

### Description

Cliffs on the eastern bank of the River Dee at Farndon expose a superb continuous section in the Chester Pebble Beds Formation in the northwest part of the Cheshire Basin. The bridge at Farndon is one of the few crossing places from Cheshire into North Wales; it was first built 650 years ago by monks from St Werburgh's Abbey, Chester, and carried the valuable salt trade from Nantwich to North Wales.

The Chester Pebble Beds here dip at about 16° to the south-east and show a wide range of fluvial sediment types organized into a series of cycles and sub-cycles (Figure 3.32). The dominant lithology is medium- to coarse-grained, reddish-brown, cross-bedded sandstone, much of it incorporating rounded pebbles; there are also beds of sandstone with few or no pebbles, thin bands of biscuit-coloured, argillaceous sandstone, and a few thin layers of chocolate-coloured mudstone. The pebbles are mostly smooth and well rounded, and rarely exceed 150 mm in length, the majority being 50 to 80 mm across. Most pebbles are brown, reddish, or grey quartzites; a few vein quartzites, as well as rarer sandstones, cherts, and igneous and metamorphic rocks, are also present.

West of the bridge, the lower part of the sequence shows pebbly sandstones arranged in large-scale (2 m) planar-tabular cross-bed sets that indicate palaeoflow to the NNW. The pebbly sandstones are interbedded with fine- to medium-grained sandstones showing smaller-scale cross-beds, plane beds, and soft-sediment deformation structures.

Immediately east of the bridge, at the picnic site, the lowest unit seen comprises rather friable, red, fine-grained sandstones with thin white bleached zones (Figure 3.33)a. Sedimentary structures include small-scale (0.1–0.2 m thick) cross-bedding with planar horizontal and low-angle planar bedded units. This unit is overlain, above an erosion surface (Figure 3.32), by greyish-red, slightly coarser-grained sandstones, which are better cemented and show a wide range of sedimentary structures. The lower beds have planar-tabular cross-bedding (Figure 3.33)b that records consistent flow to the north and north-west. These are overlain by sandstones with prominent water-escape and other soft-sediment deformation features, which are overlain in turn by trough cross-bedded sandstones. Palaeoflow indicators in these beds are oriented towards the east and west, in contrast to those in the planar-tabular units.

South-east of the picnic site, these beds are overlain by thinly bedded, fine-grained, red sandstones and pebbly sandstones cut by shallow scour channels (Figure 3.32).

### Interpretation

The Chester Pebble Beds Formation was deposited in a fluvial environment. Pebbles in the lower unit were deposited from high-energy streams as lags; strong currents winnowed the pebble lags, resulting in concentrations of the coarse

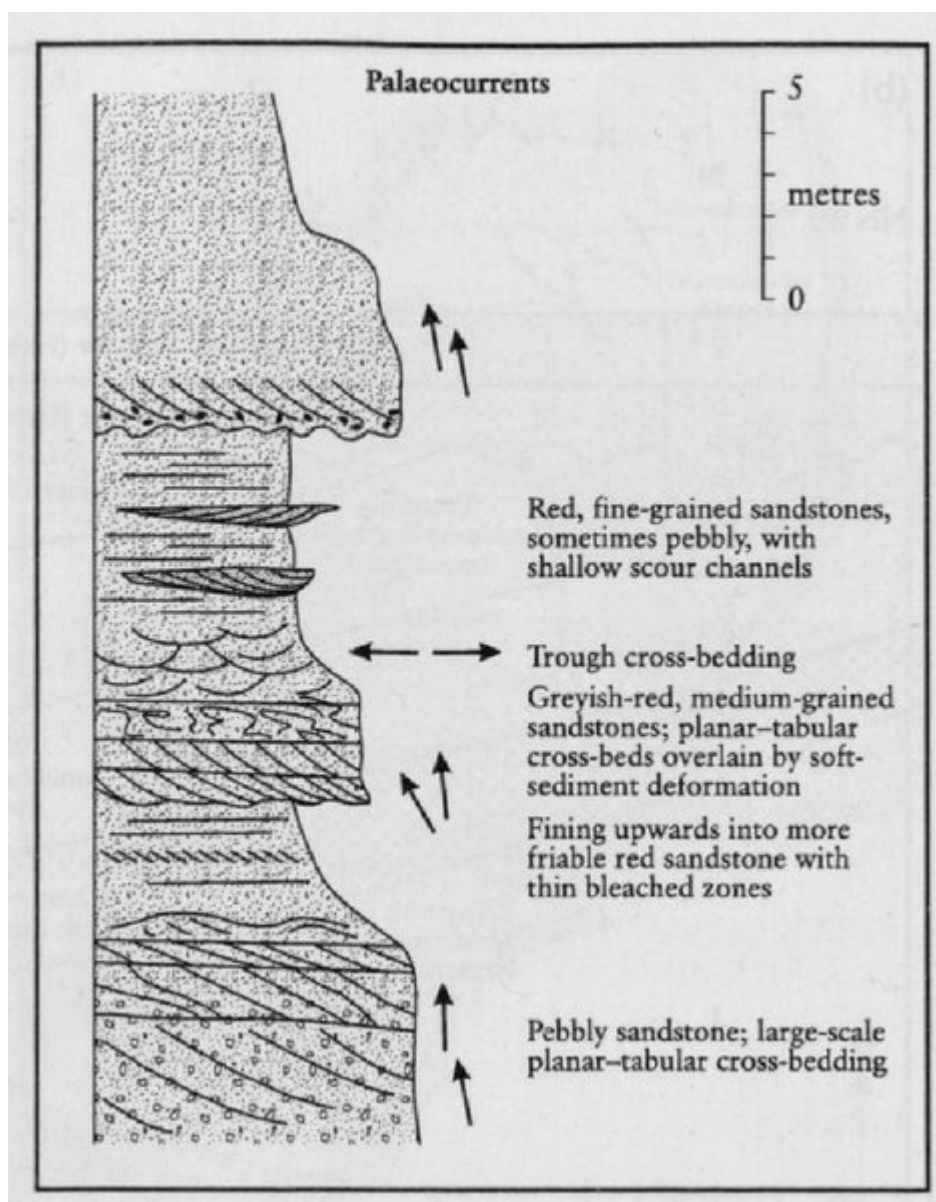
debris. In places, the pebble beds fill erosive scours. The quartzite pebbles appear to have been transported a long distance, probably from a source of early Palaeozoic rocks far to the east and south. This is the case also for the metamorphic and igneous clasts. Thin sandstone pebbles appear to be intraformational. Palaeocurrent directions vary from north-west to west, and indicate varying flow directions, typical of complex braided streams.

The middle unit of planar-tabular cross-bedded sandstones (Figure 3.32) can be interpreted as the deposits of dunes that migrated around larger bar forms during low flood stages of the river. The upper unit of thinly bedded, intercalated sandstones and pebbly sandstones may represent ephemeral flood deposits that cut the floodplain of the perennial fluvial system.

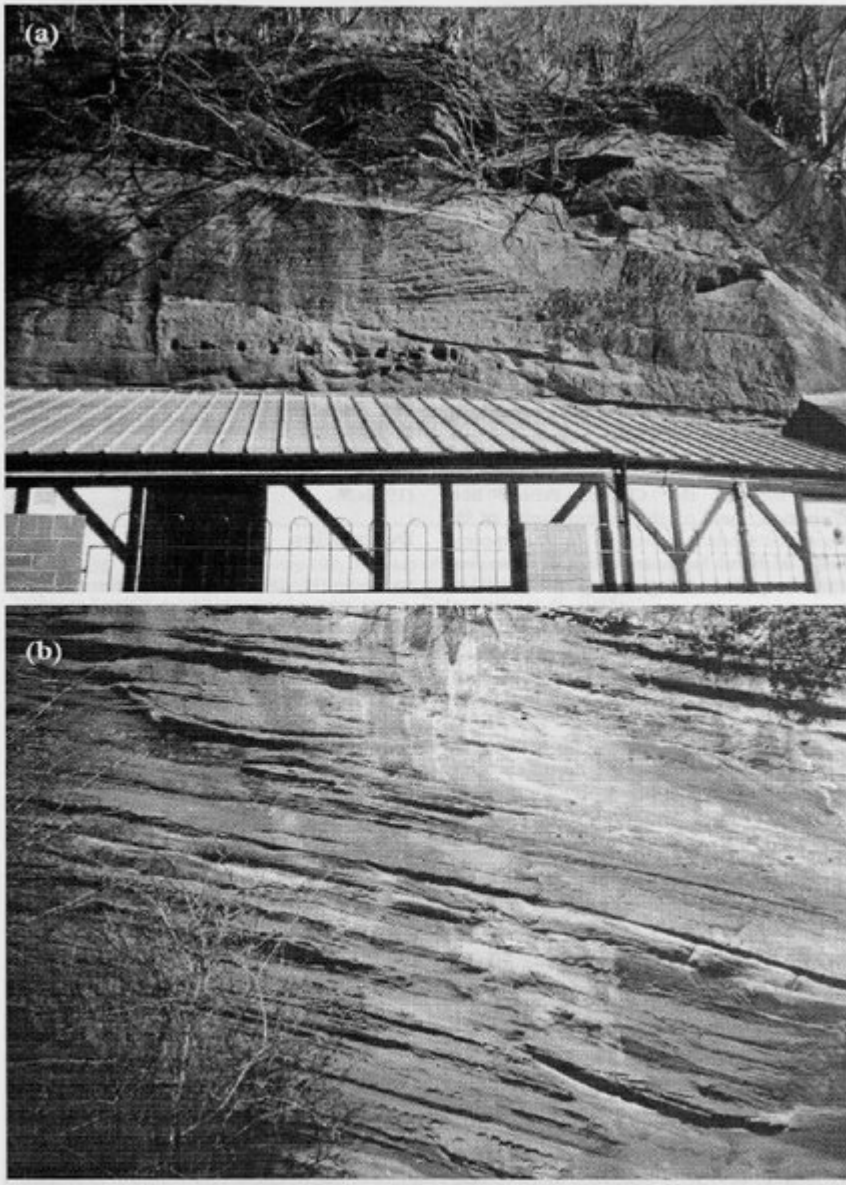
## Conclusions

The Dee Cliffs at Farndon provide excellent sections through the Chester Pebble Beds Formation, one of the lowest units of the Sherwood Sandstone Group. The site exposes a range of fluvial facies, including deposits from different phases of high-energy flood streams. This is an excellent site for the study of high-energy fluvial sedimentology, and for the understanding of the early phases of Triassic sedimentation in the Cheshire Basin.

## References



(Figure 3.32) Diagrammatic section at the Dee Cliffs GCR site, showing the range of fluvial styles in the Chester Pebble Beds Formation. Logged by P. Thrner.



(Figure 3.33) The Chester Pebble Beds Formation at Dee Cliff, (a) the lower planar-tabular cross-bedded sets at the picnic site; (b) stratigraphically higher plane-bedded sandstones with thin (upper left) scour fills. The height of the section in (b) is about 10 m. (Photos: P Turner.)